

## PARTICIPATORY CONSERVATION AND MONITORING OF GREAT HORNBILLS AND MALABAR PIED HORNBILLS WITH THE INVOLVEMENT OF ENDEMIC KADAR TRIBE IN THE ANAMALAI HILLS OF SOUTHERN WESTERN GHATS, INDIA

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**ABSTRACT.** – The Anamalai landscape unit of Western Ghats in southern India is an important hornbill area, with four sympatric hornbills: Great Hornbill (*Buceros bicornis*), Malabar Pied Hornbill (*Anthracoceros coronatus*), Indian Grey Hornbill (*Ocyrceros birostris*) and Malabar Grey Hornbill (*Ocyrceros griseus*). Traditional hunting of hornbills by tribal people is suspected to be an important threat. A preliminary survey in the Vazhachal division conducted during 2004-05 with support of Kerala Forest Department (KFD) and the endemic Kadar tribal people discovered 23 nests of Great Hornbills and two nests of Malabar Pied hornbills. This is the only known available nesting location of the near threatened Malabar Pied Hornbill in Kerala state. The survey was developed into a participatory monitoring and conservation programme with the involvement of community groups (VSS—Vana Samrakshana Samithy) of the forest dwelling Kadar tribe. Tribal guards were selected based on their previous experience with hornbills or their knowledge of the forest. They were trained in the field to monitor hornbills during the nesting season. Protection of nesting trees was ensured with regular patrolling of the selected tribal guards. The programme was executed along with other regular Joint Forest Management (JFM) activities of the KFD and it has now been incorporated as part of the regular programme of the tribal VSSs of the division. This also supported the tribe's traditional forest dwelling instincts and reduced their pressure on hornbills and other forest resources. A total of 57 Great Hornbill and four Malabar Pied Hornbill nests were discovered. Seven previously abandoned nests have been re-occupied as a probable result of the reduction of disturbance. The programme throws light on the need for continuous monitoring of resources and establishment of real community resource links in the current conservation paradigm.

This paper was presented at the 5<sup>th</sup> International Hornbill Conference jointly organised by the National Parks Board (Singapore) and the Hornbill Research Foundation (Thailand), in Singapore on 22<sup>nd</sup>–25<sup>th</sup> March 2009.

**KEY WORDS.** – Great Hornbill, Malabar Pied Hornbill, Kadar tribe, Participatory conservation, Western Ghats.

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### INTRODUCTION

Hornbills are generally frugivorous, arboreal, and secondary cavity-nesters (Kemp, 1970; Leighton, 1986). They have always been considered important agents of seed dispersal in tropical forests (Kemp, 1995; Leighton, 1982; Poonswad

et al., 1983; Kinnaird, 1998). Their vulnerability is mainly because of loss of primary forest habitats due to various practices such as deforestation, habitat alteration, raising of plantations, agriculture, shifting cultivation and logging of old growth trees (Kemp & Kemp, 1975; Leighton, 1982; Kannan & James, 1998; Poonswad, 1995; Mudappa & Kannan, 1997;

Datta & Rawat, 2004; Bachan, 2006). Historically, hornbills have also been subjected to hunting all over their range in Asia, adding to their vulnerability (Bennett et al., 1997).

Of the nine species of hornbills in India, four occur in south India: the Great Hornbill (*Buceros bicornis*), Malabar Pied Hornbill (*Anthracoceros coronatus*), Indian Grey Hornbill (*Ocyrceros birostris*) and Malabar Grey Hornbill (*Ocyrceros griseus*). The Great Hornbill is listed in Schedule I of the Indian Wildlife Protection Act (1972) (MoEF, 2006) and is considered near threatened (IUCN, 2000). In India, the Great Hornbill is found only in the forests of Western Ghats, Eastern Himalayas and foothills of India (Ali & Ripley, 1987; Kannan & James, 1998; Datta, 2004). The Malabar Pied Hornbill is near threatened (IUCN, 2000; Collar et al., 1994) and this species is endemic to the low elevation moist forests of Western Ghats, a few locations in central India, Eastern Ghats and Sri Lanka (Ali & Ripley, 1987). Datta (2004) lists this species among the four most threatened or rare hornbill species in India.

