

Observations on the Nesting Behaviour of the Brahminy Kite *Haliastur indus* on Penang Island, Malaysia

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Summary

A study of the breeding behaviour of the Brahminy Kite *Haliastur indus* was conducted at the campus of Universiti Sains Malaysia, Penang, Malaysia, from January to March 2009 for a total observation time of 50 h on 63 days. It was found that the pair of Kites covered the egg for 91% of the total observation time. Although both the female and the male shared incubation, the presumed female performed most (71%). The egg failed to hatch because the nest fell down on the 40th day. The pair constructed a new nest adjacent to the former nest; however, after 12 days the nest was abandoned because of disturbance by human activities close to the nest-site. Prey captured and brought to the nest consisted mostly of fish.

Introduction

The Brahminy Kite *Haliastur indus* occurs in coastal Malaysia, in mangrove forest, where there is little information on its abundance (K. Kumar pers. comm.). It is a totally protected raptor in Malaysia (*Wildlife Protection Act 72/76*, Appendix II), where its population is declining, because of destruction of its natural habitat (Department of Wildlife and National Parks 1992); its abundance is linked to mangroves, and any loss of this habitat affects it negatively (Wells 1999). According to Chan *et al.* (1993), cited by Macintosh *et al.* (2002), ~12% of the total area of mangrove forests in Malaysia has been lost between 1980 and 1990, which would affect the entire ecosystem of the forest, including the Kite's habitat. To the best of our knowledge, there is no publication on this species, including its nesting and breeding behaviour, in Malaysia.

In other parts of its distribution, Lutter *et al.* (2006) reported on the breeding behaviour of a pair of Brahminy Kites in northern coastal New South Wales, Australia, and Sivakumar & Jayabalan (2004) studied Kites in Tamil Nadu, India. In the former case, the Kites' nest was 10 m from a busy road in a built-up area in a reserve, and close to an estuary. In the latter case, nests were located near human habitation, at the edge of waterbodies and surrounded by agricultural land. Brahminy Kites are common raptors in a coastal fishing village in Tamil Nadu (Morrison *et al.* 1990), where Palmyra Palms *Borassus flabellifer*, Coconut Palms *Cocos nucifera* and Portia Trees *Thespesia populnea* are common nest-trees, although unusual nest-sites were also reported by Morrison *et al.* (1990) and Balachandran & Sakthivel (1992).

The objective of this present work was to study and report on the Brahminy Kite's nesting behaviour, from the beginning until mid breeding cycle, at the nest-site of one pair on Penang Island, in Malaysia.

Study area and methods

Location

The nest was located at the Universiti Sains Malaysia (USM) campus (5°22'N, 100°18'E) on Penang Island, Malaysia. It was found on 12 January 2009. Starting from that date, the nest and pair's activities were observed for a variable period up to 7 h (minimum 3 h), almost on a daily basis. Observations were conducted using Omicron Estavia binoculars (8×42), a tape recorder, and a Kodak ZD710 camera, until 15 March. The nest-site was located using a GPS (Garmin 60CSx). The height of the nest above ground and the girth at breast height (gbh) of the nest-tree were measured using an Abney level and measuring tape (Othman & Baharuddin 2006). Observations were conducted from dawn (around 0630 h) until dusk (around 2000 h), for a total observation time of 50 h. After the nest fell, the scattered sticks from the nest and the broken egg were examined; the nest area was revisited until 15 March.

Fieldwork

The observations were mostly conducted between 0800 h to 1200 h, and then continued from 1300 h to 1700 h. However, a few observations were carried out earlier in the morning until later in the afternoon. Data were collected using continuous focal-animal sampling (Lehner 1979), and the duration of each behaviour activity was recorded. The pair of Kites was difficult to sex from the birds' physical appearance, but in the Brahminy Kite females are larger than males (Ferguson-Lees & Christie 2001), so in this study they were qualified as 'presumed', following Ferguson-Lees & Christie (2001).

Results

Location of nest

The nest was located in an open area at USM, ~10 m behind a student hostel (Plate 11). It was 20 m above ground in a live Rhu *Casuarina equisetifolia* tree with gbh of 3 m (diameter at breast height of 95 cm).

