

nest entry and exit dates. At some nests, chicks were observed coming out of the cavity. Where direct observations of chick emergence was not made, we inferred nesting success if the nest was active throughout the breeding season and the nest seal was found to be broken and opened at the end of the breeding season (July-August) or if a chick was observed in the vicinity of the nest tree with the adult hornbill pair.

RESULTS AND DISCUSSION

First season: January-August 2012

Nesting success

In the first season, 28 nests were located, of which 17 were active (pair occupied the nest cavity) and 11 were successful, while eight nests were inactive (Table 1). Three additional nests were not visited, either because they were far away and difficult to access in the monsoon or because they were found towards the end of the breeding season. As this was the first year, regular diary writing and intensive monitoring did not happen as planned for all the nests, therefore, a nest was recorded as successful if (1) chicks were seen outside the nest with both parents in July-August, (2) the male was, or the pair were, seen feeding chicks in the nest until mid-July or (3) the nest remained sealed and active until mid-July.

Out of the 28 nests, 11 were of the Great Hornbill. Out of these, nine were active, one inactive (Margasso) and one nest found in 2012 was not visited in 2012 for logistical reasons. Finally, seven nests were successful (87.5% success), and the outcome of one nest was unknown, as that nest was visited only once during the beginning of the season. Seven Oriental Pied Hornbill nests were found. One was inactive (Moboso 2), while six were active. However, only three nests were successful (50% success). Five Wreathed Hornbill nests were found; two were inactive (Jolly, Moboso 2), three were active and only one successful (33% success) (Table 2). Four other nests (Lanka) showed signs of use/activity from previous years but were inactive so we could not determine which species they belonged to (Table 2). The overall nesting success was 65%.

Five nests were unsuccessful; one Great Hornbill nest got burnt down during a forest fire (Darlong). A Wreathed Hornbill pair abandoned the nest tree during the forest fire, although the tree was not destroyed (Goloso). Two nest trees were cut down, one Wreathed Hornbill nest in Bali basti and one Oriental Pied Hornbill nest in Darlong. One Oriental Pied Hornbill nest was abandoned mid-way for unknown reasons (A2/Moboso 1).

Nest entry and exit dates

The nests were observed more frequently during March-April and end of June to early August to record dates of female entry into the nest and chick exit from the nest. As this was the first year, we had some problems in getting all the nest protectors to write/record data and observations regularly and accurately on each visit they made. The breeding season for the Great Hornbill started between 2 and 22 March and ended between 2 and 31 July. Oriental Pied Hornbill started nesting from 10 to 14 April and they came out around 28 June to 4 July (Table 3). For the Wreathed Hornbill, nest entry and exit dates were missed.

Second season: January-August 2013

In the second season, we had 23 nests in total: eight Great, five Wreathed and ten Oriental Pied Hornbill nests (Table 4). Three additional nests, one of the Great Hornbill and two of the Rufous-necked Hornbill were reported by villagers from Lasung-pate, which was not part of the current nine participating villages in the programme (Table 5). Our team of nest protectors visited the area in July and found that at one nest, the chick had been killed, while the other nest was not shown by the villager as it was very far away. One Great Hornbill nest that was active near this village had also been partially cut which had resulted in nest abandonment by the pair, although the nest tree is still standing. Twelve nests were active (five Great, one Wreathed and six Oriental Pied Hornbill) in the main participating villages (Tables 4 and 5). Female entry into the nest took place between 18 March to 4 April for the Great Hornbill, on 21 March for the single Wreathed Hornbill nest and between 12 April and 29 April for the Oriental Pied Hornbill (Table 6). The success and exit date of chicks is given in Table 6.

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In PRF, nesting was initiated in 17 out of 25 nests (68%) in 2012 (barring the three nests that were not visited), while in PTR in the same year; nesting was initiated in only 47% of nests (15 active and 17 inactive). Nesting success in PTR was 93% (14 out of 15 active nests) and much higher than that observed in PRF (65%). This is to be expected as, despite improved protection at nest trees, there are diverse human pressures in the area outside, with villages, settlements and resource-dependency of the local community. It is therefore unrealistic to expect 100% protection in the first year. Most of the nests that were unsuccessful (direct tree loss due to felling and fire) were also located very close to three villages, where it is more difficult to ensure protection. In addition, it is important to note that in total 11 nests were successful of which seven were of the Great Hornbill, which is more threatened and which used to be the main target of hunters in this area. The maximum number of nests observed was of the Great Hornbill and nesting success of its nests was very high in the PRF (87.5%). This indicates that despite the continuing problem of occasional felling of trees, the ban on hunting and the nest protection through this program has helped the species successfully breed in these forest areas outside PTR. It remains unclear why fewer nests of the Wreathed Hornbill have been located and why nesting success of this species has been much lower. It is possible that the Wreathed and Oriental Pied Hornbills are more adaptable species and may nest more often in locations/trees that are closer to villages which results in greater chances of them being cut down/disturbed.

