

# Providing nest boxes for Java sparrows *Padda oryzivora* in response to nest site loss due to building restoration and an earthquake, Prambanan Temple, Java, Indonesia

Sunaring Kurniandaru

*Coordinator of Java Sparrow Conservation Programme, Kutilang Indonesia Foundation for Bird Conservation, Jl. Tegal Melati No. 64 A, Sleman Yogyakarta, Indonesia 55581.*

Corresponding author e-mail: [kutilangindonesia@yahoo.com](mailto:kutilangindonesia@yahoo.com) or [naring\\_bobo@yahoo.com](mailto:naring_bobo@yahoo.com)

## SUMMARY

A small but important population of the endangered Java sparrow *Padda oryzivora* nests within crevices between stone blocks of an ancient temple complex in Java. In response to nest site losses due to temple restoration, and subsequently further damage to nest sites caused by a major earthquake, artificial nest sites (wooden nest boxes, sections of bamboo, and coconut shells) were provided. In the subsequent breeding season (2007), two pairs of Java sparrows successfully nested in these wooden boxes, one pair fledging seven young and the second pair two young. In 2008, three pairs again nested in the wooden nest boxes (located in different trees): one nest had nine eggs but failed as the parents were taken by a local birdcatcher; the second nest had 12 eggs, six of which hatched and subsequently fledged; the third pair fledged three young. A coconut shell was prospected by one pair but not used for nesting.

## BACKGROUND

The Prambanan Temple complex on the island of Java supports a remnant of lowland forest in an otherwise mainly urban landscape. One important bird species at this locality is the endangered Java sparrow *Padda oryzivora*, which is endemic to the islands of Java, Bali and Kangean (Indonesia). Primarily a lowland species, it was formerly widespread and abundant but its numbers have crashed in recent years, as a consequence of which it is listed as Vulnerable by the IUCN (van Ballen 1997, BirdLife International 2004). The main reason for the dramatic decline is attributed to extensive collection for the bird trade. In 2000, the Java sparrows nesting at Prambanan represented the largest single extant population in Java (Laudisensius *et al.* 2000), with surveys (conducted since 1998 by Aji and Yuda) recording no fewer than 16 nesting pairs in 2004. Their nests were located in slots (a few centimetres wide) between stone blocks of the Roro Jonggrang temples (part of Prambanan Temple complex), with most nests located about 10 m above the ground.

However, from 2003 to 2005, renovation of Siwa (the largest Roro Jonggrang temple building and the main nesting area) was undertaken. This included closing the gaps between the main building stones by gluing small stones within them, consequently preventing Java sparrows from entering and nesting. Loss of nesting sites is just one of the threats facing this small but important Java sparrow population; other threats include the presence of local birdcatchers and habitat loss, especially a reduction in foraging areas (e.g. loss of rice paddies due to road and housing development). In light of this, the Kutilang Indonesia Foundation (KIF) decided to provide some artificial nest sites within the temple complex in an attempt to mitigate for those that had been lost, with the plan being to put them up in early May 2006. However, because of technical and administration problems, this was delayed.

Then on 27 May 2006, a major earthquake occurred, centred near Yogyakarta City, 15 km to the east of Prambanan. An estimated 6,000

people were killed and more than 100,000 homes destroyed. Roads, bridges and other infrastructure were damaged. At Prambanan, temples were also damaged resulting in loss of roosting and nesting sites used by Java sparrows; on June 2006, a survey team from KIF found that 70% of roosting places had been lost and 30% of holes formerly used for nesting were damaged. In response, the first nest boxes were erected in July 2006. This case study describes the provision of nest boxes and uptake by Java sparrows in the subsequent breeding seasons of 2007 and 2008.

