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NEST SANITATION IN INDIAN GREY HORNBILL IN CENTRAL INDIA

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***ABSTRACT.* –** The breeding behaviour of Indian Grey Hornbill (*Ocyceros birostris*) was studied for two consecutive breeding cycles during 2007 and 2008 in an urban environment in Nagpur city in Central India. The nest sanitation practices undertaken by the hornbills were monitored. It was found that the incarcerated female ejects her excreta by using a projectile technique with the excreta thrown up to 2.9±0.2 m from the nest cavity. The male assists the nest inmates by throwing away the excreta lying at the cavity opening. The continual supply of bark pieces to the cavity inmates by the male may ensure that excreta are removed by absorption and adsorption, besides probably helping to maintain the micro-climate inside the nest cavity. It was found that the male hornbill preferred to supply bark of certain tree species available within 200m of the nest. The presence of large cakes of excreta inside the nest indicated that in spite of all these measures taken by the hornbills to ensure good sanitation, there was still surplus waste not dealt with.

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***KEY WORDS.* –** nest sanitation, Indian Grey Hornbill, India, urban enironment.

INTRODUCTION

The Indian Grey Hornbill (*Ocyceros birostris*) is resident and fairly widespread across India. It is found in open but well-wooded country with a scattering of *Ficus* trees (Ali & Ripley, 1983). Though common, very little information and literature is available about its breeding biology, the main references being cited by Charde et al. (2011).

The remarkable nesting habits are typical of other Asian hornbills, such that the female seals herself in a large cavity of a living tree, leaving only a narrow opening slit for her mate to pass food to her and her chicks (Kemp, 1995). The nesting female of Indian Grey Hornbill stays inside the cavity until just before the fledging of the chicks. Hornbills are secondary cavity nesters, that is, they nest in large tree cavities naturally formed by decay or excavated by primary cavity nesters such as woodpeckers. They show high nest site fidelity, returning to the same tree year after year (Kemp, 1978).

In Nagpur city, in Central India, the Indian Grey Hornbill breeds regularly in an urban environment. Breeding behaviour was studied there for two consecutive breeding cycles during 2007 and 2008. The nest sanitation practices were monitored. This hornbill is fastidious, regularly removing food remains, faecal matter and other debris to prevent the nest from becoming a breeding ground for parasites and pathogens. Nest sanitation may also contribute to nest safety because the odour of faecal matter and debris in and around the nest may attract insects and the attention of predators. Equally important is the removal of eggshells from the nest cavity as these could harm the tender skin of the naked chicks.

RESULTS AND DISCUSSION

***Nest microclimate*. –** The microclimate of the nest is crucial to the successful incubation of the eggs and the health of the hatchlings. Nest microclimate also influences the adult's

daily energy requirements, as well as the amount of time the parents must spend on the nest for incubating the eggs and then brooding the young. Nest warmth like that of a house is determined by the thickness of its insulation. We have found that the male keeps supplying the female and then the chicks with many dry bark pieces throughout the breeding season. These bark pieces lie on the nest floor, where the chicks initially defaecate. The bark pieces absorb much of the water content from the semi-solid excreta. This probably helps in maintaining the moisture content at a level at which the cavity inmates are comfortable. This may help in maintaining proper humidity in summer, when the ambient temperature in Nagpur rises to 45°C.

Role of incarcerated female in nest sanitation. **–** The incarcerated female defaecated externally through the narrow slit of the nest cavity. For this she placed her cloaca exactly over the cavity slit and defaecated with a loud pumping noise. The excreta were propelled to a distance of 2.9±0.2 m from the nest cavity (n=5). The distance was measured from the point where an object will fall when not thrown with force to the longest distance at which it was propelled by the incarcerated female. The method of ejecting the excreta to such a distance by biological force is nothing but reminiscent of the *bazoomba* technique used by some tribal peoples to propel arrows for hunting. The female preferred to defaecate in the morning and evening and fresh excreta could be found between 0800 to 0830 hours and between 1700 to 1800 hours. The excreta were semi-solid with some water content. The excreta contained undigested seeds of the various food items delivered to her by the male hornbill. However, the excreta never contained any pieces of bones of the many garden lizards (*Calotes versicolor*) provided to her and the incarcerated chicks by the male.

The female accepted the numerous bark pieces foraged and provided by the male hornbill. These lie on the nest floor as lining material. Initially, the chicks defaecated on the nest floor where the excreta may be adsorbed by the dry bark pieces. Some bark pieces were thrown out by the incarcerated female; we collected many such ejected bark pieces with fresh excreta on them. These dry bark pieces absorb much of the water content in the faecal matter. Thus, they probably play a vital role in maintaining humidity inside the nearly sealed cavity nest.

Role of chicks in nest sanitation. **–** Older chicks ejected their excreta externally from the nest opening. The accuracy of the nestlings in voiding their faeces through the narrow slit, as well as the distance to which they propelled them, was remarkable. The ground below the nest up to quite a distance was white with their droppings as well as sprinkled with bits of dropped Peepal (*Ficus religiosa*) fig burst. But we never saw any bones of castings such as an owl voids (Hall, 1918).

