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A Review on Aerial Jousting and Bill Grappling Behavior of Indian Grey Hornbill (*Ocyrceros birostris*)

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Abstract: Indian Grey Hornbills (*Ocyrceros birostris*) are a species of hornbill found in the Indian subcontinent. Aerial jousting and bill grappling are two intriguing, little-studied behaviors of hornbills in the Bucerotidae family. Few of these interactions have been seen, and there has been a wide range of interpretations. The few observations-always recorded as individual incidents- have been classified as either play, aggression, social engagement, or pair bonding. In this review, it is proposed that bill grappling and aerial jousting can best be understood in two distinct life cycle contexts: social play in non-breeders and as a courtship ritual in adult, breeding birds. This review has looked at social interactions such as bill grappling (also known as bill locking) and aerial jousting (also known as clashing or casque butting).

Keywords: Indian Grey Hornbill, Aerial jousting, Bill grappling, Bucerotidae, Social play

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Introduction

The long, decurved beak topped by a casque, which is distinctive among avian families, makes the Bucerotidae spp. one of the most recognizable groups of birds (Kemp, 2001; Kemp *et al.*, 2020; Shukla *et al.*, 2023). The bill casque is also used for a variety of different behaviors, including aerial jousting and bill grappling

(Raman, 1998; Kinnaird *et al.*, 2003; Vijayakumar and Davidar, 2007; Kemp, 2009). Schneider (1945) originally suggested that aerial jousting was caused by fig intoxication; however, Cranbrook and Kemp (1995) called attention to the phenomenon of aggressive interactions among Asian hornbills (Bucerotidae), in which males

clash their casques in midair flight. Asian hornbills are divided into six genera and 31 species (Kemp 1995), and only a small number of hornbill species have reliably confirmed engaging in such aerial casque butting (Raman, 1998; Vijayakumar and Davidar, 2007).

The Indian Grey Hornbill is a little bird (50 cm tall, 375 g in weight; Kemp, 2001), silvery grey and white in color, with a long, graduated tail. The species is found in northeastern Pakistan, southern Nepal, northwestern Bangladesh, and most of India. Based on the size and shape of the casque, it was possible to determine the gender (male or female) and age (fledgling, immature, adult) of each individual. The female's casque is smaller and more rounded than the male's, which is bigger and pointed (Kasambe, 2009). The immature birds have a growing, unfinished casque on their bill (6-18 months after leaving the nest), whereas the fledglings (1- 5 months after leaving the nest) lack one. According to Kasambe (2009), the Indian Grey Hornbill breeds in its third year.

Throughout the year, communal roosting of Indian Grey Hornbills is typically observed. Hornbills gathered in the region at dusk to form communal roosts, which can number from 6 to 31. Aside from the females who were incarcerated during the breeding season, both breeders and non-breeders used the common roost.

Courtship Behavior- Aerial Jousting and Bill Grappling:

Courtship behavior in birds refers to the various actions, displays, and rituals that individuals of a particular bird species engage in to attract mates and establish a reproductive bond. These behaviors are often species-specific and have evolved over time to ensure successful reproduction. Courtship behaviors serve several important purposes, including the selection of healthy and genetically suitable mates, the coordination of reproductive timing, and the establishment of pair bonds that may last for the duration of the breeding season or longer. These behaviors are the result of complex interactions between genetic predispositions and environ-

mental cues. Observing and studying courtship behavior in birds provides valuable insights into their reproductive strategies, evolutionary history, and the complex interplay between behaviors and genetic fitness. Different bird species show different types of courtship behaviors like Symbolic Feeding, Nest Building, Visual Displays, Vocalizations, etc.

Same like, Aerial jousting and Bill Grappling are two essential behaviors in understanding the social dynamics and breeding strategies of Indian Grey Hornbills. Observing these behaviors in the wild can provide valuable insights into their reproductive success, mate selection, and overall population dynamics.

Aerial Jousting:

Indian Grey Hornbills exhibit an amazing behavior known as aerial jousting (Figs. 1, 2), which is particularly noticeable during the breeding season. Male hornbills compete for the favor of females by engaging in mid-air combat displays of power and agility. Two male hornbills fly at one another rapidly during the beginning of the jousting. Upon meeting, they clash their bills together, attempting to push one another away (Kemp, 1995). Male hornbills are thought to engage in this behavior as a means of asserting their authority and securing the right to mate with a certain female.

Bill Grappling:

Bill grappling (Fig. 3) is another interesting behavior observed in Indian Grey Hornbills. During this behavior, a male and a female hornbill clasp their bills together and engage in mutual bill-wrestling. They grasped each others' bills for periods of 10-12 s and in some cases; the behavior resembled a tug-of-war when two individuals held each others' bills for short periods of time, then released bills while still perched beside each other. This intimate interaction often occurs between pairs and is thought to be a way for the bonded individuals to strengthen their pair bond.

Multiple theories of aerial jousting and bill grappling have been offered for numerous



Fig. 1: Flight of Indian Grey Hornbill captured during Aerial Jousting.



Fig. 2: Indian Grey Hornbill captured during the Courtship Call.

Hornbill species (Raman, 1998; Kinnaird *et al.*, 2003; Vijayakumar and Davidar, 2007; Kemp, 2009). The Malabar Pied Hornbill (*Anthracoceros coronatus*) had been observed engaging in aerial jousting. Due to the fact that it occurred outside of the breeding season, Vijayakumar and Davidar (2007) assumed that it was likely social play. Raman (1998) noted aerial combat in the Great Hornbill (*Buceros bicornis*), but he believed it to be part of the Great Hornbill's pre-breeding rituals.