## ACTION

**Study site:** The Prambanan Temple complex (20 ha; 149 m a.s.l.) is located 15 km east of Yogyakarta city (central Java), and stands beside the Opak river. It consists of four groups of temples: Roro Jonggrang (the main temple), Bubrah, Lumbung and Sewu. Prior to restoration, Roro Jonggrang (comprising six temple buildings: the largest, Siwa, 47 m tall; on either side Brahma and Wisnu each 37 m tall; and three smaller temples, Angsa, Nandi and Garuda, each 24 m in height) was the main Java sparrow nesting area (Fig. 1).

This area supports a remnant of lowland forest in an otherwise mainly urban environment, with tree species including kapuk *Ceiba petandra*, melinjo *Gnetum gnemon*, guava *Psidium guajava*, mango *Mangifera indica*, mahogany *Swietenia mahagoni* and casurina *Casuarina junghuhniana*.

Prambanan is managed jointly by PT.Taman Wisata Candi Borobudur dan Prambanan (PT.TWCBP) and the archaeological department of Yogyakarta (BP-3 DIY), and is divided in three zones, all of which are used by Java sparrows:

Zone I - the ancient temple site under the responsibility of and maintained by, the archaeological department.

Zone II – an area for which PT.TWCBP is responsible, used for tourism activities, temple preservation research, public functions, etc.

Zone III – an area comprising streets, green belt/farmland etc. which helps maintain a buffer zone between the temples and the otherwise urban environment that surrounds it.

**Java sparrow research project:** Prior to provision of the nest boxes, a Java sparrow research project had been ongoing for one year (2005) with the plan being to initiate habitat improvement at Prambanan in 2006. This research included mapping the distribution of Java sparrow roosting trees and recording other use by the birds of habitats within the three temple zones.

Nest box trials were undertaken using boxes made of wood, bamboo or coconut shells: nest boxes made from wood were trialed, inspired by their successful use in captive breeding as practiced by local people; nest boxes made of coconut shells and bamboo are successfully used by birdcatchers to catch java sparrows. Nest boxes were made by locally employed carpenters.

As the first step in 2006 and 2007, a selection of artificial nest sites (wooden nest boxes, sections of bamboo, and coconut shells) were provided. It was originally planned to put the first of these up in May 2006, but because of technical and administration problems, and subsequently the earthquake, this was delayed until July 2006.

