

**OBSERVATIONS ON A SUCCESSFUL NESTING OF A PAIR OF ORIENTAL PIED
HORNBILL (ANTHRACOCEROS ALBIROSTRIS, SHAW & NODD, 1790)
AT CHANGI VILLAGE, SINGAPORE**

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INTRODUCTION

Singapore had its native Oriental pied hornbills (*Anthracoceros albirostris*) in the 19th century (Gibson-Hill, 1949) and until about the 1920s (Robinson, 1927). The species appeared to have become locally extinct until the 1960s when it was irregularly sighted on Singapore Island. These birds were thought to be escapees from the wild bird trade (Wang & Hails, 2007). There were two subspecies present, the northern pied hornbill (*Anthracoceros albirostris albirostris*) and the southern pied hornbill (*Anthracoceros albirostris convexus*), both believed to be breeding in Singapore. The former has black tail feathers broadly tipped with white while the latter has mostly white outer tail feathers. In the early 1990s a pair was found breeding in the offshore island of Pulau Ubin (Lim, 1994; Wee & Subaraj, 2006). It was speculated that they must have flown from the nearby Johore state of Peninsular Malaysia as they belong to the *convexus* subspecies (Wang & Hails, 2007). Madoc (1956) and Robson (2005) noted that this subspecies occurs in the south of Peninsular Malaysia, as opposed to subspecies *albirostris* that occurs in the north. However, Wells (1999) is of the opinion that, based on present evidence, the Peninsula population is probably an *albirostris-convexus* integrate, the two subspecies having hybridised where the two populations meet.

The hornbills at Changi, in the eastern extremity of Singapore Island, are generally believed to have moved from nearby Pulau Ubin in their search for nesting cavities and are mostly the southern pied hornbills. The first report of them nesting was around Oct.2006–May 2007 (Wee et al., 2008). Two nestings that occurred simultaneously failed to fledge any chicks—their failure was thought to be owed to the pairs being inexperienced first-time breeders. Subsequently, there was a successful nesting, although not documented (R. Teo, pers. comm.). We report here our observations on the fourth known nesting, and second successful attempt, in Changi. It is possible that the third and fourth nestings involved one of the earlier two pairs, for as far as we can ascertain, there are only two pairs of southern pied hornbills in the area.

On 14 Mar.2009, a male Oriental pied hornbill of the subspecies *convexus* was sighted flying to an angasana tree (*Pterocarpus indicus*) on Changi Village Road, near the intersection with Loyang Avenue. Further observation revealed that the male bird was feeding a female and possible chicks, sealed inside a tree cavity approximately 12–15 m above the ground. Two previous nesting attempts by this subspecies in the Changi area were reported to have been unsuccessful (Wee et al., 2008), and a third, successful, nesting was undocumented. The decision was taken, therefore, to conduct regular observations of this nest to shed light on some critical aspects pertaining to successful breeding patterns of the species. Regular observations were conducted between 14 Mar.–7 May 2009.

OBSERVATIONS

Table 1 provides the summary of events and observations made of the nesting of the breeding pair.

Table 1. Summary of Events.

Date	Event(s)
End-Jan.2009	Probable nest sealing
Early–mid-Feb.2009	Probable egg laying
Early Mar.2009	Probable hatching
14 Mar.2009	First observation of the nest and male feeding
14 Mar.–19 Apr.2009	Extensive observations of the male feeding female and two chicks
19 Mar.2009	Nest threatened by a longtailed macaque; female alarm calls from the nest cavity
19 Apr.2009	Female and one chick leave the nest
19 Apr.–end-Apr.2009	Extensive observations of the male feeding remaining chick
30 Apr.–7 May 2009	Fledging of the remaining chick

