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Hainan Peacock Pheasant (*Polyplectron katsumatae*): an endangered and rare tropical forest bird

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Abstract The Hainan Peacock Pheasant (*Polyplectron katsumatae*), the smallest allied species of somber forest peacock pheasants among the taxa of *Polyplectron* spp., is a rare tropical forest bird endemic to China, and distributed only in the mountainous region of central and southwestern Hainan Island dominated by evergreen broadleaf forests. By integrating references and unpublished data based on our field surveys, we presented information on species status, distribution and population, habitat and home range, breeding ecology and conservation of the Hainan Peacock Pheasant. Future investigation should focus on its life history traits in relation to vulnerability. Considering its limited distribution and small population size, it has recently been recognized as "Endangered" by the IUCN Red List to prevent loss of this island endemic.

Keywords Hainan Peacock Pheasant, home range, clutch size, conservation

Introduction

Hainan Peacock Pheasant (*Polyplectron katsumatae*) is a rare tropical forest bird endemic to the island of Hainan, China (Cheng et al., 1978; Cheng, 1987; Zheng, 2005), and distributed only in the mountainous region of central and southwestern Hainan with evergreen broadleaf-dominated forests. Generally considered as a subspecies of the Grey Peacock Pheasant (*P. bicalcaratum*) which is distributed in a relatively larger range, the Hainan Peacock Pheasant has been recognized as non-threatened by the IUCN Red List for a long time (IUCN, 2006), and it has just been listed as "Endangered (EN)" species by the IUCN Red List since 2010 (IUCN, 2011). In China, it was listed as an endangered bird with Category I of nationally protected animals (Zheng and Wang, 1998).

So far, little has been known about the natural history, ecology and spatial requirements of the Hainan Peacock Pheasant (Gao and Yu, 1990; Gao and Yang, 1991; Gao, 1998; Gao and Yu, 2000). The knowledge of the natural history and spatial requirements of threatened species is crucial for promising conservation strategies and the maintenance of viable populations (Crandall et al., 2000). In the light of this, here we provided updated information on the ecology and conservation status of the Hainan Peacock Pheasant, by integrating published data and our field surveys, including the radio-telemetry work in the Bawangling National Nature Reserve (18°57′–19°11′N, 109°3′–109°17′E) in 2000 and 2004 (Li, 2005).

Species status

The peacock pheasants (*Polyplectron* spp.), comprising of six or seven species, is a group of small, relatively somber forest pheasants in tropical Asia (Madge et al., 2002). Only two taxa of peacock pheasants are distributed in China, the Grey Peacock Pheasant (*P. bicalcaratum*) in the west and southwest of Yunnan (Delacour, 1977; Cheng et al., 1978; Cheng, 1987; Johnsgard, 1999; Madge et al., 2002; Zheng, 2005) and the Hainan Peacock Pheasant (*P. katsumatae*) that is endemic to Hainan Island (Cheng, 1987; Zheng, 2005).

The Hainan Peacock Pheasant was first described in 1906 and was treated as a full species, *Polyplectron kat-*

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sumatae Rothschild. Delacour (1977) lumped it with the Grey Peacock Pheasant and this taxonomic treatment became widely accepted (Johnsgard, 1986, 1999; Cheng, 1987, 1994; Gao and Yang, 1991; del Hoyo et al., 1994; Clements, 2000; Dickinson, 2003); however, some ornithologists still considered the Hainan Peacock Pheasant as a full species (Sibley and Monroe, 1990; Monroe and Sibley 1993; Mackinnon and Phillipps, 1999; Madge et al., 2002; Zheng, 2002, 2005), since taxonomy plays a key role in species conservation (Mace, 2004).