In the same vicinity, there were also two nests that belonged to two other pairs of Kites, one of which was 552 m from the focal pair, and the other 528 m away. These nests were in Norfolk Island Pines *Araucaria heterophylla* in secondary forest on campus. During the same period, the pair at one of these nests started incubation earlier, while the other pair was still nest-building.

Nest-building

The first observation, on the afternoon of 12 January, showed the Kites building their nest: the birds arrived with sticks, arranged these in the nest, and then flew off again to find other materials. The duration from the fly-out to search for material until the return to the nest was between 5 minutes and 1 hour. These different durations may have been caused by differences in the distance and availability of nest materials, or because the Kites foraged during that period. The Kites collected material and built their nest in the morning from ~0830 h until 1100 h, then continued in the afternoon from ~1500 h until 1700 h over 10 days. On 13 January the Kites were seen to build the nest together. Some materials collected by them might have been taken from the trees near the nest-site; they used mostly branches from fig *Ficus* spp., Black Wattle *Acacia mangium* and Earpod Wattle *A. auriculiformis*, trees found on campus.



Focal Brahminy Kites' nest in Rhu tree on campus of USM, Penang

Plate 11

Photo: Patricia Indrayanto



Broken egg of Brahminy Kite and sticks of nest on the ground below the nest

Plate 12

Photo: Patricia Indrayanto

On 16 January, one Kite flew down and took a stick from the ground near the nest-site to use for nest-building. On 22 January in the afternoon, ~1700 h, the female appeared to lay an egg.

Incubation

The incubation period started on 23 January. In the morning the presumed female was sitting on the nest in the absence of the male. About 1 h afterward, the female called several times; 50 minutes later the male came to the nest, and the male and the female changed incubation shifts. Approximately 1.5 h later, the male made the same call a few times, and the female came and changed shift again. This calling routine was observed before each incubation changeover over several days of observation. On 28 January, between early morning and late afternoon, nine incubation changeovers were observed, each shift lasting 30–120 minutes.

During the incubation period, if one Kite was on the nest, the other was seen roosting in a tree near the nest-site or searching for food. The Kites ate near the nest-site during this period (seen on 23 January, 28 January and 19 February), sometimes on the nest. Once, the presumed male was seen to bring food for his mate on the nest (20 February, in the morning). On occasion, the non-incubating Kite (mostly the presumed male) brought some sticks and rebuilt part of the nest (23 January, 16 February and 18 February).

During the incubation period (26.2 h of observation), the egg was covered by the Kites for 91% of the time; the nest was unattended for only 9% of the time, including the time when the Kites roosted in other trees nearby or flew over the nest-site. The nest was unattended for periods averaging 22.1 ± 16.1 minutes (mean \pm Standard Deviation, $n = 8$). The presumed female performed most of the incubation (71% of the observation time), whereas the male incubated for only 11% of the observation time. This behaviour was confirmed on 28 January (during 7 h of observation, between 0900–1200 h and 1300–1700 h).

Fate of the nest

On the afternoon of 20 February (~1600 h), a broken egg was found on the ground, with sticks from the nest scattered with it (Plate 12). As there was no evidence of fighting or nest attack, it was presumed that strong winds at USM's campus (a sign of approaching rain) that afternoon contributed to this incident. By the time that we examined the area, only one damaged egg was found, containing a dead Kite chick covered by some down, at ~28 days of development (Plate 13). The chick, at ~1 week before hatching (following Lutter *et al.* 2006), measured 8 cm long and weighed 12.5 g. The scattered sticks averaged 43.6 cm long and 2.2 cm in girth (0.7 cm in diameter). The Kites were observed to fly repeatedly above the nest-site that afternoon.

The nests of the other two pairs of Kites were attacked by crows *Corvus* sp. (at least two species, i.e. House Crow *C. splendens* and Slender-billed Crow *C. enca*, were detected on the USM campus). Brahminy Kite feathers and scattered eggshells were found on the ground near these nest-sites, indicating that fighting had occurred there.

