



Special Ecology Feature

Conserving Hornbills in the Urban Environment

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Photography as credited

Introduction

Known as “farmers of the forest”, hornbills play a crucial role in the spread and germination of the seeds from big-fruited forest trees. There are 54 species of hornbills in the world—23 in Africa and 31 in Asia (12 in Southeast Asia). Three species are believed to be native to Singapore—the Oriental Pied Hornbill (*Anthracoceros albirostris*), Rhinoceros Hornbill (*Buceros rhinoceros*), and Helmeted Hornbill (*Rhinoplax vigil*). Only the Oriental Pied Hornbill, a species common in Southeast Asia, remains extant in Singapore.

A generally black and white bird, with a pale yellow bill, and white facial markings, the Oriental Pied Hornbill is unmistakable (Fig. 1). Measuring over one metre from bill to tail, it is one of Singapore’s larger and more conspicuous birds. Compared to other hornbills in the world, however, it is one of the smaller and less colourful species. Its loud, cackling call is unmistakable.

The species is sexually dimorphic—males are physically distinguishable from females (Fig. 2). When mature, the male is larger than the female, and has a larger, more pronouncedly “horned” casque. In addition, females have diffuse dark brown or reddish colouration on the lower bill near the gape, as well as a black edge along the dorsal part of the bill.

Most Asian hornbills require large areas of high forest to survive, but the Oriental Pied Hornbill is very adaptable. Besides primary and secondary forests, coastal scrub, mangroves, and cultivated areas, it can also be found in urban areas, where it has been observed to tolerate a moderate level of human presence and activity.

Hornbills are generally omnivorous, feeding on both fruits and animals (Fig. 3 and 4). The diet of the Oriental Pied Hornbill consists mainly of fruits (e.g., figs, palms, bananas, papaya, tamarind, *Syzygium* spp., *Knema* spp., *Nephelium* spp.), supplemented by small animals (e.g., small birds, eggs, lizards, snakes, bats, squirrels, arthropods, snails, crabs). In turn, predators like civets and pythons (Fig. 5 and 6) prey upon the Oriental Pied Hornbill. Fledglings are possibly open to predation by large raptors like the Changeable Hawk Eagle as well.

Hornbills are known for their unique breeding method—the female seals herself in a tree hole (Fig. 7 and 8) for a few months, where she lays and incubates her eggs, and breaks out only when the nestlings are fully fledged. Each breeding pair usually nests only once a year, although there have been records of two nestings per year. In Singapore, the breeding season of the Oriental Pied Hornbill is from December to April. The clutch consists of one to four eggs, but usually only one to three chicks would fledge successfully.



ABOVE, FIG. 1. Oriental Pied Hornbill (Photo: Robert Teo).

LEFT FIG. 2. Sexual dimorphism in the Oriental Pied Hornbill. The male is in the background and the female in the foreground (Photo: Marc Cremades).

The Oriental Pied Hornbill has a breeding cycle of about 90 days from nest sealing by the female to the fledging of the chicks (Fig 9). The eggs are incubated for 26 to 28 days and upon hatching, they are cared for by the female for a further 47 to 54 days. As the chicks grow, the male would forage more intensely and return to the nest with food more frequently. The male regurgitates the food from its crop and passes it to the female. As the nesting progresses, the chicks require more protein and the food brought by the male contains more animal components. With larger broods of three or four, the youngest chick is often the weakest due to competition for food, and it often succumbs or is killed by the female. The dead chick is then either fed to the other chicks or eaten by the female.

The Singapore Hornbill Project

The Oriental Pied Hornbill disappeared from Singapore in the mid-1800s, possibly due to hunting and loss of suitable habitat. In 1994, after an absence of about 140 years, a pair of wild hornbills was recorded from Pulau Ubin. The species has since been “back from the dead” and is reestablishing healthy colonies here, thanks to the collective efforts of the National Parks Board (NParks), Jurong BirdPark, Nanyang Technological University, and French researcher Marc Cremades.

Initiated in 2004 by Marc Cremades and avid naturalist Professor Ng Soon Chye, the Singapore Hornbill Project studies the nesting ecology of the Oriental Pied Hornbill, such as the growth progression of nestlings, food requirements, and sensitivity to external disturbances. This is the first project in the world to document the breeding ecology of wild hornbills within the nest. Its key objective is to enhance the population and distribution of this locally endangered bird in Singapore.

The bird’s breeding behaviour was monitored so as to better understand the factors behind nesting success and failure. Infrared video cameras were installed in both natural and artificial nests to capture what happens after a female seals herself in to raise her brood of chicks. Cameras outside the nests also recorded the activities of the males as they bring food to the nests.