More recently, molecular markers, including the complete mitochondrial cytochrome *b* gene and intron *G* of the nuclear ovomucoid gene, were used to re-evaluate the taxonomy of the Hainan Peacock Pheasant. The results showed phylogeographic monophyly and large genetic distance between the Hainan Peacock Pheasant and the Grey Peacock Pheasant, with sequence differences corroborating the species-level distinction between the two peacock pheasants, which were inferred to have diverged about 1.4 ± 0.3 million years ago, and thus suggested the Hainan Peacock Pheasant should be considered as a full species (Chang et al., 2008).

The morphological data also indicate that the Hainan Peacock Pheasant (male: 511.7 ± 24.7 mm in body length, n = 5; female: 376.3 ± 45.2 mm in body length, n = 3) is distinct from the Grey Peacock Pheasant (male: 665.5 ± 3.5 mm in body length, n = 2; female: 515.7 ± 51.0 mm in body length, n = 3) (Delacour, 1977; Yang et al., 1995; Madge et al., 2002; see also Chang et al., 2008). In addition, the crest of the Hainan Peacock Pheasant is obviously shorter than that of the Grey Peacock Pheasant. Differences also exist in the color of ocelli, with those of the mantle and wings blue and green, and the tail ocelli have a complete grayish-buff border and a diameter of no more than 15 mm (Cheng, 2002) (Fig. 1, also see www.cnbird.org.cn with the Grey Peacock Pheasant for comparison).

The taxonomic uncertainty of the Hainan Peacock Pheasant is highly relevant to its conservation status. Among the taxa of *Polyplectron* spp., Hainan Peacock Pheasant is the smallest among allied species of somber forest peacock pheasants. Considering its limited distribution and small population size, as a full species, it has now been recognized as "Endangered" by the IUCN Red List (IUCN, 2011) to prevent loss of this island endemic.

Distribution and population

The Hainan Peacock Pheasant was once widely distributed in tropical rainforest over most of Hainan Island, espe-

Fig. 1 The male Hainan Peacock Pheasant (photo by Qing CHENG)

cially the central and southwestern mountains (Guangdong Institute of Entomology et al., 1983; Gao, 1998). As a result of habitat loss (Lin and Zhang, 2001) and illegal hunting, both the range and population have decreased drastically since the 1950s (Zheng and Wang, 1998), and the extant population of the Hainan Peacock Pheasant has become fragmented into small, partially isolated populations (Table 1 and Fig. 2).

The population density of the Hainan Peacock Pheasant in Bawangling National Nature Reserve (NNR) was provisionally estimated at 3.75 birds per km^2 in 1992 and 3.74 birds per km^2 in 1993 (Gao, 1998). Based on an estimated population of 2700 individuals in 1990s (Gao and Yu, 1990), and assuming the population has declined at 50–79% over the past 15 years (three generations), the population is best placed in the band 250–999 individuals (Chang et al. 2008). However, further surveys are urgently required to assess the population size throughout the entire island.

Table 1 Distribution sites of the Hainan Peacock Pheasant in Hainan Island, China

Number in Fig. 2	Site	Protected status [a]	Reference [b]
1	Jianfengling	NNR	2, 3
2	Houmiling	PNR	1, 2, 3
3	Jiaxi	PNR	3
4	Bawangling	NNR	1, 2, 3
5	Yinggeling	PNR	3
6	Limushan	PNR	2, 3
7	Panjia	PNR	3
8	Nanweiling		1, 2, 3
9	Huishan	PNR	3
10	Baimaling		3
11	Diaoluoshan	NNR	1, 2, 3
12	Wuzhishan	NNR	2, 3
13	Kafaling		3
14	Maorui		3
15	Baolong		3
16	Ganshiling	PNR	3
17	Baomei	PNR	3
18 [c]	Xinglong		1

[a] NNR, national nature reserve; PNR, provincial nature reserve.
[b] 1, Guangdong Institute of Entomology et al. (1983); 2, Gao (1998); 3, field surveys confirmed by the present study.
[c] Historical distribution site recorded by Guangdong Institute of Entomology et al. (1983).