This behavior is referred to as "drumming" and "jousting" by Kinnaird *et al.* (2003) and Kemp (2009). Additionally, it was reported that Helmeted Hornbills (*Rhinoplax vigil*) were seen clashing casque to casque in flight; the impact and abrasion that resulted from these aerial battles was thought to have contributed to the adult birds' casques' recognizable flat front aspect (Cranbrook and Kemp, 1995). Although females have bills and casques that are similar in structure and

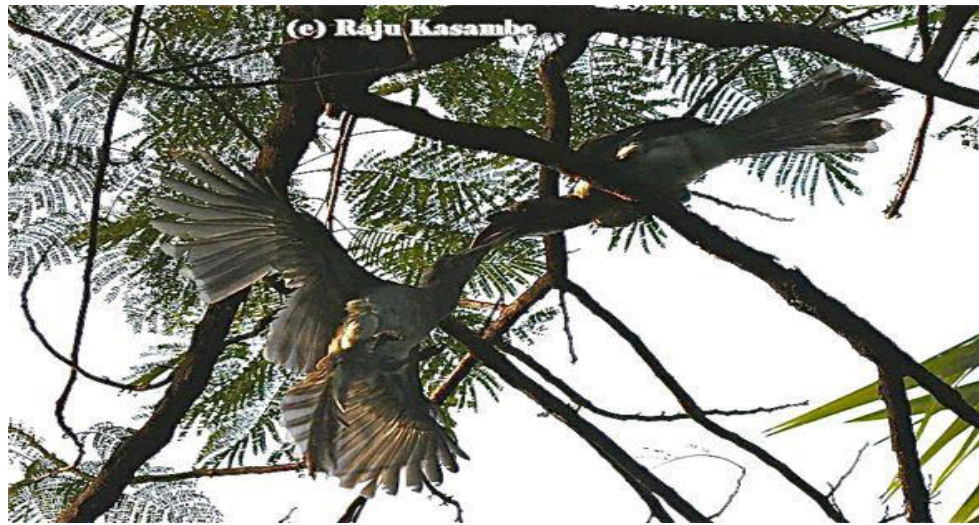


Fig. 3: Indian Grey Hornbill captured during Bill Grappling and Aerial Jousting Behavior (Photo credit -Raju Kasambe).

proportion to males' (Sanft, 1960; Kemp, 1995; Raman, 1998), the behavior was initially assumed to be sex-specific. Kinnaird *et al.* (2003) observed that the female was perched in the upper canopy of a fruiting fig preening while the male circled in a large loop overhead, then flew straight towards the female and collided with her casque-to-casque.

According to Schneider (1945), territorial defence and agonistic interactions are the causes of interactions that can continue for up to 2 h. Aerial jousting did not originate as a territorial display, but as an agonistic behavior during resource competition, according to Kinnaird *et al.* (2003) and Kinnaird and O'Brien (2007). They claim that simultaneous jousting among multiple males did not rule out resource defence, but they vehemently opposed territorial behavior unless collective defence took place.

Bill grappling or wrestling was also described as part of defense or fighting in the Southern Yellow-billed Hornbill (*Tockus leucomelas*; Kemp 1988); however, the fact that we observed this behavior in foraging juvenile Indian Grey Hornbills suggests that this is part of the species' ritualistic play activity. Inherent in flocking species, such behavior helps to prepare young

birds to meet adult requirements (Moreau and Moreau, 1944). Alternatively, it would allow the individuals in a flock to establish "pecking order." Some of the interactions were between an adult and a juvenile; we are unable to ascertain as to whether this was an interaction between intruding flock members and a territory-defending male or a parent-offspring interaction. Some of the interactions involved an adult and a juvenile, and the observers were unable to tell whether they involved a male protecting his territory against intruders from the flock or a parent and child.

Ten different bird orders have been found to exhibit play behavior (Diamond and Bond, 2003). Examples of avian social play, however, are generally uncommon and most play behavior described in the literature are essentially solitary, either locomotory play (aerobatic flight of raptors, gulls, and frigate birds; Diamond and Bond, 2003) or object play, in the form of repeated manipulation of inappropriate items ("play caching" by Pinyon Jays, *Gymnorhinus cyanocephalus* - Marzluff, and Balda, 1992; *Pica pica* - Deckert, 1991). In at least two of the studies (Kinnaird *et al.* 2003; Raman 1998), a female was perched while males engaged in jousting, which

raises the possibility that this behavior may also play a role in sexual selection. These playful interactions are known to be a part of rituals that prepare juveniles for survival and reproduction purposes during their adult life (Diamond and Bond, 2003).

Furthermore, the observation of a male jousting its partner by Kinnaird *et al.* (2003) supports the idea that the behavior may contribute to pair formation and tie strengthening in breeding pairs. Both of these interactions, indicates the need for a thorough investigation to fully define all interactions and behaviors in any given species.

Conclusion

It can be concluded that bill fighting and aerial duels between youngsters, as well as between juveniles and adults, contribute significantly to the understanding that many of the interactions were likely play behavior on the part of the hornbills involved. These lighthearted exchanges are well-known. Therefore, this review will encourage the young researchers to look more closely at the behavioral aspects of Hornbill species.

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