RAFFLES BULLETIN OF ZOOLOGY 2008 **56**(2): 453–456
Date of Publication: 31 Aug.2008

VARIABLES AFFECTING HABITAT USE OF HUME'S PHEASANT IN TWO DISTURBED SITES IN NORTHERN THAILAND

Apirat Iamsiri
Joint Graduate School of Energy and Environment, King Mongkut's University of Technology, Thonburi, Bangkok, Thailand 10140
Email: apirat_i@yahoo.com

***ABSTRACT.* –** Hume's Pheasant, *Syrmaticus humiae*, a near threatened species exists in relatively fragmented populations in southern China, north-east India, northern Myanmar, and northern Thailand. Although the species is thought to be threatened by habitat degradation throughout its range, little is know of its habitat preferences particularly in areas where habitat degradation have been introduced. I assessed habitat selection by examining their occurrences in relation to tree and ground vegetation characteristics in relatively disturbed habitat in northern Thailand. Disturbed habitat contained dense but small oaks with a small proportion of pines. The results from a Mann-Whitney U-test suggested that only ground vegetation height and cover of ground leaf litter affect its habitat selection. Therefore, maintaining ground vegetation height to a required level (33.4 cm) is suggested. Distinct characteristics between disturbed and broad-scale habitats were the basal area of pine and size of trees. Conservation strategies for Hume's Pheasant in the study sites may include control of fires in order to promote large-sized trees. Additional pine plantation forest patch is suggested only when the proportion of pine and oak-dominated areas in a home range is further studied. Further studies on nest characteristics and reproductive success between disturbed and undisturbed areas are also needed to monitor possible effects of habitat degradation on the pheasant.

***KEYWORDS.* –** Hume's Pheasant, *Syrmaticus humiae*, disturbed habitat, Thailand.

INTRODUCTION

Hume's Pheasant *Syrmaticus humiae* is classified as a globally "near threatened" species and is only found in very limited areas of China, India, Myanmar, and Thailand (BirdLife International, 2005; Fuller & Garson, 2000). The species tends to inhabit mature pine and oak associated forest with little ground vegetation, and not dense above one metre (Iamsiri et al., 2005). However, these habitat preferences were based on data collected from six sites in Thailand where the degree of hunting and habitat degradation are different in comparison to other areas. Thus, the results were a selection at various quality habitats, later called "broad-scale habitat".

The term habitat quality is often used to describe the availability of food resources, suitable nest sites, and protection from predators (Robinson et al., 1995). Possible threats include hunting, tree cutting, and frequent fires, and are key factors in determining the quality of the habitat and were found to differ among sites based on degree of protection and local participation in conservation activities. For example, only fires were found to be affecting the reproductive success of Hume's Pheasant at Doi Chiang Dao Wildlife Sanctuary, Thailand, while all the other possible threats were observed at Mae Lao-Mae Sae Wildlife Sanctuary and Doi Khun Mae Daet (Iamsiri et al., 2005).

As variation in habitat quality is an important factor affecting habitat selection, an understanding of how the species selects its habitat in both disturbed and undisturbed environments may lead to valuable conservation measures. Data on relatively undisturbed sites, i.e. Doi Inthanon and Doi Suthep-Pui National Parks, are not available due to few observations (see Iamsiri et al. (2005) for more details). I therefore investigated significant variables affecting selection of habitat at the two most disturbed sites, Mae Lao-Mae Sae Wildlife Sanctuary and Doi Khun Mae Daet, Thailand and made a comparison with the broad-scale habitat assessed in Iamsiri et al. (2005).

MATERIALS AND METHODS

***Study areas.* –** Generally the habitat of Hume's Pheasant is described as evergreen hardwood with pine (EG/pine) and deciduous dipterocarp-oak + pine forests following the forest classification system of Maxwell (1998). Mae Lao-Mae Sae Wildlife Sanctuary was designated in 1996 and has an area of 514 km^2. The study area is located at approximately

19°15'N 98°36'E (Fig. 1) and some parts of the region are heavily disturbed by agricultural activities, although they are recovering through plantation. Although the area is under protection, fire and hunting were also observed during this study. The area is located far from management centres and the enforcement was weak. Doi Khun Mae Daet is a community forest that belongs to the Mae Daet Noi Village. The area is closed to human settlements and thus fire, tree-cutting, and hunting were commonly found during the study. It located approximately at 180°59'N 98°23'E (Fig. 1).