Habitat and home range

The Hainan Peacock Pheasant inhabits only natural tropical forests, e.g. primary and secondary forests in the mountainous regions with 200–1300 m in elevation, and within its habitat, dominant trees include *Homalium hainanense*, *Podocarpus imbricatus*, *Vatica mangachapoi*, *Dacry diumpier* and *Syzygium araiocladum*. No peacock pheasants were found in plantations, including rubber tree (*Hevea brasiliensis*), eucalypt (*Eucalyptus* spp.) and areca (*Areca catechu*), though these plantations seemed to be in "good" condition with dense forest cover. In Bawangling NNR, habitat features, such as density and coverage of shrub, distance to water, grass abundance and human disturbance, were among main factors influencing habitat use of the Hainan Peacock Pheasant (Li, 2005).

Radio-tracking data showed that the home range of the Hainan Peacock Pheasant was much small and relatively fixed (male: 2.95 ha, with a range of 2.32–8.59 ha, $n = 3$; female: 2.54 ha, with a range of 1.48–3.4 ha, $n = 1$). Several local hunters also reported that the Hainan Peacock Pheasant was much easy to capture within its fixed foraging sites, and it turned out to be the case further confirmed by us using walk-in traps.

Breeding ecology

The Hainan Peacock Pheasant usually lives solitarily, or in pairs during the breeding season, rather than in groups (more than two birds), and monogamy is suggested as its mating system (Gao and Yang, 1991) but this needs further investigation. The breeding season is from February to June and lasts long enough up to five months, while males mark their territories by loudly crowing with "*guo-guo-guo* …", much different from its alarming call "*ga-ga*". All nests found were on the ground in the forest near the ridge, either at the base of trees, or under the rocks, with a small clutch size of only 1 egg or 2 eggs ($n = 5$) (Table 2). The egg size and mass, incubation periods and reproductive success remain unknown, but low fecundity together with high predation is suggested in this rare tropical pheasant.

Threats and conservation

Deforestation and replacement with exotic tree species such as *Acacia mangium*, and *Eucalyptus* spp. occurred in some forest areas (Fig. 3) and these are important threats to the Hainan Peacock Pheasant and other forest birds, e.g., Hainan Partridge (*Arborophila ardens*), even though