Four days after the focal nest fell (24 February), a new nest was being built nearby (in an adjacent tree in the same area), suggesting that the previous nest failure was related to natural causes (e.g. a storm) and not to a predator's attack

(K. Kumar pers. comm.), because predator attack would probably have caused the pair to construct a new nest farther away. The pair was seen building the new nest until 7 March. On 9 March, road construction near the nest caused some disturbance from noise and frequent human activity, and this pair of Kites was not seen again. Some sticks fell from the new nest. Up until 15 March, the pair did not return to the nest, and the new nest was therefore presumed to be abandoned.

Vocalisations

The nesting Kites called frequently, especially before each change in incubation shift, with a sound described as a plaintively descending mew or bleat (Ferguson-Lees & Christie 2001). From our tape-recorded calls, the Kites' call was repeated about 4–5 times during each calling bout.

Defence against predators

In general, during the nest-building and incubation periods, the location of the nest-site was safe from other predators. Only once, on 19 February, two crows attempted to snatch the egg. In response, the Kites defended their nest and egg by taking turns attacking the crows. When the presumed male attacked, the female stayed perched near the nest, and vice versa.

Diet

The pair ate their prey mostly near the nest-site, especially when the incubation period had started. The presumed female Kite was also seen eating on the nest during incubation.

Most prey consisted of fish, although insects and small mammals were occasional prey items. One fish that could be identified was *ikan gerut-gerut Pomadasys* sp. (M. Hifni pers. comm., Plate 14). Other prey included a juvenile Long-tailed Macaque *Macaca fascicularis*, which was eaten in a low tree near the nest-site. The duration of feeding ranged from 10 to 40 minutes. Hunting and feeding occurred in the morning (from 0900–1100 h) and afternoon (1600–1800 h). No remains of prey were found on the ground below the nest.

Discussion

In this study, the nests were built in Rhu and Norfolk Island Pine trees, two species which are straight-trunked and grow to be some of the tallest trees at the USM campus. In Tamil Nadu, India, Sivakumar & Jayabalan (2004) reported that half of the Brahminy Kites' nests were in Coconut Palms. In northern coastal New South Wales, Australia, a pair built a nest in a large Blackbutt *Eucalyptus pilularis* (Lutter *et al.* 2006). At the USM campus, the nests were built between 18 and 20 m above ground, higher than reported by Sivakumar & Jayabalan (2004) (13–15 m), but lower than the nest studied by Lutter *et al.* (2006) (23 m). Although the most common nest-trees in Tamil Nadu were Palmyra Palms, Coconut Palms and Portia Trees, one pair built a nest (which was abandoned after predation) only 2 m up in a Chilean Mesquite *Prosopis chilensis* (Morrison *et al.* 1990). Balachandran & Sakthivel (1992) also noted an unusual nest-site, with two eggs, at Point Calimere (Tamil Nadu), on a dead *Suaeda* bush ~40 cm above the ground.



Dead developing Brahminy Kite chick, from within broken egg

Plate 13

Photo: Patricia Indrayanto



Fish *Pomadasys* sp. being eaten by Brahminy Kite

Plate 14

Photo: Mohamed Hifni Baharuddin

In our observations at USM campus, Kite nests were situated in an open area and in secondary forest, relatively close to waterbodies. Nests observed by Sivakumar & Jayabalan (2004) were located among human habitation, on the periphery of waterbodies and agricultural land, and that studied by Lutter *et al.* (2006) was in a coastal area. These examples show that, in general, Kites tend to build nests relatively close to water, and hence close to their main, primarily aquatic, food resources. Morrison *et al.* (1990) and Balachandran & Sakthivel (1992) reported a shortage of, and strong competition for, suitable nest-sites, but the Kites in the present study showed some adaptability to the human environment, although still vulnerable to disturbance from human activity and from predators (crows).

Materials used in the construction of nests by the Kite in Malaysia and in India were different. The focal pair of Kites in the present study used branches of trees that were found on campus (fig, Black and Earpod Wattles). In India, Morrison *et al.* (1990) reported twigs of Chilean Mesquite, Glasswort *Arthrocnemum indicum* and *Suaeda* sp. as nest materials, together with mud and cow dung, similar to the findings of Balachandran & Sakthivel (1992), who also reported that a pair of Kites used sticks of Chilean Mesquite and *Suaeda* sp., and the nest was lined with small pieces of dried mud. Nest materials are obviously influenced by local conditions and availability.

