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Determinant factors of the Javan green peafowl (*Pavo muticus muticus* Linnaeus, 1758) habitat in Baluran and Alas Purwo National Parks, East Java, Indonesia

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Abstract. *Hernowo JB. 2017. Determinant factors of the Javan green peafowl* (*Pavo muticus* muticus) *Linnaeus 1758 habitat in Baluran and Alas Purwo National Parks, East Java, Indonesia. Trop Drylands 1: 50-56.* There is limited understanding of the factors determining the habitat variables preferred by the Javan green peafowl (*Pavo muticus muticus* Linnaeus, 1758). Baluran National Park (BNP) and Alas Purwo National Park (APNP) in East Java, Indonesia are habitats of the natural distribution of the Javan green peafowl population. While they occur on various types of habitat (e.g. savanna, beach forest, and monsoon forest in BNP; and grazing area and intercropping teak plantations in APNP), it is not clear what environmental factors affecting their abundance. This research aimed to investigate the determinant factors of Javan green peafowl habitat in correlation with food, water, roosting, shelter, and nesting site. The Principal Component Analysis (PCA) was used to analyze determinant factors of habitat components. The results showed that the determinant factors of the Javan green peafowl habitat in BNP were the density of shelter, the density of food, the number of roost trees and the height of roost trees. Meanwhile, in APNP, the determinant habitat factors were the number of roost trees, the height of roost trees, and the number of continuously available water. The findings of this study highlight the importance of preserving and maintaining the discriminant components of the habitat of the Javan green peafowl in BNP and APNP.

Keywords: Alas Puwo, Baluran, determinant, food, green peafowl, nesting, roosting

INTRODUCTION

The Javan green peafowl (*Pavo muticus muticus* Linnaeus, 1758) is an avifauna native to Southeast Asia. It is listed as Endangered in IUCN Red List due to habitat loss and fragmentation. In general, the peafowl selects particular habitat for feeding sites, sheltering, roosting and nesting site (Hernowo 1995). This Javan green peafowl birds prefer open areas with grasses and shrubs as feeding sites, particular trees as the roosting site, and they also shelter at shaded places close to the feeding site (Hernowo 1995, Hernowo 1999, Hernowo and Hernawan 2003, Hernowo and Wasono 2006, Hernowo 2011).

Determinant factors of the habitat types on the presence of the Javan green peafowl are not clearly understood. Meanwhile, knowledge about the suitable habitat of Javan green peafowl's habitat is vital for the conservation of the bird. Anecdotal evidence indicates that the habitat types are chosen by Javan green peafowl in Baluran National Park (BNP) in East Java, Indonesia include savanna, beach forest, and monsoon forest, but those in the nearby Alas Purwo National Park (APNP) are lowland tropical rain forest, grassland and teak plantation in an intercropping system. The suitability of the habitat is related to the population density of the birds in each habitat type. Hernowo (1997) provided an example in BNP that the green peafowl were more abundant at habitat type of savanna-monsoon forest as compared to other habitats. Meanwhile in APNP, habitat types of Sadengan grassland and intercropping of teak plantations were more preferred than other habitat types (Hernowo and Wasono 2006, Yuniar 2007, Hernowo 2011).

Very few studies on Javan green peafowl habitat have been done particularly regarding the influencing factors of habitat component that might affect peafowl population health. The present research aimed to investigate the determinant factors of Javan green peafowl habitat which have correlation with food, water, roosting, shelter, and nesting site. Those factors are important to be analyzed to determine their impact on habitat type selection.

MATERIALS AND METHODS

Study site

Baluran National Park

Baluran National Park (BNP) is located at the tip of northeastern part of Java Island ($7^0$29`10" - $7^0$55`55" latitude South and $114^0$29`10" - $114^0$39`10" longitude East), covers an area of about 25,000 ha. The national park is bordered by Madura Strait to the north and Bali Strait to the east. The southern west of the park was bordered with Bajulmati and Klokoran Rivers (Hernowo 1995).

The geological situation of BNP is described as part of a small volcano with Plio-Pleistocene deposits. Baluran Mountain is 1247 meters above sea level (m asl) high, close to the center of the national park. Most of the area in the national park is flat (0 - 10 m), except those close to

Baluran Mountain, Priok Mountain, Montor Mountain, and Glengseran Mountain, which are mostly hilly areas. The two major soil types in BNP are volcanic and marine origins. The most important component is volcanic soils that are rich in minerals but poor in organic materials. The soils are high in soil chemical fertility but low in soil physical fertility because of high soil porosity and low soil water holding capacity. Black soil covers about half of the lowland including most of the monsoon forest and savanna grassland (Hernowo 1995).

Baluran has a typical monsoon climate type with a long dry season. This climate type is heavily influenced by the southeast wind during April to October, with less precipitation. The dry period lasts about 7-8 months of the year. The annual precipitation ranges from 900 to 1600 mm. Due to the long dry period, water is the most limiting factor in BNP. The local distribution of wild animals is influenced by water availability. During the dry season, animals can easily be observed near the water hole, but in the rainy season, they spread everywhere (Hernowo 1995).