Modern technology was also utilised to study the species. A Global Positioning System (GPS) transmitter attached to a bird provided information on its movement, distribution, and breeding territory.

As natural tree holes for nesting are limited in the wild, artificial nesting boxes (Fig. 10) have also been set up to provide more nesting opportunities. The success in using artificial nests on Pulau Ubin is expected to facilitate the spread of the Oriental Pied Hornbill on mainland Singapore.

Mr. Mah Bow Tan, the then Minister for National Development, highlighted the success of the Singapore Hornbill Project in Singapore’s address to the 9th Conference of Parties to the Convention on Biological Diversity in May 2008. It was also cited by Dr. Ahmed Djogh-laf, Executive Secretary of the United Nations Environment Programme and Secretariat of the Convention on Biological Diversity, at the World Cities Summit in June 2008. The findings of the project were also



FIG. 3. Hornbill tossing a banana into its mouth (Photo: Robert Teo).



FIG. 4. Hornbill feeding on centipede (Photo: Robert Teo).



FIG. 5. The Common Palm Civet (*Paradoxurus hermaphroditus*) has been recorded feeding on chicks of the Oriental Pied Hornbill (Photo: Robert Teo).



FIG. 6. The Reticulated Python (*Python reticulatus*) will ascend a tree to attack hornbills (Photo: Robert Teo).



FIG. 7. Female in a prospective nesting hole (Photo: Robert Teo).



FIG. 8. Male bringing food to a nesting hole (Photo: Marc Cremades).

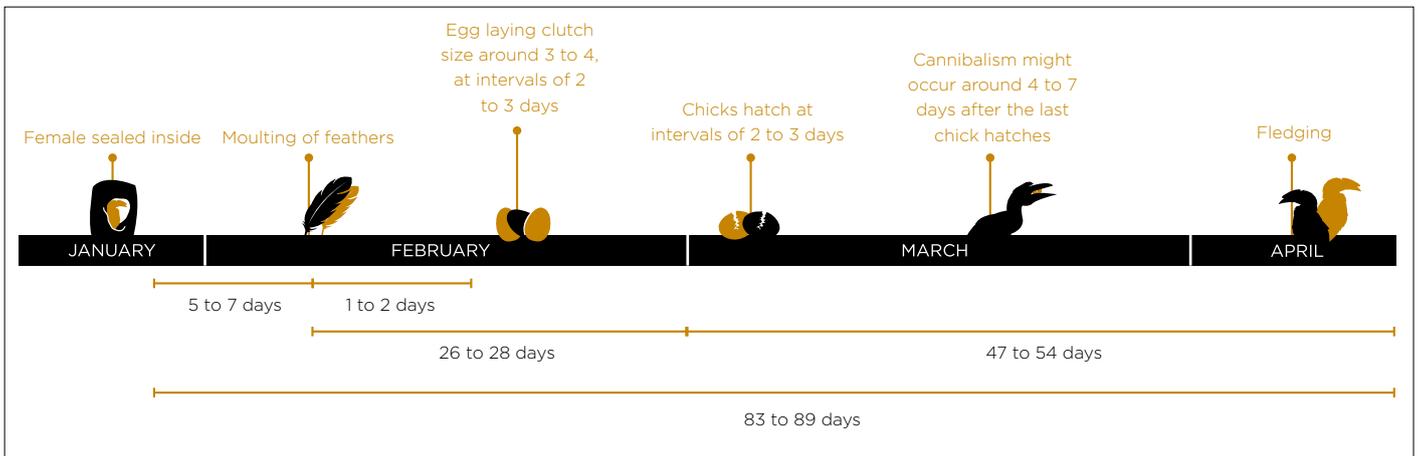
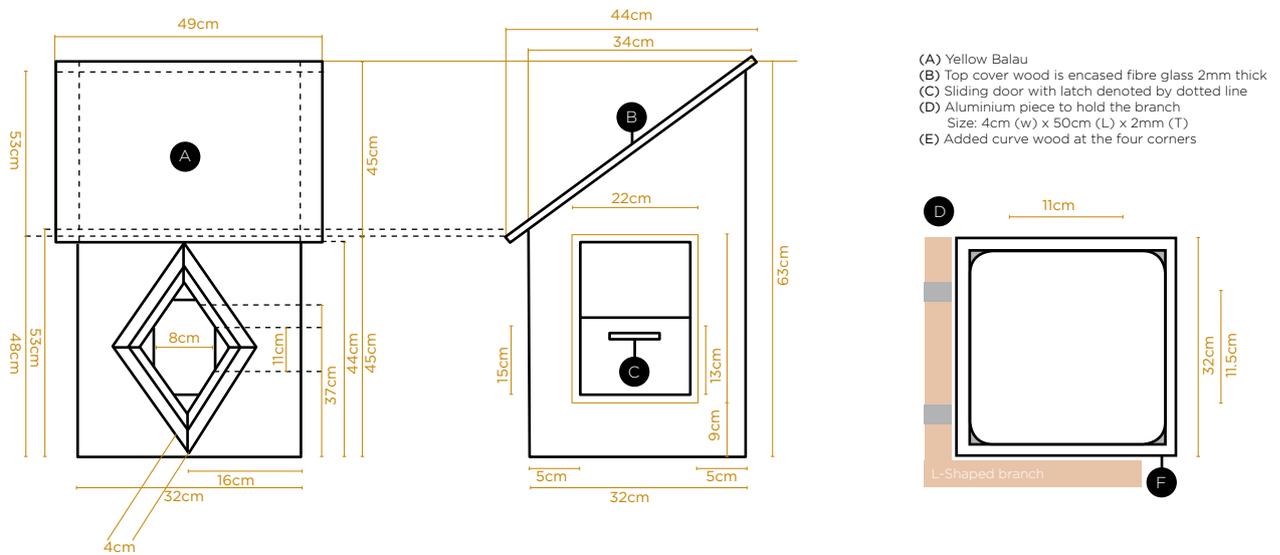