Habitat sampling methods at two disturbed sites. **–** A team of three persons conducted surveys in Feb. and Nov.2003, Jan. and Feb.2004, and Mar.2005 by walking trails and roads (from approximately 0800 to 1800) and based on data collected from interviews with local sanctuary staff, bird watchers and villagers.

Locations where the birds were directly observed and where the foraging tracks were verified were referred to as use points. At each site, Mae Lao-Mae Sae Wildlife Sanctuary and Doi Khun Mae Daet, observed locations were plotted on a map. Two outliers were chosen as start points for conducting "non-use points". Ten non-use points were placed at 500 m intervals from each outlier and 50 m perpendicular to existing trails or roads. If the points located in non-forest or suspected foraging signs were observed, they were canceled. However, the habitat at Doi Khun Mae Daet was fragmented and surrounded by human use areas. Five hundred metres is too long a distance and only a few non-use points would be allowed. Therefore, I selected an interval of 200 m instead. Based on field observations (Iamsiri, 2006), 200 m was the average distance of one day traveling for a Hume's Pheasant and 500 m was considered of sufficient distance to separate individual groups, assuming an approximate home range of 0.2 km^2.

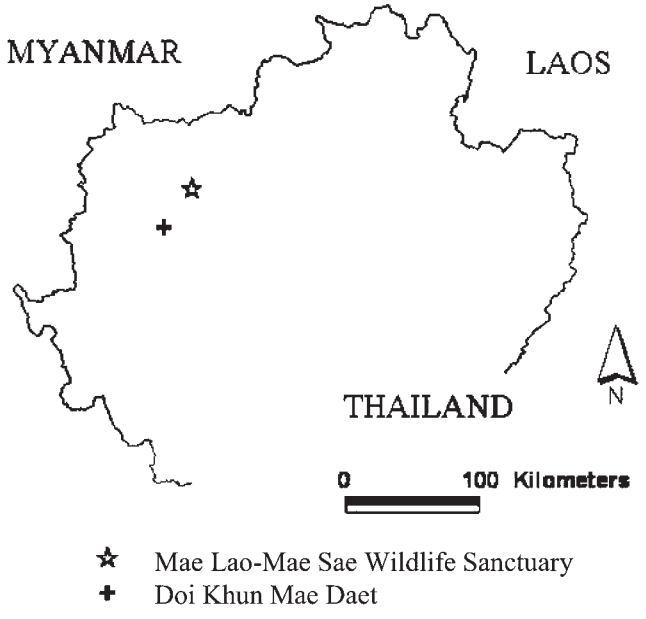

Figure 1. Map showing the locations of Doi Chiang Dao and Mae-Lao Mae-Sae Wildlife Sanctuaries and Doi Khun Mae Daet located in northern Thailand.

Seventeen habitat variables indicating tree and ground vegetation community were collected at use and non-use points (Table 1). Detailed methods of collecting data were described in Iamsiri et al. (2005). Briefly, a 30 m transect centered at the point of observation or selected non-use point was drawn in a north-south direction and used to measure the average value of crown coverage by taking 15 readings at 2 m intervals along the transect line for the presence or absence of leaves. At 10 m intervals along the transect, diametre at breast height (DBH), tree height, basal area of pine, oak, and other trees in which neither pine nor oak were calculated following the point-centered quarter method (Brower et al., 1990). Three of 1 × 1 m plots were placed along the transect for measuring of sapling density, density and diversity of herbaceous plants and grasses, density of ground vegetation at 50, 100, and > 100 cm, ground vegetation height, and ground leaf litter as shown in Table 1.

Habitat data analyses. **–** Differences between use and non-use points collected at Mae Lao-Mae Sae Wildlife Sanctuary and Doi Khun Mae Daet were tested using Mann-Whitney U-test.