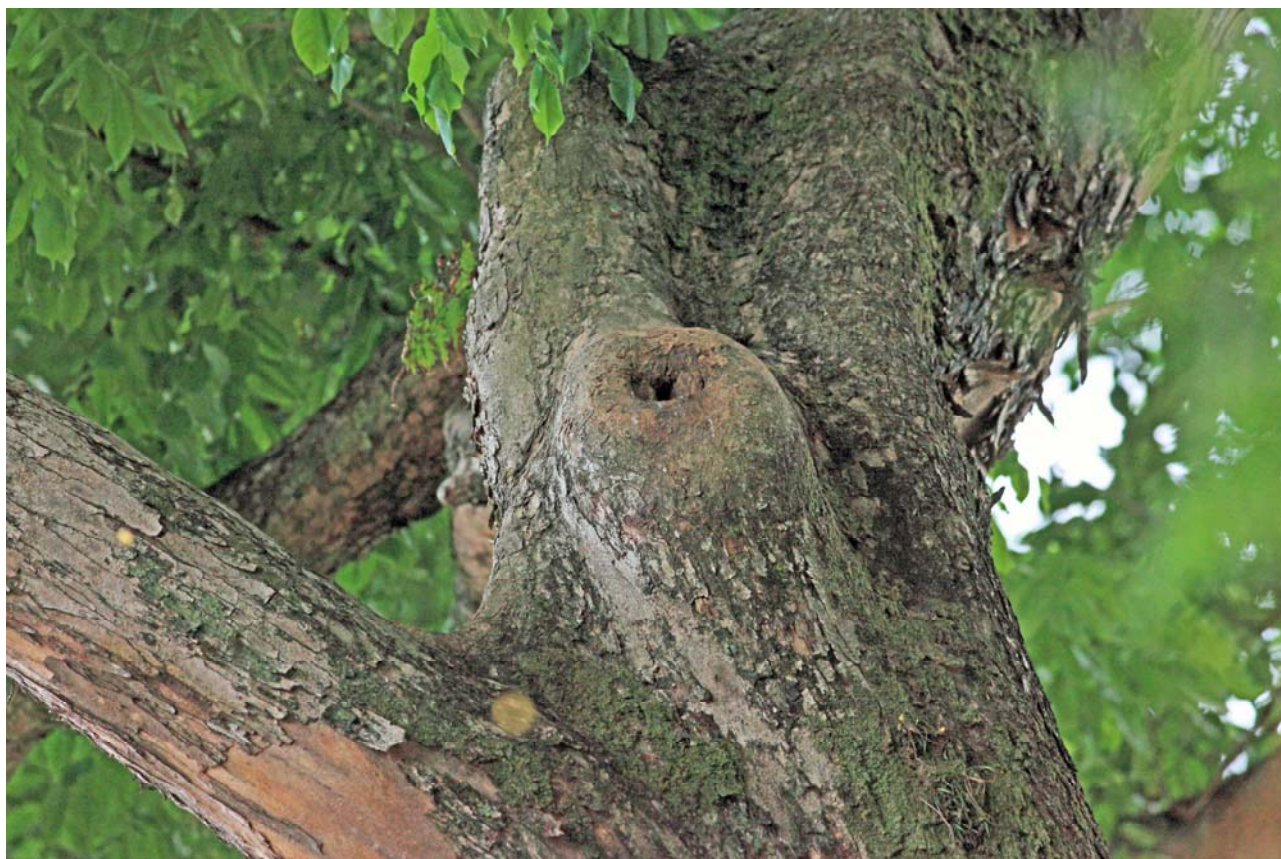


Fig. 1. The nesting cavity developing from the stump of a damaged branch in the angšana tree. (Photograph by: Howard Banwell).

Location of nest. – The nesting cavity developed from an old branch stump on the main trunk of an old angšana tree (*Pterocarpus indicus*) on Changi Village Road (Fig. 1). This tree is approximately 3 m from the road, and some 15 m from a four-storey block of Housing Development Board (HDB) flats. The cavity was located some 12–15 m above pavement level. Extensive renovation of the HDB flats on both sides of Changi Village Road were being conducted during the nesting period, with pavement improvement works also being carried out directly beneath the nesting tree. The tree is approximately 50 m from a very busy road intersection, and some 120 m from a popular Hindu temple.

The ambient noise level at this spot is significant. There is almost constant traffic noise from buses, trucks, delivery vehicles and cars. The site is almost directly under the landing path of airplanes approaching Changi Airport from over the Johore Straits (and take-offs from the opposite direction). At any time of day (and, we assume, night), amplified chanting and musical instruments may be blaring from the temple. Lastly, there is the incessant screeching of the many Tanimbar corellas (*Cacatua goffini*), and red-breasted parakeets (*Psittacula alexandri*) that make Changi Village their home.

While hornbills are mostly forest birds, the Oriental pied hornbill is an exception (Poonswad, 1995). As long as there is sufficient food and large mature trees for nesting, it is able to survive around human habitation (Chong, 1998). It would appear from the current observations that a noisy, busy urban environment is no barrier to the selection of a nesting site and to successful breeding. Far more problematic for the hornbills would be the availability of a suitable and large enough tree cavity in which to nest. Singapore's National Parks Board (NParks) is aware of this nesting and we have been given unofficial assurance that trimming any of the angšana trees in the vicinity will be restrained to try and facilitate future nestings.

Feeding patterns. – Food brought by the male consisted of fruits (Fig. 2), insects like beetles and crickets, spiders (Fig. 3), snails, lizards (Fig. 4) and newly hatched bird chicks (Fig. 5). These are generally what hornbills eat, as well as what they feed their chicks (Collar, 2001). By volume, fruits predominated; while we were unable to identify many of the fruit species, figs from the bodhi tree (*Ficus religiosa*) constituted a significant quantity, together with fruit that appeared to be that of the Macarthur palm (*Ptychosperma macarthurii*). Observations were made of 40 feeds. Of these, 22 consisted of fruit alone, 17 feeds amounting to between 20 and 91 fruit each. The other 18 feeds comprised either meat items alone, or a mixture of meat and fruit, and were usually significantly smaller in numbers of items. The bulkiest item fed was a newly hatched bird chick of unidentified species—on one occasion a single chick, on a second occasion one in the bill upon arrival, and another regurgitated. We estimate that while feeding the female and two chicks an average of approximately 500 food items were brought to the nest by the male each day.