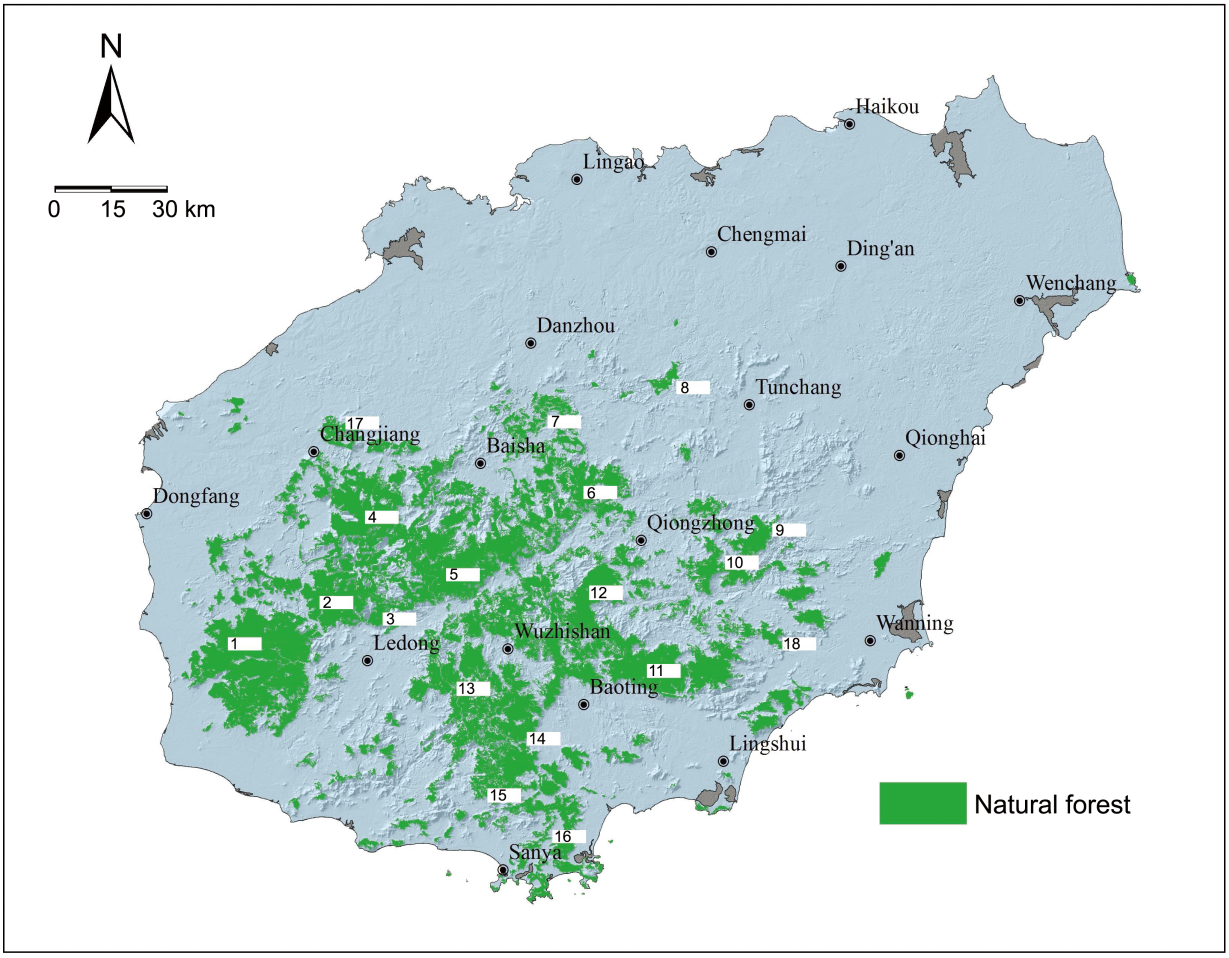

Fig. 2 Locations of the Hainan Peacock Pheasant found in Hainan Island, China

Fig. 3 Replacement with exotic tree specie (*Acacia mangium*) in Yinggeling natural forest, Hainan Island, China (Photo by Canchao YANG)

few local people could benefit from these activities (Liang et al., 2005).

Illegal hunting of birds is found in most surveyed areas, and is carried out mainly for sale in markets, rather than by local people for their own consumption (Liang et al., 2005). From December 1987 to August 1988, more than 30 hunted peacock pheasants were found in Bawangling, Nanweiling, Limushan and Diaoluoshan areas (Gao and Yang, 1991). Among 17 current distribution sites of the Hainan Peacock Pheasant (Table 1), and during a survey period of 2002–2006, at least one hunted peacock pheasant was found at 10 sites (58.8%), including three national nature reserves and five provincial nature reserves, suggesting that almost none of these reserves was secure from illegal hunting or trapping. However, illegal hunting was much more common in forest areas outside the nature reserves, e.g. Nanweiling (Liang, unpublished data) and

Table 2 Nests of the Hainan Peacock Pheasant

	Nest No.					
	1	2	3	4	5	6
Date		June 11, 1988	Feb 23, 2001	Feb 27, 2001	April 2003	April 26, 2000
Location	Xinglong	Bawangling	Bawangling	Bawangling	Bawangling	Bawangling
Nest site	Forest, ground	Forest, ground	Forest, ground	Forest, ground	Forest, ground	Forest, ground
Elevation (m)	200	950	1025	1025		1030
Nest material	Dead leaves and grass	Dead leaves	Dead leaves	Dead leaves	Dead leaves	Dead leaves
Nest size (cm)		15 × 15 × 3	23 × 20 × 3	19 × 18 × 7		
Clutch size	1	2	2	1	2	
Egg color		Pure white	Pure white	Pure white	Pure white	
Nest fate	Collected	Collected	2 nestlings	Predated		1 nestling
Reference	Guangdong Institute of Entomology et al. (1983)	Gao and Yang (1991)	This study	This study	This study	This study