RESULTS

Mae Lao-Mae Sae Wildlife Sanctuary. **–** The first observation was in Feb.2003 at a location where a female was often found by local staff of Mae Khun Ya Watershed Management Unit located in the sanctuary. It was found feeding on termites along an unpaved road at an elevation of 1,291 m. The bird was followed for three days and two additional use points (at least 60 m apart from each other) were identified. A four-day survey walk was conducted along walking trails, usually on ridges, in a circular fashion centered on the first recorded location and three use points were recorded.

Another survey was conducted again in Feb.2004 and one additional use point was recorded. By using an area of 250 m radius, or 500 m distance to separate groups of the birds, there were at least three groups of Hume's Pheasant within this study site. The birds were observed between 1,233 and 1,345 m elevation.

Doi Khun Mae Daet. **–** There were two remains (feathers) collected from this area in Nov.2003. Two local hunters who shot the birds were interviewed and a survey walk conducted over three days at the areas where presence of the birds were noted. No birds were observed during the survey. Exact locations where the species had been harvested previously were thus searched and if the tracks appeared to be likely from Hume's, the area nearby, which typically covered a hillside, were surveyed intensively. Nine groups of areas with feeding evidence were recorded from 1,220 to 1,357 m above mean sea level, and could be separated into two groups based on a 500 m distance. One additional group comprised of one male and one female was observed in Mar.2005 close to a stream. Therefore, at least three new localities where the pheasant was present in the forest at Mae Daet Noi village were recorded. There were also unconfirmed records of the pheasant from

Table 1. Description of measured habitat variables of use (n = 16) and non use (n = 29) points at relatively disturbed sites, Mae Lao-Mae Sae Wildlife Sanctuary and Doi Khun Mae Daet.

Descriptions	Measurement Units	Mean (SE)	
		Use points	Non use points
Crown closure	%	73.5 (5.2)	84.4 (3.1)
Average DBH	m	17.0 (1.6)	16.0 (1.1)
Average tree height	m	10.3 (0.6)	10.5 (0.4)
Basal area of pine	m^2/ha	3.4 (1.9)	4.1 (1.8)
Basal area of oak	m^2/ha	15.1 (2.8)	9.9 (2.0)
Total Basal area of trees (neither pine nor oak)	m^2/ha	9.5 (0.9)	12.8 (2.3)
Sapling density	plants/m^2	1.3 (0.2)	1.3 (0.2)
Grass species richness	No.	2.2 (0.1)	2.0 (0.1)
Grass density	plants/m^2	23.4 (3.0)	23.2 (5.5)
Herbaceous plant species richness	No.	6.3 (0.7)	6.4 (0.4)
Herbaceous plant density	plants/m^2	16.1 (2.1)	19.0 (1.7)
Total leave hits at 0–50 cm	No. of hits	11.2 (0.9)	9.1 (1.0)
Total leave hits at 50–100 cm	No. of hits	7.0 (1.1	9.5 (1.1)
Total leave hits above 100–200 cm	No. of hits	6.4 (1.2)	13.0 (1.9)
Average ground vegetation height	cm	33.4 (4.2)	47.9 (2.5)
Cover of ground leaf litter	%	69.8 (3.0)	78.4 (2.4)
Litter depth	cm	3.9 (0.3)	4.4 (0.4)

villagers elsewhere around this village particularly at the Huai Puu and Mae Ta-la Nuea villages.

***Overall habitat description of disturbed habitat.* –** There were 45 sampled points, 16 use and 29 non-use points collected in this study. Mean and standard error of the variables were shown in Table 1. The forest was dominated by oaks (11.7 m^2/ha) and other species (11.6 m^2/ha) with a small proportion of pines (3.8 m^2/ha).

***Habitat selection at disturbed sites.* –** The results of the Mann-Whitney U-test indicate that only ground vegetation height and cover of ground leaf litter were statistically different between use and non-use points in relatively disturbed sites of the Mae Lao-Mae Sae Wildlife Sanctuary and Doi Khun Mae Daet at a 95 % confidence level. The pheasant preferred areas with shorter ground vegetation (Mann-Whitney U-test, P = 0.01) and less leaf litter coverage at this confidence level (Mann-Whitney U-test, P = 0.03, n = 16 use and 29 non-use points).