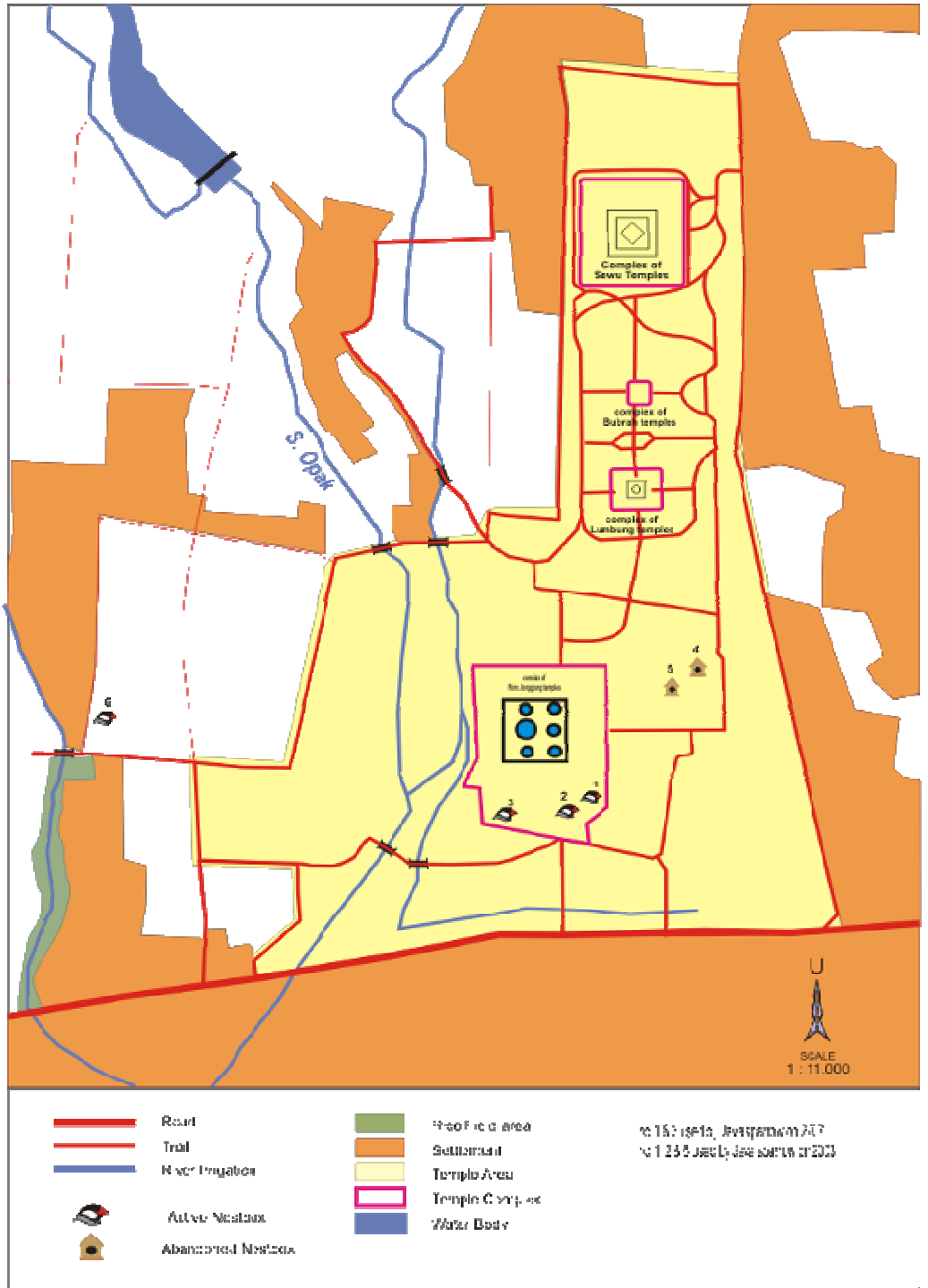
**Nest box provision:** In July 2006, KIF assembled 70 nest boxes of three different types (20 wooden, 25 bamboo and 25 coconut shells):

Mahogany wood boxes - 32 cm tall x 15 cm wide x 23 cm deep, wood 1.5 cm thick; entrance hole diameter 5 cm with a wooden perch below. The roof was hinged and could be opened to check box contents (Fig. 2);

Bamboo - sections of bamboo, 10-12 cm in diameter x 40 cm long; entrance hole diameter 5 cm, made in one end; positioned horizontally (Fig. 3).

Coconut shells – a coconut shell (contents removed), entrance hole diameter 8 cm (Fig. 4).

### Java sparrow nestboxes map On Prambanan area



**Figure 1.** Prambanan Temple complex showing position of trees in which nest boxes placed and those used by Java sparrows in 2007 and 2008.



**Figure 2.** Mahogany wood nest boxes (the box design used was that with the round entrance hole).



**Figure 3.** A bamboo nest box placed horizontally in the canopy of a *C.petandra* tree.



**Figure 4.** A coconut shell 'nest box' on a *C.petandra* tree trunk.

**Placement of nest boxes:** Placement of nest boxes was undertaken in four sessions, July 2006 and December 2006, and January and May 2007. They were installed on six *Ceiba petandra* trees (each 15-25 m in height) known to be roosting sites for Java sparrows. Boxes were placed at between 8 to 20 m above the ground. The tree, number, type and date that nest boxes were placed in each tree is given in Table 1 (for a map of their location see Fig. 1). Wooden nest boxes were attached to tree trunks with a metal nail through the upper section of the back of the box, with an additional nail or bamboo peg located under the box. Bamboo sections and coconut shells were attached using wire, and positioned against the main trunk or under the canopy amongst smaller branches.