The vegetation types that have developed in BNP include savanna grassland, beach forest, mangrove, deciduous forest or monsoon forest, evergreen forest, swampy area and sub-mountain forest. Mangrove occurs at Bilik, Lempuyangan, Mesigit, Tanjung Sedano and Kelor. Typical vegetation at mangroves is *Avicennia alba, Sonneratia caseolaris, Ceriops tagal, Rhizophora apiculata, Bruguiera gymnorrhiza,* and *Luminitzera racemosa*. Beach forest presents between Pandean and Tanjung Candibang and in some places, such as Labuan Merak and also east of Gatal. This type of forest is dominated by *Barringtonia racemosa, Terminalia catappa, Pandanus tectorius,* and *Hibiscus tiliaceus*. The savanna grassland with fire-climax vegetation is strongly influenced by human intervention. The dominant tree species in that area are *Acacia nilotica* (an introduced African exotic species), a few *Acacia leucophloea, Schleichera oleosa, Zizyphus rotundifolia* and *Corypha utan*. Dominant grass species are *Dichantium coricosum, Brachiaria mutica,* and *Sorgum nitidus*. Monsoon forest is characterized by dominant tree species of *Tamarindus indica, Schoutenia ovata, Grewia eriocarpa, Flacortia indica, Cordia obliqua, Azadirachta indica,* and *Sterculia foetida*. Mountain forests and evergreen forests consist of trees species including *Mallotus philippensis, Homalium foetidum, Emblica officinalis,* and *Aleurites moluccana* (Hernowo 1995).

Wild animals existing in BNP that have relation with green peafowl are leopard (*Panthera pardus*), civet (*Viverra malacensis, Paradoxurus hermaphroditus*), mongoose (*Herpestes javanica*), red dog (*Cuon alpinus*), piton (*Phyton reticulatus*), monitor (*Varanus salvator)* and serpent eagle (*Spilornis cheela*) (Hernowo 1995).

Alas Purwo National Park

Alas Purwo National Park (APNP) covers an area of about 43,420 ha. The national park is located at the tip of southeastern Java Island ($8^0$26`45" - $8^0$47`00" latitude South and $114^0$20`16" - $114^0$36`00" longitude East). The eastern part of the national park is bordered by Bali Strait and the south and west parts are bordered by the Indian Ocean. An intensive study was focused on Sadengan grazing area, lowland tropical forest and teak forest plantation of Rowobendo. Topography at the national park consists of flat area (0 – 8% slope) of about 10,554 ha, undulating area with the slope of 8 – 15% around 19,474 ha, meanwhile rolling part (15 – 25% slope) around 11,901 ha and a small portion of mountainous areas about 2301 ha. There are four types of soil in study area, i.e. Mediterranean red litosol complex about 2106 ha, gray regosol 6238 ha, gray grumusol about 379 ha and alluvial hydromorph at around 34,697 ha. Numerous small streams flow at AP National Park with a radial flowing pattern. All of the rivers flow into the Indian Ocean. Several underground rivers occur at karst complex such as Pancur River (Hernowo et al. 2011).

According to Smith and Ferguson climate classification, the study area was classified as B climate type with annual precipitation ranging from 1079 to 1554 mm per year and 79 - 112 rainfall days. The mean annual temperature is around 27.1 ˚C, and relative humidity is about 85% (Hernowo et al. 2011).

Five types of vegetation have developed in Alas Purwo national park, i.e. beach forest, mangrove, lowland tropical forest, bamboo forest, and teak plantation. Beside those vegetation types, human-made grazing area occurs at Sadengan. Beach forest occurs at the southern park from Grajagan to Plengkung about 30 km and Plengkung to Tanjung Slakah around 50 km. The beach forest is also found in about 40 km at the northern park. The dominant species at the beach forest are ketapang (*Terminalia catappa*), waru (*Hibiscus tiliaceus*), keben (*Barringtonia asiatica*) and nyamplung (*Calophyllum inophyllum*). Mangrove is existing at Grajagan with species of vegetation such as bakau (*Rhizophora* spp), tanjang (*Bruguiera* spp), api-api (*Avicennia* sp), pedada (*Sonneratia caseolaris*) and nyirih (*Xylocarpus granatum*). Tropical lowland forest has a big portion at the park. The vegetations that exist in those forests are *Ficus* spp, bendo (*Artocarpus elastica*), rao (*Dracontomelon mangiferum*), pule (*Alstonia* spp), santen (*Lannea grandis*), gintungan (*Bischovia javanica*), and pohpohan (*Buchanania arborescens).* Vegetation types found in a drier condition in the forest are kepuh (*Sterculia foetida*), asam (*Tamarindus indica*), and randu alas (*Bombax valetoni*). Besides, bamboo formation and consociation of sawo kecik (*Manilkara kauki*) also occur in the park (Hernowo et al. 2011).