***Review of broad-scale habitat preferences*:** Based on all available records of Hume's Pheasant in Thailand, Iamsiri et al. (2005) concluded that the species preferred areas with denser pines (basal area = 11.8 m^2/ha) and larger trees (DBH = 21.6 cm, Height = 12.7 m) and avoided areas with a dense shrub layer above 1 m. Average height of ground vegetation was found lower at the use habitat (41.6 cm).

DISCUSSION

Pinus kesiya is a dominant species found within the habitat (Iamsiri et al., 2005), and is a large size tree occurring along the ridge tops make it easy for logging and valuable for construction purposes. Thus, distinct characteristics between the study sites and the broad-scale habitat assessed by Iamsiri et al. (2005) were basal areas of pines (3.8 versus 11.8 m^2/ha) and average DBH (16.1 versus 21.6 cm) and height of trees (10.4 versus 12.7 m). The disturbed habitat corresponds to broadleaf forests containing non-pine medium tree sizes, which were considered as being used for roosting in China (Ai-wu et al., 2006).

Only the average height of ground vegetation and cover of ground leaf litter were variables determining occupation of the pheasant in disturbed areas. No significant differences were found between tree community in use and non-use points. For example, DBH (Mann-Whitney U-test, P = 0.55), tree height (Mann-Whitney U-test, P = 0.73) and basal area of pines (Mann-Whitney U-test, P = 0.98). Thus, tree community did not appear to be a factor affecting habitat selection for the birds in a disturbed habitat. This is in contrast with the broad-scale study since tree community appeared to be the main factor in habitat selection (Iamsiri et al., 2005). Because tree height, DBH, and basal area of pines of the use habitat in the broad-scale study were much higher than those found in this study, disturbed habitats could be considered as having small and immature trees with sparse or few pines. Acorns from oaks are the important food source for the pheasant (Iamsiri et al., 2005) but young and small oaks may not provide a valuable food resource. Pine dominated area provides important foraging substrate for insectivorous birds (Payne & Bryant, 1994) but sparse pine forest patch may not support that environment.

Average ground vegetation height was also found significant for the pheasant in the broad-scale habitat selection assessed

by Iamsiri et al. (2005), as shorter ground vegetation allows them to detect predators at long distances and reduce predation risks. Cover of ground leaf litter is an additional variable found in this study. Areas with a medium cover of ground leaf litter (69.8 %) were related to their diets and/or foraging behaviors. For example this habitat provided a richer source of food such as plant materials and insects, while dense ground leaf litter could obstruct their feeding ability as no birds were reported to use their legs for scratching (Iamsiri, 2006).

Tree community, particularly pine, appeared to influence the habitat selection when it was mature and undisturbed as shown in the broad-scale habitat study. Although little of this habitat type remains in the study areas which were disturbed habitat, a number of birds were still present. This indicates that the bird can persist under disturbed habitat. However, density of the birds in these disturbed areas needs to be estimated to understand how well it can tolerate habitat disturbances.

Conservation strategies for Hume's Pheasant in disturbed sites may include control of fires in order to promote large-sized trees and maintenance of the ground vegetation height to the required level (33.4 cm). Additional pine plantation patches might be needed, but the proportion of pine and oak-dominated areas in a home range is unclear and thus a further study of the habitat components is needed before making a conclusion. More studies on nest characteristics and reproductive success between disturbed and undisturbed areas are also needed to monitor possible effects of habitat degradation on the pheasant.

ACKNOWLEDGEMENTS

I am grateful to my supervisor, George Gale, for his encouragement and continuous supports of my study. Financial support was provided by the Thailand Research Fund through the Royal Golden Jubilee Ph.D. Program (Grant No. PHD /0052 /2546) to the author and the National Energy Policy Office through the Joint Graduate School of Energy and Environment, King Mongkut's University of Technology Thonburi. I thank the Royal Forestry Department for permission to carry out research work.

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