**Food to attract birds:** In the 2007 breeding season, food (rice, local seeds) was placed in the front of the wooden nest boxes in an attempt to attract Java sparrows. Nest box monitoring revealed that other birds were also attracted and ate the food, most commonly Javan munia *Lonchura leucogastroides* and scaly-breasted munia *L.punctulata*, as well as Java sparrow. However, neither of the munia species entered the boxes (probably as they were not suitable nest sites). After consideration that such feeding in the close proximity of boxes might be counterproductive to Java sparrow box uptake, feeding was not undertaken in 2008. As Java sparrows still prospected and used nest boxes in that year, it appears that providing food to attract them to boxes is not necessary.

**Nest box monitoring:** In 2007, monitoring of nest boxes (observations through binoculars/telescope to assess bird activity/behaviour) was undertaken every day (morning and evening) for one month after installation, then once a week subsequently. Nest box checking (i.e. looking into boxes to record nest material, nest construction, to count eggs and/or young, and the presence of other species, and box condition.) was undertaken once a month.

**Table 1.** Location, numbers, design and dates of installation of nest boxes.

Tree number	Wooden	Bamboo	Coconut shell
1	6 (July 2006)	5 (January 2007)	5 (January 2007)
2	3 (January 2007)	5 (May 2007)	5 (May 2007)
3	4 (July 2006)	5 (January 2007)	5 (January 2007)
4	2 (January 2007)	5 (May 2007)	5 (May 2007)
5	2 (January 2007)	5 (May 2007)	5 (May 2007)
6	3 (December 2006)	0	0
Total:	20	25	25

In 2008, monitoring of boxes was undertaken twice a week over the entire day. During the breeding season, boxes used by Java sparrows were checked twice a month to count eggs etc. and to see if any repairs to nest boxes were required. After fledglings hatch from box, monitoring of nest box did once a month (in post breeding, is about until November).

## CONSEQUENCES

**Use of nest boxes in 2007:** January to June is the usually Java sparrow breeding season at Prambanan. In the breeding season commencing January 2007, two pairs nested in two of the wooden nest boxes (Fig.5). Nest building and courtship behaviour was first recorded in February. Eggs in boxes were found at the beginning of March during routine monthly nest box checks. Two eggs were present in a box in tree 1 at 10 m height (just southeast of the Roro Jonggrang temples), and seven eggs in a box in tree 3 at 8 m height just south of Roro Jonggrang (Fig. 1). The distance between these two boxes is about 100 m.

The time of hatching is unknown, but we recorded the first fledglings assumed to be from a nest box on 23 April 2007, when two young were seen close to the nest box with the 2-egg clutch. In May a nest box check revealed no eggs inside, therefore both young were assumed to have fledged successfully. On 7 May a fledging was seen around the second occupied box (7-egg clutch); subsequently seven fledglings were seen in a *C.petandra* tree close to the box; again a nest box check revealed no eggs present and all young were assumed to have fledged successfully.

Around the time of fledging, the ground under the boxes was checked for fallen chicks. None were found, in contrast to this usually being the case for Java sparrow broods reared in nests located in the stone crevices within the temple buildings.

In two of the six trees (4 and 5) in which boxes have been placed, no Java sparrows have yet nested. This is considered possibly due to human disturbance; these trees are located in the middle of Prambanan Park (about 500 m from Roro Jonggrang) which is frequented by many people, and close to a busy street.



**Figure 5.** Adult Java sparrow emerging from one of the wooden nest boxes.

**Other species using the nest boxes in 2007:** Two pairs of Javan myna *Acridotheres javanicus*, used two of the wooden nest boxes placed at slightly higher elevations (10 -12 m) than the two boxes occupied by the Java sparrows. Large geckos (possibly *Gekko gekko*, a common species at Prambanan, but identification uncertain) occupied four wooden nest boxes; these were below those used by Java sparrows (height range 5 - 8 m). Two bamboo nest boxes were occupied by ants and honeybees (one box each), and one coconut shell was used by a mouse for nesting.