From our observations, it can be concluded that the most active time for nest-building was in the morning. According to Lutter *et al.* (2006), nest-building and copulation rates are higher in the morning than at other times, and the female frequently sat on the nest before finally laying an egg. Our observation confirmed that one day before the incubation of the egg commenced, the female sat on the nest, unfolding her wings.

Although it was difficult to differentiate the sexes, incubation was performed by both the female and the male, which took turns in incubating the egg. However, the presumed female incubated for a higher proportion of the incubation time (71%), compared with only 11% for the male. This was similar to the observations of Lutter *et al.* (2006) except that there the male covered the egg while the female consumed food, whereas in our observations, the male mostly roosted in a tree near the nest-site while the female consumed prey. On many occasions the nest was left unattended (for between 2 and 30 minutes), although one Kite kept watch from a nearby tree while roosting. However, once, both Kites left the nest for ~55 minutes while roosting in another tree, preening or feeding. This behaviour was also similar to that observed by Lutter *et al.* (2006), except for differences in times when the nest was unattended (only 2–6 min. in Lutter *et al.* 2006 vs ~30 min. in the present study).

The Kite's diet consists of live prey (commonly small fish, insects, small mammals and birds, and carrion) (Ferguson-Lees & Christie 2001). In our observation, the diet consisted mostly of marine fish, because the nest was close to the sea, where fish are the main prey (Ferguson-Lees & Christie 2001). Besides fish, the Kites also consumed insects and a juvenile macaque monkey. Lutter *et al.* (2006) reported that the Kite's diet consisted of insects, fish and live crabs. The times for hunting and feeding in our study were in the morning (0800–1100 h) and afternoon (1600–1800 h) (During this study, sunrise on Penang Island was around 0730 h and sunset was around 1930 h.) Lutter *et al.* (2006) reported almost the same time (i.e. between 1615 h and 1700 h) when the Kites delivered crabs to the nest. Sivakumar & Jayabalan (2004) reported that 30% of the Kite's diet was freshwater paddy-field

crabs *Paratelphusa* sp. and freshwater fish; the diet also included frogs, garden lizards, birds and field rats, and other prey (64%) that could not be identified. The times for the delivery of prey and feeding were 0800–0900 h, 1000–1200 h and 1500–1700 h, which are similar to the present study. Manakadan & Natarajan (1991) noted that Kites also take fast-moving prey (bats) in India. Iqbal *et al.* (2009) reported a Kite feeding on a large fish while flying.

Lutter *et al.* (2006) described that their work was not completed; the Kite eggs were suspected to be infertile or addled, possibly related to chemical pollution (e.g. DDT in past decades; Olsen *et al.* 1993). The present report was also incomplete as the nest and egg fell, and the replacement nest was abandoned probably because of disturbance from human activity. Clearly, natural and human-related characteristics are important in determining the outcome of breeding by Brahminy Kites.

Conclusions

The Kite's breeding cycle and nesting behaviour on Penang Island, Malaysia, show similarities with, and some differences from, other studies, in Australia and India. These differences may relate mainly to the different nest-trees available.

The breeding success of the Kite is determined by many factors, including natural factors such as strong wind and rain, disturbance from predators (in this study crows), or non-natural ones, specifically human activities such as development (land clearance) and pollution (Lutter *et al.* 2006).

Further studies are highly recommended to gain better insights into the Kite's breeding cycle, biology, behaviour, population and survival in Malaysia. The rapid loss of its habitat in many parts of the country requires urgent action from researchers to establish baseline information on the species. At present, the knowledge of this species would be insufficient for successful conservation efforts in its natural habitat in Malaysia.

Acknowledgements

This study was funded by an E-Science Grant, Ministry of Science and Innovation, Malaysia (04-01-05-SF0362), and transport was provided by the School of Biological Sciences, USM. Patricia Indrayanto was partially sponsored by USM's graduate fund. We thank Kanda Kumar (Malaysian Nature Society), who shared very useful information about the Brahminy Kite, especially in Malaysia; Mohamed Hifni Baharuddin (USM, Penang) for information about the Kite and his photograph; and Ravichandran (Managing Editor, *Journal of Threatened Taxa*) for sharing with us several journals from the Bombay Natural History Society.

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Received 7 May 2010