Habitat loss due to shifting cultivation and logging, and traditional hunting by tribes was reported as important threats to hornbills in India in the northeast and the Western Ghats (Kannan & James, 1998; Datta, 1998; 2004; Raman, 2001). Earlier studies in various parts of the Anamalai landscape (Indira Gandhi Wildlife Sanctuary- Kannan 1993 and 1994, Kannan & James, 1998; Vazhachal forest division – Bachan 2006) indicated hunting by the endemic ‘Kadars’ as an important threat. Many have suggested the need of continuous monitoring and protection against hunting of squabs as an important conservation measure (Kannan & James, 1998; Datta, 1998; Prabhu et al., 2005; Bachan, 2006).

This paper explains how the traditional forest dwelling community, the ‘Kadars’ endemic to the Anamalais, who practice traditional hornbill hunting, were brought into conservation and monitoring of hornbills in the forests they reside and its implications on the conservation of the two hornbill species in the area.

## STUDY AREA

Four species of hornbills occur sympatrically in the Anamalais (‘Elephant Mountains’) which is one of the strongholds for hornbills in south India (Bachan, 2003; 2006; Mudappa & Raman, 2007; Kaimal et al., 2007). In these hills, their abundance is higher in the forests below 900m elevation; in the Western Ghats region highest numbers of Great Hornbills occur here (Mudappa & Raman, 2007). The four species sympatrically exist in the low elevation riparian areas of Vazhachal forests in the Anamalai landscape unit (Bachan, 2003; 2006; Kaimal et al., 2007) and three species, Great Hornbill, Malabar Pied Hornbill and Malabar Gray Hornbill sympatrically nest here (Bachan, 2006).

The Western Ghats comprises the major portion of the Western Ghats and Sri Lanka Biodiversity Hotspot, one of 34 such hotspots for conservation, and one of the two on the

Indian subcontinent. The Anamalai Hills along the southern edge of the Palghat Gap culminating at Anaimudi (2695 m), the highest point in the Western Ghats is considered one of three endemic centers of the Ghats (Nayar, 1996; Ramesh et al., 1997). It covers an area of 6,014 square kilometers (3.3 percent of the total Western Ghats area) in two states Kerala and Tamil Nadu (Bawa et al., 2007).

The present study area, the Vazhachal Forest Division, lies between 76° 09' 06" - 76° 54'E and 10° 07' 08" - 10° 23' 16"N in the Anamalai landscape unit. Forests of Vazhachal occupy a central and pivotal position in the landscape and link all the important forest areas in the vicinity.

The temperature ranges 16 to 23°C in the forest areas and >23°C in the lower reaches. The average rainfall is 4,019 mm with 2–4 months of dry period. The primary wet-evergreen forest in this division occupies 190 km<sup>2</sup>, which is 47% of such forests in the Kerala part of Anamalai landscape unit (Ramesh et al., 2007). The Sholayar and Vazhachal ranges contribute a major portion of the primary forest in the area.

The predominant tribal people of these forests are the Kadars. They are a primitive, seasonally nomadic, forest dwelling community endemic to the Anamalai hills of the Western Ghats. Their population is nearly 1,500 living across central and northern side of the Anamalais overlapping with the climax vegetation complex within the Chalakudy river basin. They are seen in 24 settlements in which 20 are within Kerala State and remaining four in Tamil Nadu. The majority of population lives in the Vazhachal Forest Division (10 settlements). They inhabit the high rainfed forest areas of the Sholayar and Parambikulam valley and were almost unfamiliar to the external world until the end of the last century. Thurston (1909) describes them as the ‘Kings’ of Anamalais. They are non-agricultural, living by collection of Non Timber Forest Produces (NTFPs). Their life style is very much linked with the rainforest forest environment and much of their NTFPs are the products of evergreen forests like Honey, Black Dammar (*Canarium strictum*), White Dammar (*Vateria indica*), and Wild Nutmeg (*Myristica* spp.) etc. Fishing also contributes greatly to their livelihood. They are on the verge of cultural extinction because of depletion of suitable habitat due to dams and plantations. Degradation of the evergreen forest habitats especially because of hydel projects in the Parambikulam and Sholayar valleys exposed them to the outer world and displaced them from their old settlements. Threats continue as other hydel projects are proposed. Most of them left their tribal means of existence and have become laborers doing odd jobs mostly with the forest department. However as part of the Vana Samrakshana Samithies (VSS) they are now dependent on JFM and eco-tourism activities related with forest department.