Baimaling (Nanmao) (Gong et al., 2006; Liang, Cai and Yang, unpublished data), whilst egrets and swallows were well protected in most areas of Hainan (Liang et al., 2006; Zhang et al., 2010). This suggest that local traditional culture should play a key role in conservation (Liang et al., 2010), and should be taken into account for any promising conservation strategies for this threatened species.

The findings that the Hainan Peacock Pheasant was not found in any of the forest plantations, let alone any other man-made habitat, and that hunting for this peacock pheasant was common, indicate indirectly that loss of habitat and hunting must have greatly reduced its numbers, and the population is likely to have declined rapidly. Apparently, conservation status of the Hainan Peacock Pheasant is not so satisfactory, and further surveys are urgently required to assess the population size and habitat requirements of this endangered and rare tropical pheasant throughout the entire island. Also, future investigation should focus on life history traits in relation to its vulnerability.

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References

Chang J, Wang B, Zhang YY, Liu Y, Liang W, Wang JC, Shi HT, Su WB, Zhang ZW. 2008. Molecular evidence for species status of the endangered Hainan Peacock Pheasant. Zool Sci, 25:30–35.

Cheng TH. 1987. A Synopsis of the Avifauna of China. Sciences Press, Beijing.

Cheng TH. 1994. A Complete Checklist of Species and Subspecies of the Chinese Birds. Science Press, Beijing.

Cheng TH. 2002. Systematic Index of Birds in China. Science Press, Beijing.

Cheng TH, Tan YK, Lu TC, Tang CZ, Bao GJ, Li FL. 1978. Fauna Sinica, Aves (Vol. 4): Galliformes. Science Press, Beijing. (in Chinese)

Clements JF. 2000. Birds of the World: A Checklist. 5th edn. Pica Press, Sussex.

Crandall KA, Bininda-Emonds ORP, Mace GM, Wayne RK. 2000. Considering evolutionary processes in conservation biology. Trends Ecol Evol, 17:390-395.

del Hoyo J, Elliott A, Sargatal J. 1994. Handbook of the Birds of the World — New World Vultures to Guineafowl. Vol. 2. Lynx Editions, Barcelona.

Delacour J. 1977. The Pheasants of the World. 2nd edn. World Pheasant Association and Spur Publications, London.

Dickinson EC. 2003. The Howard and Moore Complete Checklist of the Birds of the World. 3rd edn. Christopher Helm, London.

Gao YR. 1998. Conservation status of endemic Galliformes on Hainan Island, China. Bird Conserv Int, 9:411–416.

Gao YR, Yu DQ. 1990. Hainan Peacock Pheasant. Chinese J Zool, 25:42–44. (in Chinese with English abstract)

Gao YR, Yu DQ. 2000. The current situation of endangered pheas-

ants in the Nanweiling forest region of Hainan Province. In: China Ornithological Society, Wild Bird Society of Taipei, China Wildlife Conservation Association (eds) Studies on Chinese Ornithology. China Forestry Publishing House, Beijing. (in Chinese with English abstract)

Gao YR, Yang L. 1991. The Grey Peacock Pheasant (*Polyplectron bicalcaratum*). In: Lu TC, Liu RS, He FQ (eds) The Rare and Endangered Game Birds in China. Fujian Science and Technology Press, Fuzhou. (in Chinese with English abstract)

Gong SP, Wang JC, Shi HT, Song RH, Xu RM. 2006. Illegal trade and conservation of freshwater turtles in Nanmao Village, Hainan Province, China. Oryx, 3:331–336.