In 2013, nesting was initiated in 52% of nests in PRF, while it was similar in PTR (51%). However, nesting success was much higher in PRF (91.5%) with 11 of 12 active nests having successful chick fledging, while in PTR it was 76.5%. There were also no direct losses/nest abandonments of active nests that are monitored by our nest protectors from the ten villages in the program. The higher success in the second year of the programme is an encouraging sign indicating that protection efforts are helping. After the loss of four nest trees in 2012, we had numerous meetings to discuss ways to prevent further losses to trees and ensure greater vigilance to detect and prevent fires and check tree felling. The nest protection teams have had discussions with their own community members in their respective villages to prevent instances of felling of nest trees and extracting wood/timber in the vicinity of existing nest trees. The two nests (one of a Great and Rufous-necked Hornbills

respectively) that have been affected by disturbance (felling and one instance of hunting) were located near a village (Lasung-pate) that is not yet a part of the programme and these nests were not monitored by our team. We hope to attempt a dialogue with them in the future, on curbing hunting and persuading them to join the nest protection programme.

CONCLUSION

While protecting hornbill nests and ensuring recruitment of hornbills every breeding season with a few villagers is an important first step towards starting a community-based conservation initiative, there are larger challenges with regard to ensuring habitat protection by the community in the long-term. Habitat degradation, weed invasion and deforestation due to anthropogenic activities continue to threaten Papum Reserved Forest. This also means resource (water, soil, firewood, bamboo, timber, non-timber forest produce) limitation for the human population in near future. There is a genuine dependency of the community on forests that needs to be addressed as there have already been instances of conflict with individual villagers over felling trees. The resident *Nyishi* community in the villages in most of PRF is supportive of conservation programmes. In April 2012, during an awareness campaign in Seijosa town, we initiated a discussion with the Ranger of the Territorial Division of the Arunachal Pradesh Forest Department and members of the Village Forest Development Council, Seijosa, about initiating a habitat restoration programme in PRF. This restoration programme would not only assist in improving hornbill and other wildlife habitat but also natural resources for villagers. We believe that the initiation of this programme would also result in greater appreciation of the importance of protecting the habitat. We also plan to use the funds for community welfare from the nest adoption program to address urgently felt needs of the larger community. We also plan to undertake a detailed socio-economic survey to understand their dependency on forest resources, development needs and attitudes and perceptions to wildlife. Unless people residing in and around forest areas understand conservation, decide to protect them and have a functional system in place for implementing conservation policies, long-term conservation of hornbills and other wildlife will be difficult to achieve.

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Table 1. Nesting status and nest outcomes in 2012 for nine participating villages.

Village Name	Nest Protector	Number of Nest	Inactive	Not visited	Active	Successful
Jolly	Tajek Wage	5	1	0	4	4
Lanka	Suraj Bagang	6	4	2	0	0
Moboso 2	Pahi Tachang	6	2	1 (GH)	3	3
Margasso	Tajeng Tachang	2	1*	0	1	?
Goloso	Rungfe Paffa	2	0	0	2	1
A2	Tade Tok	1	0	0	1	1
Moboso 1	Gingma Tachang	1	0	0	1	0
Bali Basti	Taring Tachang	2	0	0	2	1
Darlong	Budhiram Tai	3	0	0	3	1
	TOTAL	28	8	3	17	11

* This nest tree got cut down subsequently in January 2013.

Table 2. Hornbill species breeding summary for 2012 season.

Hornbill Species	Number of Nest	Inactive	Not visited	Active	Successful
Great Hornbill	11	1	1	9	7
Oriental Pied Hornbill	7	1	-	6	3
Wreathed Hornbill	5	2	-	3	1
Not known	6	4	2	-	-
TOTAL	28	8	3	17	11

Table 3. Nest entry and exit dates for successful nests in 2012.