## METHODS

A preliminary hornbill survey was conducted between November 2004 and May 2005 with field support of the Kadars. It was incorporated as a programme of the VSS

Table 1. Characteristics of Great Hornbill nest trees.

	Mean	SD	Range	Median	N
GBH in m	4.36947	1.3007	2-8.4	4.1	57
Tree Height	31.15789	3.38478	24-40	31	57
Bole Height	24.4386	3.80797	16-32	25	57
Height at Nest	25.17544	3.17986	18-32	25	57

(Vana Samrakshana Samithy) - a community organization of the tribe under the forest department. A total of seven tribesmen were selected from five different settlements of Kadar ethnic lineage based on their interest and experience in interior forest dwelling. Five of them were poachers of hornbill squabs. A total of thirty tribesmen participated from seven settlements during the four years of the programme. Transects were selected from their traditional NTFP collection routes, which cover almost all important forest areas. Nesting trees were located with help of the previous experience of the tribal people, the following of lone males, presence of regurgitated seeds in fecal matter or seedlings of hornbill-preferred trees and presence of old feathers at the middens under nesting trees. The selected tribesmen were trained in the field to monitor nests during the nesting season and also for general surveys. Sheets were prepared in the local language (Malayalam) to record and monitor nests. Separate sheets were maintained for each nest for every year. The selected hornbill guards perambulated each area during the nesting seasons, recording nest activities and protecting trees from forest fire and poaching. We accompanied each group once a month, verified their findings, ensured that they followed directions, documented their perceptions and slowly empowered them for scientific monitoring. Details regarding nesting trees like name, girth at breast height (GBH), height of tree, bole height and height at the nest cavity, location of nest-tree, nature of vegetation, nature of terrain, nearest

plants, and activity of the nesting birds in each nesting season were recorded during the process. Thirty nests were monitored intensively and others were monitored two to three weeks during the nesting period. At the very least, nest activities recorded were entry of females, hatching of chicks, existence of female inside, and fledging of chicks. For each nest six threat factors were recorded as positive or negative. The factors were: forest fire, degradation of forest quality, hunting by tribes, hunting by non-tribes, human disturbance, and influence of river flow fluctuation by dams on nesting trees. Basic statistics of the relative threat values were used for comparison of threat factors for different regions and also for the success of the conservation programme.

## RESULTS AND DISCUSSION

**Nesting and nest trees.** – A total of 61 nests were located during four years search, of which 57 were Great Hornbill nests and four were Malabar Pied Hornbill nests. Forty-four (77%) nests were in wet evergreen forests and 13 (23%) in degraded edge forests. Malabar Pied Hornbill nests were present only in riparian edge forests at an elevation of 150–250 m. Great Hornbills here found to nest on trees greater than 2 m GBH (average 4.3 m,  $n=57$ ). Average tree height ranged 24–40 m with an average of 31 m. Height of the nest ranged 18–32 m with an average of 25 m (Table 1).

Great Hornbills were found to nest on 18 species of trees (Fig. 1. and Table 2.). Most nests were located on *Terminalia bellirica* (Table 2). Out of the four Malabar Pied Hornbill nests, three were on *Tetrameles nudiflora* and one on *Terminalia bellirica*. There was some overlap in nesting tree species by the Great Hornbill and Malabar Pied Hornbill. Two of the 18 species (11 %) were shared by both hornbill species (Table 2).