Fig. 2. Male southern pied hornbill regurgitating fruits at the nest. (Photograph by: Jeff Lim).



Fig. 3. Male southern pied hornbill returning to the nest with a spider. (Photograph by: Jeff Lim).



Fig. 4. Male southern pied hornbill with a lizard. (Photograph by: Jeff Lim).



Fig. 5. Male southern pied hornbill with a dead chick. (Photograph by: Howard Banwell).

When the male hornbill was feeding the female and two chicks, 41 complete feeding cycles were observed (departure/return/feeding). The average time away from the nest over these 41 cycles was 34 minutes, with the longest absence being 96 minutes and the shortest being just six minutes, leading to an estimate of approximately 20 feeds per day. However, there was a difference in the timing as the chicks got older and demanded more food; between 14–20 Mar., the average time away was 38 minutes (longest 96 minutes), while between 1–16 Apr., the average time away dropped 26% to 28 minutes (longest 60 minutes). During the 1–16 Apr. observations, the male was seen feeding into the nest on 23 occasions; the average number of food items fed to the female and chicks was 27, the largest was 91 pieces of fruit, and the smallest was just one (a single snail and a single lizard).

After the departure of the female and the first chick, there was a distinct change in feeding pattern. The longest absence of the male from the nest more than doubled to over two hours. While insufficient complete cycle observations were made for a statistically valid conclusion, it is estimated that the average time away from the nest rose from 28 minutes to perhaps 60–90 minutes. At the same time, the average quantity of food brought by the male dropped from 27 to 21 pieces over 17 observed feeds (the maximum item count being 65 and the minimum just one).

Of the 24 occasions where it was possible to note the direction from which the male returned to the nest, two thirds of the time it was from the west or southwest—that is, from the direction of the Changi Golf Club and the mature treed areas to the west of Changi Village (fruit predominated). A quarter of the time it was from the east or northeast, in the direction of the Changi Food Centre and Changi Beach Park (snails and insects predominated). On only one occasion it was from the north, and on no occasion from the southeast (Changi Airport direction—no significant expanse of trees).



Fig. 6. Male southern pied hornbill feeding his two chicks. (Photograph by: Howard Banwell).

It should be noted that the large bodhi tree (*Ficus religiosa*) at the Hindu temple formed a nearby and frequently used source of fruit for the male bird.

Male behaviour. – Throughout our observations it is clear that the male hornbill has only one mission in life: the feeding of his mate and their chicks (Fig. 6). From sunrise to sunset (approximately 0700–1900 hours) his entire day is spent foraging for food and bringing this food to the nest (Figs. 7, 8). In addition, of course, he must consume sufficient food himself to fuel his incessant activity. The earliest feeding was seen at 0722 and the latest at 1840 hours.



Fig. 7. Male southern pied hornbill arriving at the nest with food. (Photograph by: Jeff Lim).

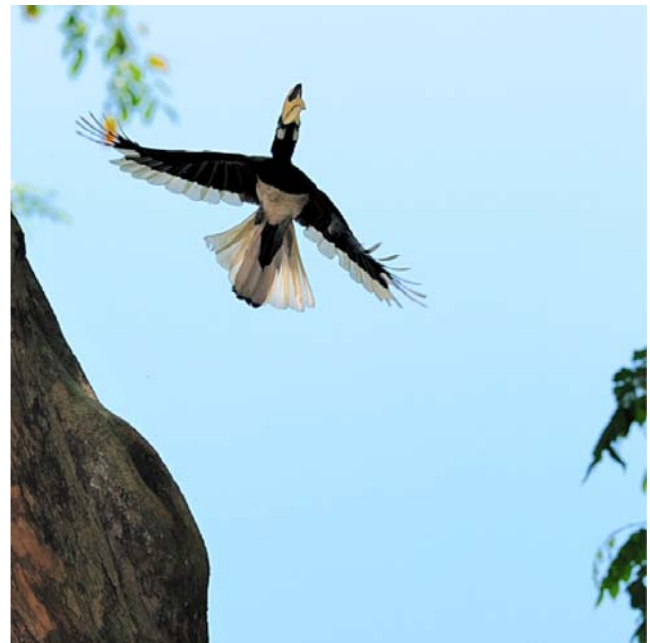


Fig. 8. Male southern pied hornbill leaving the nest after delivering food. (Photograph by: Jeff Lim).