S. No	Village Name	Nest ID	Hornbill Species	Entry Period (by female)	Exit Period (by chick)
1	Darlong	GHD1	Great Hornbill	Between 18 and 22 March	Between 17 and 19 July
2	A2/Moboso 1	GHA/M1	Great Hornbill	between 15 March and 17 March	Between 2 and 10 July
3	Goloso	GHG1	Great Hornbill	between 18 and 21 March	Between 15 and 17 July
4	Moboso 2	GHM1	Great Hornbill	between 2 and 6 March	Between 10 and 14 July
5	Jolly	GHJ2	Great Hornbill	Mid-March	End July
6	Jolly	GHJ3	Great Hornbill	Mid-March	End July
7	Jolly	GHJ4	Great Hornbill	Mid-March	End July
8	Moboso 2	OPHM3	Oriental Pied Hornbill	Between 10 and 14 April	Between 28 June and 4 July
9	Moboso 2	OPHM5	Oriental Pied Hornbill	Not known	Between 28 June and 4 July
10	Bali Basti	*OPHB1	Oriental Pied Hornbill	Not known	Between 29 June and 2 July
11	Jolly	WHJ1	Wreathed Hornbill	March	Early August

*During initial visits, a pair of Wreathed hornbills were seen at the nest, cleaning and inspecting the cavity.

Table 4. Nesting status and nest outcomes in 2013 for 10 participating villages.

Village Name	Nest Protector	Number of Nest	Inactive	Active	Successful
Jolly	Tajek Wage	5	1	4	3
Lanka	Suraj Bagang	2	2	0	NA
Moboso 2	Pahi Tachang	6	3	3	3
Margasso	Tajeng Tachang	2	2	0	NA
Goloso	Rungfe Paffa	1	1	0	NA
A2	Tade Tok/Gingma Tachang	2	0	2	2
*Moboso 1	Ohey Tayem	1	0	1	1
Bali Basti	Taring Tachang	1	1	0	NA
Darlong	Budhiram Tai	2	1	1	1
*Taraboso	Vijay Tachang	1	0	1	1
	TOTAL	23	11	12	11

*Two new nest protectors joined the programme.

N/A = Not available

Table 5. Hornbill species breeding summary for 2013 season.

Hornbill Species	Number of Nest	Inactive	Active	Successful
*Great Hornbill	9	3	6	4
Wreathed Hornbill	3	2	1	1
Oriental Pied Hornbill	10	4	6	6
*Rufous-necked Hornbill	2	1	1	0
**Unidentified	2	2	0	0
TOTAL	26	12	14	11

*In July, one additional Great and two Rufous-necked Hornbill nests were reported by villagers in Lasung-pate which are included in the total count in this table, but were not under protection through the programme.

**Potential hornbill nest cavities shown by one nest protector in Lanka village, but not occupied.

Table 6. Nest entry and exit dates for successful nests in 2013.

S. No	Village Name	Nest ID	Hornbill Species	Entry Period (by female)	Exit Period (by chick)
1	Moboso 2	GHM1	Great Hornbill	1 to 5 April	Between 27 and 30 July
2	A2/Moboso 1	GHA/M1	Great Hornbill	18 March	17 July
3	Jolly	GHJ2	Great Hornbill	23 to 28 March	Between 1 and 3 July
4	Jolly	GHJ3	Great Hornbill	26 to 29 March	Between 1 and 3 July
5	Jolly	GHJ4	Great Hornbill	29 March to 3 April	Abandoned
6	Lasung-pate	GHL1	Great Hornbill	March	Abandoned
7	Jolly	WHJ1	Wreathed Hornbill	21 March	Between 27 June and 1 July
8	*Taraboso	OPHT1	Oriental Pied Hornbill	Before 20 April	Between 21 and 25 July
9	Moboso 2	OPHM3	Oriental Pied Hornbill	25 to 29 April	27 July
10	Moboso 2	OPHM4	Oriental Pied Hornbill	23 to 26 April	17 July
11	A2/Moboso 1	OPH A/M2	Oriental Pied Hornbill	12 to 17 April	21 July
12	A2/Moboso 1	OPH A/M3	Oriental Pied Hornbill	Before 15 April	2 August
13	*Darlong	OPHD2	Oriental Pied Hornbill	Found on 16 June	Between 3 and 8 July
14	*Lasung-pate	RNHL1	Rufous-necked Hornbill	Visited in July, but chick hunted	-
15	*Lasung-pate	RNHL2	Rufous-necked Hornbill	Reported by villager, but not confirmed	-

*New nests found this year. The Great Hornbill nest in Lasung-pate (reported by villager) was visited for re-check in July by our field staff and the nest tree was found partially cut and abandoned by the pair. The chick had been killed at one Rufous-necked Hornbill nest, and another reported Rufous-necked Hornbill (inactive) nest was not visited by our team.