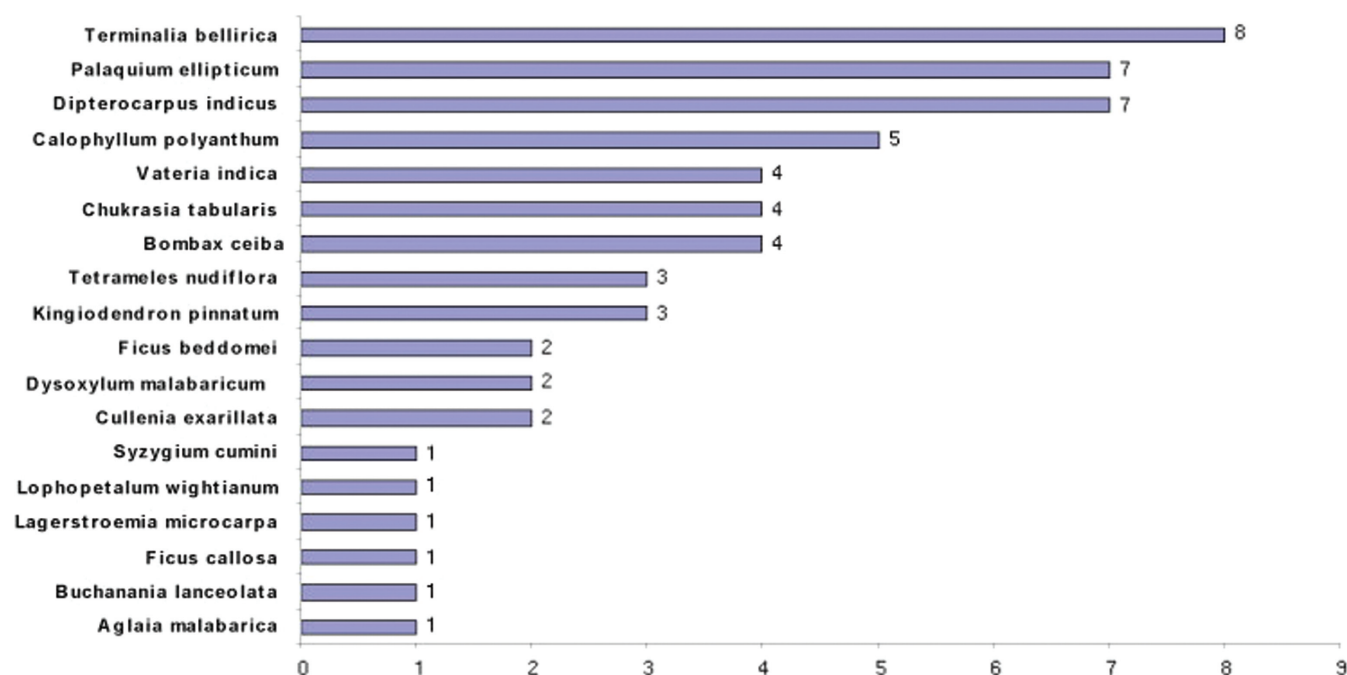


Fig. 1. Nesting Trees of Great Hornbills.

Table 2. Nesting tree preference of Great Hornbill and Malabar Pied Hornbill.

	Tree species	Great Hornbill nests	Malabar Pied Hornbill nests
1	<i>Terminalia bellirica</i>	8	1
2	<i>Tetrameles nudiflora</i>	3	3
3	<i>Dipterocarpus indicus</i>	7	–
4	<i>Palaquium ellipticum</i>	7	–
5	<i>Calophyllum polyanthum</i>	5	–
6	<i>Bombax ceiba</i>	4	–
7	<i>Chukrasia tabularis</i>	4	–
8	<i>Vateria indica</i>	4	–
9	<i>Kingiodendron pinnatum</i>	3	–
10	<i>Cullenia exarillata</i>	2	–
11	<i>Dysoxylum malabaricum</i>	2	–
12	<i>Ficus beddomei</i>	2	–
13	<i>Aglaia malabarica</i>	1	–
14	<i>Buchanania lanceolata</i>	1	–
15	<i>Ficus callosa</i>	1	–
16	<i>Lagerstroemia microcarpa</i>	1	–
17	<i>Lophopetalum wightianum</i>	1	–
18	<i>Syzygium cumini</i>	1	–

**Nesting density.** – Fifty-seven active Great Hornbill nests were found in the 414 km<sup>2</sup> of the overall area (forest plus non-forest) with a nesting density of 0.14 nests/km<sup>2</sup>. When comparing with actual forested area, the overall nesting density was 2.25 nests/km<sup>2</sup>. Malabar Pied Hornbill nests were found only in low elevation riparian forests of Vazhachal, and nesting density was very rare (0.009/ km<sup>2</sup>).