**Use of nest boxes in 2008:** At the end of January 2008, there were again two pairs of Java sparrow nesting in nest boxes (on different trees) both in wooden nest box (one of these used by Javan myna in 2007). One nest (tree 2) had nine eggs but failed as the parents were caught by a local birdcatcher; the second nest had 12 eggs (tree 1), six of which hatched and subsequently fledged. Late in the breeding season a third pair occupied another wooden nest box in a third tree (tree 6) and fledged three young in July. Another pair was observed prospecting one of the coconut shells on one occasion but this was not used for nesting.

Elsewhere in the temple complex, there were six Java sparrow nests located in four temples (Nandi, Angsa, Brahma and Wisnu).

**Other species using the nest boxes in 2008:** A Sunda woodpecker *Dendrocopos moluccensis* made a hole in the base of one wooden box (but did not use it for nesting). Several geckos were also observed.

## Conclusions and discussion

**Prambanan Temple renovation:** Presently, the government is planning to renovate and rebuild parts of the Prambanan Temple complex in a process estimated to take about 10 years. It is considered that this reconstruction will disturb Java sparrows, especially in the breeding season, as well as resulting in the further loss of traditionally-used stone crevice nest sites in addition to those lost during the 2003-2005 renovation of Siwa, the main Java sparrow nesting area within the complex. It is considered that this combined disturbance and nest site loss could lead to extirpation from Prambanan unless alternative nest sites are provided.

**Success of nest boxes so far:** Based on the first two years of the nest box trials, four pairs of Java sparrows have successfully used the artificial nest sites (all in wooden nest boxes) fledging a total of 18 young (9 in 2007; 9 in 2008). With a better understanding of nest box design preference and where best to locate them, there is the expectation that more Java sparrows will use boxes in future breeding seasons. It is also hoped to provide more boxes of designs so far successfully used, and also to experiment with new designs and placements (see below).

An additional finding is that Java sparrow chicks reared in boxes are safer, in terms of not falling from them prior to fledging, as opposed to those nesting in stone crevices: during every year when monitored, we found that 1-2 chicks had fallen from each nest located in crevices at the stage when chicks were older and began to appear at the nest site entrance. However, in the nest boxes they have so far not been observed to fall out, presumably as the entrance hole is situated fairly high up and is therefore inaccessible to chicks until around fledging age, when they are able to fly.

**Nest box durability and future box designs:** Nest boxes made from hard wood, bamboo or coconut shells are not very durable in the tropical climate, so use of other materials, e.g. stone or clay, is being considered. An additional advantage of using stone or clay (if found acceptable to the birds) is that they can be made to be more 'artistic' and thus they can be installed on the temple walls themselves, (where wooden boxes are not allowed) and in other areas of the temple, especially tourism areas.

**Conservation education and involvement of local birdcatchers:** The ever present problem of loss of birds to birdcatchers was highlighted by the capture of one of the breeding pairs in 2008 when activities of birdcatchers around Prambanan were monitored. As a consequence, a conservation education approach was undertaken aimed at the catchers and they were invited to count help count the Java sparrow population, in conjunction with initiatives to develop and enhance captive breeding techniques to satisfy the demand of Java sparrow buyers. In the future it is hoped that the birdcatchers can supplement their income by acting as guides to visitors that are interested in seeing Java sparrows, in return for not catching wild birds.

The Java sparrow project at the Prambanan Temple complex is ongoing, monitoring and provision of more nest boxes will continue in future breeding seasons.

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**Further information about Kutilang Indonesia Foundation:** Kutilang Indonesia Foundation is a non-profit organisation undertaking ornithological research, educational initiatives including birdwatching field trips for

local people, and habitat improvement. For more information about Kutilang Indonesia, please visit the website:  
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