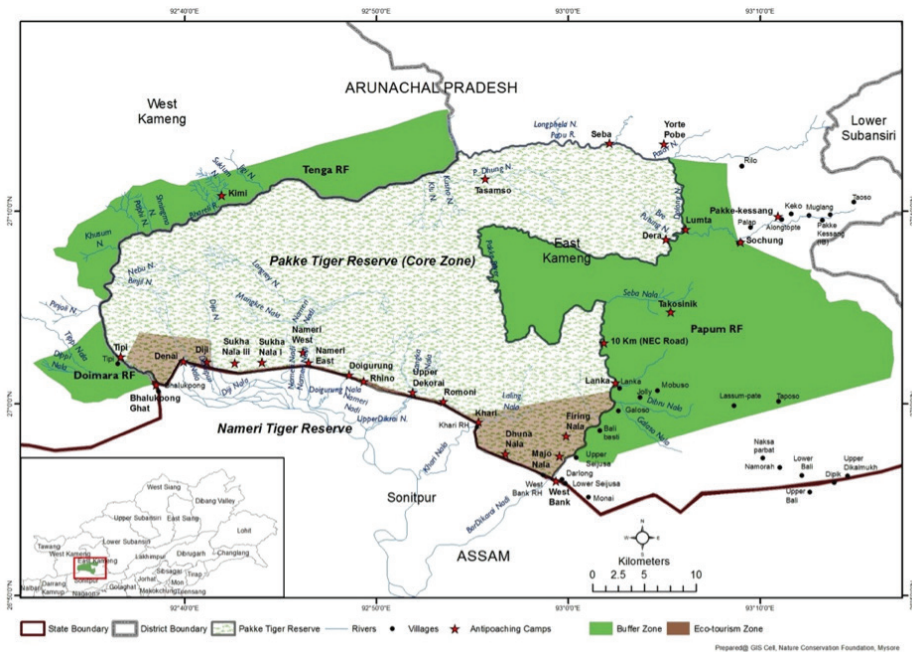


Figure 1. Map of Pakke Tiger Reserve, Papum Reserved Forest and other surrounding forest areas showing villages outside and Forest Department anti-poaching camps inside the reserve. Through the Hornbill Nest Adoption Programme, we are monitoring nests in nine villages in Papum Reserved Forest, while we continue to monitor hornbill nests inside the park since 2003.

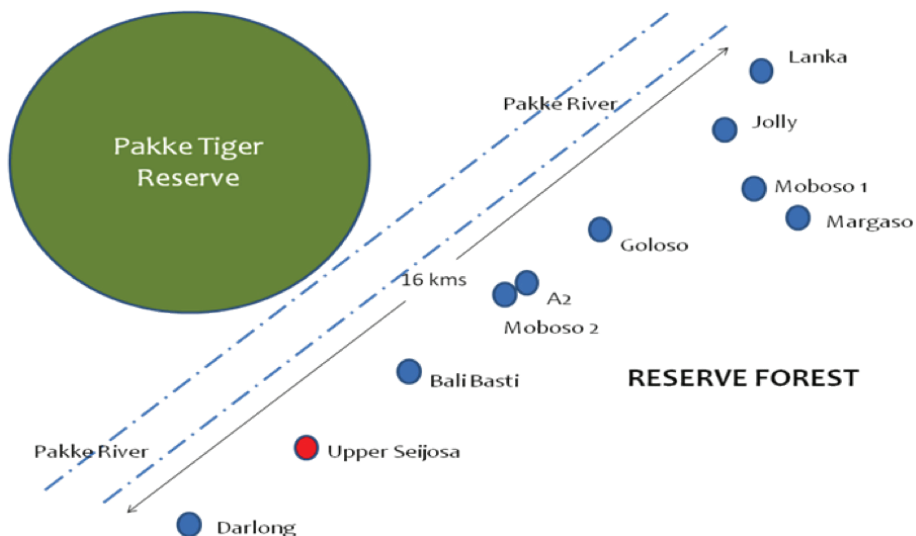


Figure 2. Schematic map showing villages (blue dots) around Pakke Tiger Reserve that are currently participating in the Hornbill Nest Adoption Programme.