FIG. 9. Typical breeding activities and timeline of the Oriental Pied Hornbill (Source: Marc Cremades).



Dimensions for one artificial nesting box design

disseminated through several papers and poster presentations at the 5th International Hornbill Conference in Singapore in March 2009.

Conserving Hornbills in Parks and Natural Areas

For the highly versatile Oriental Pied Hornbill, the two critical factors for its successful conservation in the urban and suburban environment are the availability of food and nesting holes.

Areas with forest or tall trees should be retained as far as possible, and habitats could be enhanced through the planting of large numbers of food plants. Trees with possible nesting holes should be retained when feasible, but the safety of park visitors should be considered.

Where no natural nesting holes are available, the provision of artificial nesting boxes could be explored (see Fig. 11 and above diagram for dimensions and construction details of one design). Such nesting boxes could be installed on trees or poles (Fig. 12 and 13), 12 to 15 metres from the ground. The boxes should be upright, with no tilt in any direction. Artificial nesting boxes should ideally be sited away from human traffic to minimise disturbance and avoid public safety issues. To minimise access by potential predators, nesting boxes should not be placed on or near branches. Large-leaved trees (e.g., *Terminalia catappa*, *Talipariti tiliaceum*) that attract nesting Red Weaver Ants should be avoided.

For safety reasons, artificial nesting boxes should only be installed with boom lifts or scaffolding. Lorry cranes mounted with buckets should be avoided.

About 40 to 50 hornbills are now found on Pulau Ubin and at least two

pairs have already dispersed to nearby Changi. Currently, there are 20 artificial nests installed across Singapore (including Pulau Ubin). From December 2008 to April 2009, three artificial nests were successfully utilised, and from December 2009 to April 2010, this number increased to seven, including the first one in Changi. Together with Singapore's extensive parklands, natural areas, and greenery that serve as important ecological corridors, it is hoped that the Oriental Pied Hornbill will one day thrive throughout Singapore.

Threats to Hornbill Conservation in the Urban Environment

Natural predators of the Oriental Pied Hornbill are unlikely to pose a significant threat to the species due to the small population of such predators in the urban environment. The key threats are more likely to be anthropogenic in nature.

One potential threat would be the disturbance of nesting activities during the breeding season from overly zealous photographers, especially when flash photography is employed. In such situations, signs might need to be put up to restrict photography and minimise disturbance. Where necessary, nesting sites might also need to be fenced off or screened with thick vegetation.

Line fishing could also pose a threat to hornbills. This might sound strange, but there have been some records of birds getting entangled in fishing lines. In 2009, a female hornbill was found dead in Pulau Ubin, entangled by its wing in a discarded fishing line (Fig. 13). Park managers in charge of coastal areas should thus ensure that discarded or broken-off fishing lines are removed regularly from trees and shrubs. 



CLOCKWISE FROM TOP LEFT FIG. 10. Artificial nesting box (Photo: Marc Cremades); FIG. 11. Artificial nesting box installed on tree (Photo: Robert Teo); FIG. 12. Artificial nesting box installed on a pole (Photo: Tan Yong Hong); FIG. 13. Dead hornbill found entangled at the wing by discarded fishing line (Photo: Lioe Kim Swee).

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