**Threat factor levels.** – Eighty-six per cent of nests (Table 3) were prone to forest fire and degradation in forest quality, and

these two were the leading threat factors. Hunting by tribes (49%), human disturbance (25%), influence of fluctuation of river flow by dams on the nesting trees (21%) and hunting by non-tribes (14%) were the other threat factors.

**Nesting status and success.** – During the preliminary (2004–2005) survey, 25 nests (23 Great Hornbill and two Malabar Pied Hornbill) nests were located. All but one of the Great Hornbill nests was successful. There was gradual increase in the number of nesting trees discovered (24–25%)

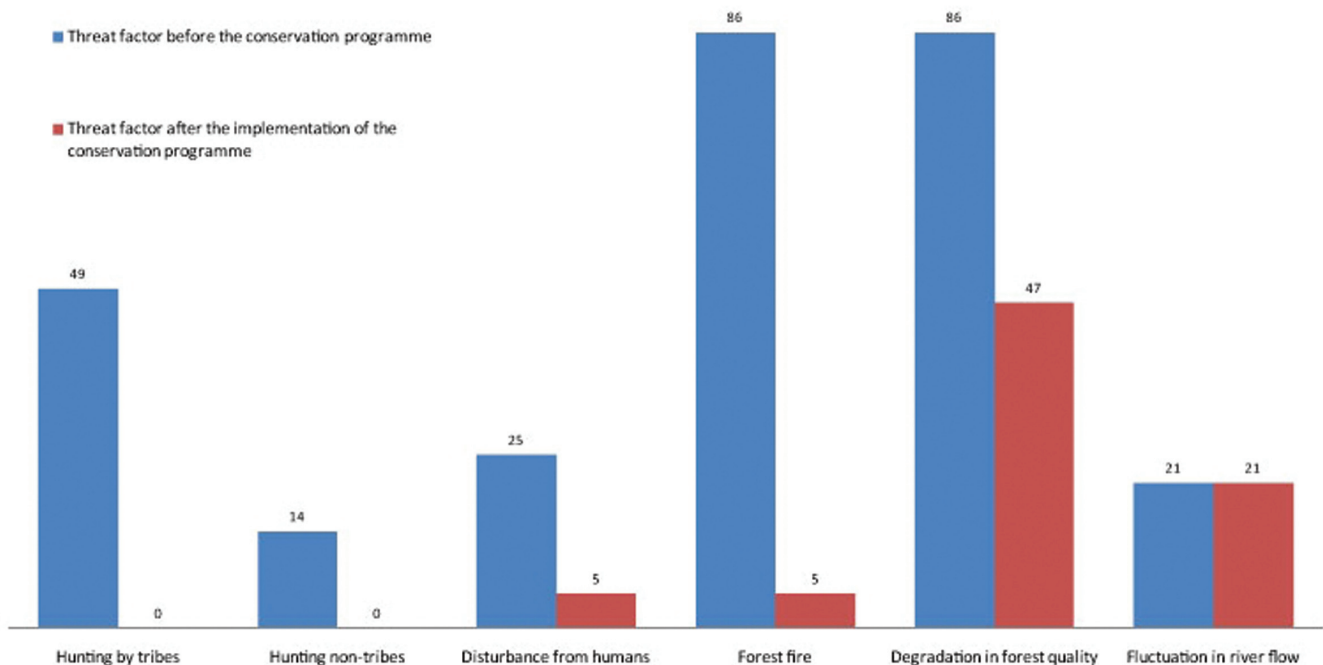


Fig. 2. Threat factor (%) comparison before and after the conservation programme.

Table 3. Basic statistics of threat factor levels on nesting trees.

	Hunting by tribes		Hunting - non tribe		Disturbance from human		Forest fire		Degradation in forest quality		Fluctuation in river flow	
	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
Implementation of conservation programme												
Total threat value	28	0	8	0	14	3	49	3	49	27	12	12
Relative threat level (%)	49.12	0	14.03	0	24.56	5.26	85.96	5.26	85.96	47.36	21.05	21.05

Table 4. Number of tribesmen who participated in the programme each year.

Tribal VSS	2004–05	2005–06	2006–07	2007–08
Vazhachal	2	4	2	2
Pokalapara and Poringal	1	3	3	3
Vachumaram	1	3	2	2
Sholayar	1	5	4	4
Malakapara	2	4	2	2
Thavlakuzhipara	0	0	1	1
<b>Total</b>	<b>7</b>	<b>19</b>	<b>14</b>	<b>14</b>

Table 5. Nesting status, success and reestablishment of nesting during 2004–08 (four consecutive nesting seasons).