Fig. 9. Female southern pied hornbill cleaning nest cavity. (Photograph by: Howard Banwell).

The male's behaviour pattern changed little throughout the period of observation. Upon returning to the nest site, he would appear quite cautious, perching for a few moments on a nearby tree, or on the nesting tree, sometimes on both, appearing to assess his surroundings for any danger. Interestingly, he was never seen to pay any attention to the human activity going on beneath him, but only look around for natural danger at the nest level.

He would then hop or fly to the nest and begin to feed his mate and the chicks. Usually he would have one item of food in his bill upon arriving at the nest and would then regurgitate further items of food (generally one piece at a time). The food was then fed piece by piece into the nest cavity. Using a scope, we were able to see that on some occasions he would refuse the female food, preferring instead to feed the chicks directly.

Feeding would take one to ten minutes depending on the quantity he regurgitated, and after this the male would fly to a nearby branch, or to another tree, rest for a minute or two, and then fly away to continue gathering food.

Female behaviour. – As the female was sealed up in the nesting cavity, little observation of her behaviour was possible. Only her bill was visible from any vantage point near the nest, but she could be seen to clear debris from the nest on a frequent but irregular basis (Fig. 9). This would appear to consist of food remains (snail shells, for example) and—we assume—the droppings of the chicks. She herself would not soil the nest but turn around, push her rump to the cavity entrance and then defecate forcefully into the air.

For long periods, the female's bill would show at the nest entrance, the mandibles open quite wide, and a slow vibration of the bill quite evident; she was apparently panting to cool herself down. Once the female left the nest on 19 Apr she played no further part in the development of the second chick.

Chick behaviour. – Little observation of the chicks was possible, especially when the female was still at nest. However, it was easy to differentiate the bills of the chicks from that of the female. By mid-April the chick bills appeared large, although clearly not yet as large as the mother's and without any visible casque. The upper mandible of the female bill was very clearly distally black while those of the chicks were plain pale yellow. On one occasion the two chicks' bills were seen together, apparently jousting with each other. The bill of the second chick showed signs of a casque



Fig. 10. Bill of the second southern pied hornbill chick showing developing casque on 22 Apr.2009. (Photograph by: Howard Banwell).



Fig. 11. Tail feathers of the second southern pied hornbill chick seen from the nest opening on 28 Apr.2009. (Photograph by: Howard Banwell).

developing when seen poking out from the nest on 27 Apr. (Fig. 10). A day later the tail feathers were observed at the nest opening (Fig. 11).

Once the female and first chick left the nest, more could be seen of the activities of the remaining chick. It defecated frequently out of the nest just as the mother had done (Fig. 12), and it attempted (however ineffectually) to remove debris from inside the nest. Whether these are natural instincts or learned from watching the mother is impossible to say. On one occasion it was observed to be 'panting'.

More and more of the single chick's bill could be seen over time, and by late Apr. it appeared to be observing the world outside its nest. By this time, the whole bill was seen up to and including the eye, and the casque had clearly begun to separate from the rest of the bill.



Fig. 12. Southern pied hornbill chick defecating from the opening of the nest. (Photograph by: Howard Banwell).



Fig. 13. Long-tailed macaque harassing the hornbill's nest. (Photograph by: Jeff Lim).

Calling. – Between the middle and end of Mar. several calls could be heard from the nest. On 19 Mar. a long-tailed macaque (*Macaca fascicularis*) was observed harassing the nest and the female was heard to give out a minute-long series of loud staccato cries to warn it away—a strategy that proved successful (Fig. 13). Around the same time, a series of thinner cries was heard when the male arrived with food; these could be assumed to emanate from the young chicks.

These sounds were not noted in Apr., other than on a couple of possible instances, although this could well have been owed to the ambient noise.

DISCUSSION

Working back from known dates, it is probable that the female Oriental pied hornbill sealed the nest cavity at the end of January. At least two eggs would then have been laid during the first two weeks of Feb. and the hatching of eggs would have occurred around the first week of Mar. By mid-Apr. observations indicated that two sizeable chicks were being fed by the male, with the female still present in the nest.

Although no direct observation was made of this event, it is clear from local residents' reports and subsequent observations that the female left the nest on 19 Apr. One of the two chicks also left the nest the same day, and was seen by local residents on the ground below the tree. It is likely that this chick then left with the female—certainly neither of them was seen after this date. The male hornbill continued to feed the single remaining chick until at least 29 Apr. No observations were made between 30 Apr.–7 May, on which date the second chick was no longer in the nest. Since up to that point the chick was healthy and well-fed, it can be reasonably supposed that fledging occurred between those two dates.

While direct observation of chicks leaving the nest was not possible, it is our assumption that the breeding of this pair of Oriental pied hornbills was successful, with the fledging of probably both chicks.

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