During our study, we found that there were few excreta below the nest after the female had broken out. As the chicks are altricial in all hornbills, the chicks are helpless at an early stage of development. This suggested that the chicks were initially unable to defaecate from the cavity slit. On 20 May 2007, the female in the Veterinary Hospital nest broke the wall. From this day onwards, we could not find many excreta below the nest, except for fallen fruits. However, from 31 May 2007, that is, the eleventh day after the female broke out, we found some excreta below the nest. After this day, the volume of excreta collected from below the nest increased. Thus, it is evident that the chicks increasingly defaecated from the nest cavity.

Role of male in nest sanitation. **–** The male helped the female throughout her incarceration in nest sanitation. The male kept her supplied with a continuous supply of dry bark pieces. Also the male removed any excreta lying at the cavity entrance during most of the visits to the nest, after feeding the nest inmates. Thus the male helps in nest sanitation for the female. After the female had emerged, the male continued to help the incarcerated chicks in the same fashion as described above.

Role of tree bark in nest sanitation. **–** Even during courtship, it was observed that the male offered the female pieces of bark on many occasions besides courtship feeding. On many occasions, it was noted that the female crushed the piece of bark offered to her by the male. This might presumably be to assess the dryness and crunchiness of the piece of bark. If the bark pieces are dry and crunchier, they will absorb more moisture and adsorb more excreta over its surface. In this way, the continuous supply of bark pieces not only helps to maintain the nest sanitation, but also probably helps to maintain the humidity inside the nest.

The male not only kept the female supplied with pieces of bark throughout her incarceration of the female, but also delivered bark pieces to the nestlings after the female had broken out.

Caked excreta. **–** As soon as the hornbill chicks fledged, thereby vacating the nest cavities, competing secondary cavity nesters took possession of the nest cavities on the same day. The Common Mynas (*Acridotheres tristis*) threw out caked excreta lying in the nest cavity. This cleaning was accompanied by collecting of nesting material like grass, bird feathers, leaves, pieces of polythene and so on by the Common Myna pair occupying the cavity. This in turn helped us to assess the sanitary condition of the nest cavity. The nesting in Maharajbag in Arjuna tree failed on 22 May 2007 (Charde et al., 2011) and a pair of Common Mynas occupied the cavity on the same day. The Mynas threw out all the nesting material of the hornbills lying on the nest floor. It was found that the large chunks of caked excreta were thrown out.

On 8 May 2008, the nesting of the hornbill pair in the Central Jail (New nest) failed and Common Mynas occupied the nest cavity on the same day. The mynas threw out whatever was lying in the cavity. The excreta cakes were collected from below the nest.

Table 1. List of trees from which bark pieces were collected by Indian Grey Hornbills.

Common name	Scientific name
Mango	*Mangifera indica*
Mahogany	*Swietenia mahoganii*
Kadu Neem	*Azadirachta indica*
Gold Mohur	*Delonix regia*
Arjuna	*Terminalia arjuna*
Rain Tree	*Albizia lebbeck*

On 25 May 2008, the nesting of the hornbill pair in the Central Jail (Old nest) failed and the Common Mynas (*Acridotheres tristis*) occupied the nest cavity on the same day. The Mynas threw out the lining material which was lying in the nest cavity. We found much excreta cakes thrown out by the Common Mynas. These cakes were collected from a net that we had installed below the nest for collecting the faecal matter.

In all the above three instances of nesting failure, the excreta cakes smelled pungent, like ammonia. The presence of large chunks of excreta cakes suggests that the sanitary condition in the nest cavity was not good despite all the sanitation measures undertaken by the breeding hornbills.

According to Moreau & Moreau (1941), the purpose of supplying these inedible bark pieces to the nest is unknown. From the debris removed from an opened nest, it appears that no large pieces of bark were retained in the nest, and there is no reason to believe that bark plays any part in nest sanitation; but we think it likely that some of it is broken up into very small fragments by the inmates. We are inclined to suggest that the bark, the sticks and the big *Odyendya* nuts may have been supplied simply as playthings, for we have seen a male on a treetop play with a lump of bark, tossing it and chewing it, until it was all broken up and then going to get another piece, which he carried straight to the nest.

***Size of bark and learning by male*. –** The male often miscalculated the size of the bark pieces to be delivered to the incarcerated female and the dimensions of the sealed cavity slit, bringing excessively large or wide bark pieces to the nest. The male tried to deliver the bark pieces to the female in various positions such as holding the bark horizontally, longitudinally or flat. Again a male would juggle the bark piece and try to pass it through the slit. The male was seen to practice this trial and error method every time till nesting was complete. The male did not seem to learn from experience about the best posture for delivering the bark to the female or about choosing the proper size of the bark.

***Preferred tree species for collecting bark*. –** Throughout the study period of two years, we found a preference for the bark of certain tree species. All these trees were found within 200m of the nests in the study area. The male foraged for pieces of bark on the trunk of these trees by hopping around and pulling the bark by force before flying off with it to the nest. The male did not seem to bother about the size of the bark and the size of the nest slit as noted above. The list of trees from which bark pieces were collected was prepared from actual observations noted in the field while following the hornbills. It was found that the male preferred the bark pieces of six species of trees found in the study area (Table 1).

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