Guangdong Institute of Entomology, Biology Department of Sun Yat-sen University. 1983. Birds and Mammals of Hainan Island. Science Press, Beijing. (in Chinese)

IUCN. 2006. The IUCN Red List of threatened species. Switzerland, Gland.

IUCN. 2011. IUCN Red List of threatened species. Version 2011.1. www.iucnredlist.org. Accessed on 25 May 2011.

Johnsgard PA. 1986. The Pheasants of the World. Oxford University Press, Oxford.

Johnsgard PA. 1999. The Pheasants of the World: Biology and Natural history. 2nd edn. Smithsonian Institution Press, Washington, DC.

Li JR. 2005. The home range and habitat use of Hainan Peacock Pheasant. MSc dissertation, Beijing Normal University, Beijing. (in Chinese with English abstract)

Liang W, Wang JC, Su WB, Wang WY, Li SN, Shi HT. 2005. Surveys of the Hainan Partridge *Arborophila ardens* on Hainan Island, China. In: Fuller RA, Browne SJ (eds) Galliformes 2004. Proceedings of the 3rd International Galliformes Symposium. World Pheasant Association, Fordingbridge, UK.

Liang W, Wong LC, Wong JYP. 2006. Ardeid nesting colony survey in Hainan, China. Waterbirds, 29(1):69–75.

Liang W, Wong JYP, Wong LC, Fung CL, Li ZM. 2010. Ardeid nesting colonies in central Guizhou, southwestern China. Chinese Birds, 1(3):198–203.

Lin MZ, Zhang YL. 2001. Dynamic changes of tropical forest in Hainan Island. Geogr Res, 20:703–712. (in Chinese with English abstract)

Mace GM. 2004. The role of taxonomy in species conservation. Phil T Roy Soc B, 359:711–719.

Madge S, McGowan P, Kirwan GM. 2002. Pheasants, Partridges and Grouse. Christopher Helm, London.

Mackinnon J, Phillipps K. 1999. A Field Guide to the Birds of China. Oxford University Press, Oxford.

Monroe BL Jr, Sibley CG. 1993. A World Checklist of Birds. Yale University Press, New Haven, Conn.

Sibley CG, Monroe BL Jr. 1990. Distribution and Taxonomy of Birds of the World. Yale University Press, New Haven, Conn.

Yang L, Wen XJ, Han LX, Yang XJ. 1995. The Avifauna of Yunnan China. Yunnan Science and Technology Press, Kunming. (in Chinese)

Zhang GG, Liang W, Liu DP, Qian FW, Hou YQ, Su WB, Kilburn M, Holmes J, Lee KS. 2010. Species abundance and conservation of coastal wintering waterbirds in Hainan Island, China. Chinese Birds 1(3):204–210.

Zheng GM. 2002. A Checklist on the Classification and Distribution of the Birds of the World. Science Press, Beijing.

Zheng GM. 2005. A Checklist on the Classification and Distribution of the Birds of China. Science Press, Beijing.

Zheng GM, Wang QS. 1998. China Red Data Book of Endangered Animals (Aves). Science Press, Beijing.

海南孔雀雉：一种濒危稀有的热带鸟类

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摘要：海南孔雀雉（*Polyplectron katsumatae*）为我国的特有鸟类，同时也是世界上体型最小的孔雀雉，仅分布于海南岛的热带山地雨林中。最近海南孔雀雉从灰孔雀雉（*P. bicalcaratum*）的亚种中被提升为种，同时被IUCN列为“濒危”等级，是目前我国最濒危的雉类物种之一。本文提供了关于海南孔雀雉的分布、生境、活动区和繁殖生态等方面的最新资料，同时对其保护和今后的研究工作提出了建议。

关键词：海南孔雀雉（*Polyplectron katsumatae*），活动区，窝卵数，保护