	2004–05	2005–06	2006–07	2007–08
<b>Great Hornbill nests</b>	23	28	40	57
Nesting attempts	21	27	35	56
Successful nests	20	25	34	56
Reestablishment of abandoned nests	NA	1	2	5
New nests located	NA	5	12	17
Nest trees loss	0	0	1	0
<b>Malabar Pied Hornbill nests</b>	2	3	4	4
Nesting attempts	1	3	4	4
Successful nests'	1	2	4	4
Reestablished nests	NA	1	2	0
New nests located	NA	1	1	0
<b>Total nests</b>	<b>25</b>	<b>31</b>	<b>43</b>	<b>61</b>

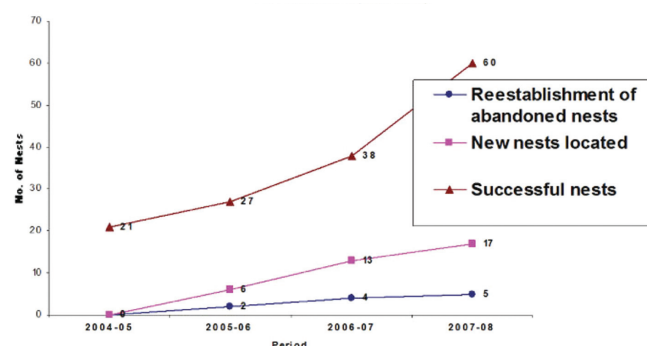


Fig. 3. Nesting Success of Great Hornbill and Malabar Pied Hornbills in the Vazhachal Forest Division (2004–2008).

each year (Table 5 and Fig. 3). After the project started, 57 Great Hornbill and four Malabar Pied Hornbill nests were located and all except one (which fell down in a storm) were found successful. Failure in nesting attempts was less (8–5% during the time). Two previously abandoned nests were reoccupied during 2005–2006, four during 2006–2007 and five 2007–2008. Among these eight were Great Hornbill nests and remaining three were that of the Malabar Pied Hornbill.

**Tribal participation, monitoring and conservation.** – The gradual increase in reoccupation of abandoned nests was probably due to the effects of the participatory conservation programme. Also, the increase in Malabar Pied Hornbill nests from two nests (2004–2005) to four nests (2007–2008) could also be due to the programme.

About 30 people from all the six Kadar tribal VSS (Table 4) of the forest division participated in the programme. It became part of the regular Joint Forest Management—monitoring programme of the forest department and VSS. Incorporating the program through the VSS and the Forest Department and making it part of their regular activities ensured the continuity of the process. The programme provided a means of sustenance to the people while preserving their traditional forest dwelling habits.

After the implementation of the conservation programme during 2004–2005 and up to the last nesting season (2007–2008), threat factors reduced markedly (Table 3). Among the six threat factors, hunting became non-existent and forest fire (85% to 5%) and human disturbance (24% to 5%) also reduced. Threat due to degradation of forest (85% to 47%) reduced although persisted, and the threat of flow fluctuation by dams (21%) remained a strong threat factor. Increase in the nest encounter, nesting success, reestablishment of abandoned nests (Fig. 3) and the increase in participation of tribesmen in the programme and decrease in the intensity of threat factors (Fig. 2) could be attributed to this conservation programme.

## ACKNOWLEDGEMENTS

We thank the Department of Forests and Wildlife, Kerala, for the support of the programme. We especially thank Dr. H Nagesh Prabhu IFS, N. Sasidharan and G. Rennensen Conservators, Dr. N.C. Induchoodan and S. Sheik Hyder Hussain, DFO's of the period, Range officers and other Staff of Vazhachal Forest Division. This would not have possible without the involvement and contribution of 'Kadar' tribes and their VSSs. We also thank Dr. S. Sathish Chandran Nair and Dr. S. Santhi, Thiruvananthapuram, Dr. Douglas A. James, University of Arkansas, USA, Aparajitha Datta, NCF and Dr. A. K. Pradeep, Department of Botany, University of Calicut.

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