Several wild animals existing at APNP that might have relation to green peafowl are leopard (*Panthera pardus*), wild boar (*Sus scrofa*) civet (*Paradoxurus hermaphroditus*), mongoose (*Herpestes javanica*), red dog (*Cuon alpinus*), piton (*Phyton reticulatus*), monitor (*Varanus salvator),* serpent eagle (*Spilornis cheela*) and white-bellied sea eagle (*Haliaeetus leucogaster*) (Hernowo et al. 2011).

Figure 1. Map of study site in A) Baluran National Park (BNP); and B) Alas Purwo National Park (APNP), East Java, Indonesia.

Methods

This research was conducted at Baluran and Alas Purwo National Parks from June to October 2006 and August to December 2007. The study was focused on the local distribution of Javan green peafowl at Bekol resort (savanna, beach forest, and monsoon forest) in Baluran National Park (BNP) and at Rowobendo resort (Sadengan grazing area, intercropping area teak plantation) in Alas Purwo National Park (APNP).

The determinant habitat components that have an influence on the presence of the javan green peafowl at certain habitat types were analyzed using PCA (Principal Component Analysis) method (Rencher 2002) as follow:

Y_j = Principle component of-j (j = 1, 2,....n)
$X_{1,2,3,...,n}$ = Variable of habitat component 1,2,3,...,n
a_{1j}, a_{2j}, a_{3j}, a_{nj} = Eigen vector variable of, 1,2,3,…,n with priciple component of j

Where,
Y = Individual number of the green peafowl at each habitat type
X_1 = Number of food species
X_2 = Density of food
X_3 = Number of roost trees
X_4 = Height of roost trees
X_5 = Number of continuously water
X_6 = Size of dancing area
X_7 = Density of shelter
X_8 = Density of cover

The PCA model was tested by Kaiser-Meyer-Olkim (KMO) test and Bartlett test. The Kaiser-Meyer-Olkim (KMO) test was used to measure the adequacy and Bartlett test was used to know the sphericity of the variables with a significant correlation. If the value analysis of KMO is > 0.5, then the model is feasible to be continued.

Anti-Image Matric used with the criteria are as mentioned below: (i) MSA (Measure Sampling Adequacy) = 1, the variable can be predicted with zero mistakes, (ii) MSA (Measure Sampling Adequacy) > 05, the variable can be predicted and the analysis is continued, (iii) MSA (Measure Sampling Adequacy) < 0.5, the variable cannot be predicted and the analysis is not continued.

Commonalities are processes to show how much variance can be explained by formed factors with multiple squares of the correlation value.

Total Variance Explained is demonstrated by variance value which is also known as the eigenvalue. Eigenvalue is composed of the biggest value to the smallest, and the value used if it is > 1.

Component Matric is a table composed of loading factors (Correlation Value) between analysis variable with factors dominant that has been formed.

RESULTS AND DISCUSSION

Influence of habitat type on the abundance of Javan green peafowl

Results of the analysis of variance revealed that the effect of habitat types on the abundance of the bird was significant (F = 68.74, P<0.01) in BNP. Duncan`s Multiple Range Test showed that the bird's abundance differed among habitat types as shown in Table 1. The difference was caused by the availability of feeding sites, nesting sites, roosting sites, and water resources (Hernowo 1999). In Baluran National Park, the javan green peafowl was more abundant in Savanna Bekol (Pattaratuma 1977; Mulyana 1988; Winarto 1993; Hernowo 1995; Hernowo 1999; Yuniar 2007; Risnawati 2008; Hernowo et al. 2011).

Table 1. Variance analysis of Javan green peafowl abundance at several habitat types in Baluran National Park, East Java, Indonesia

Habitat types	Mean abundance
Savanna Bekol	47.20[a]
Beach Forest Bama-Manting	7.65[b]
Monsoon Forest Bekol	7.80[b]
Evergreen-Monsoon Forest Bekol	7.25[b]

Note: Means within the same column with the same letter (s) are not significantly different at 0.05 DMRT.

Table 2. Variance analysis of Javan green peafowl abundance at several habitat types in Alas Purwo National Park, East Java, Indonesia

Habitat types	Mean abundance
Grazing area with Lowland TRF, Sadengan	27.85[b]
Teak Plantation & Intercropping, Gunting	36.90[a]
Mix Plantation & Intercropping, Rowobendo	8.55[c]
Teak Plantation, Sumber Gedang	2.50[d]
Teak Plantation, Ngagelan	2.35[d]

Note: Means within the same column with the same letter (s) are not significantly different at 0.05 DMRT

As with BNP, variance analysis results also demonstrated a significant effect of habitat type (F= 163.55, P< 0.01) on the abundance of green peafowl in APNP. Similarly, Duncan's Multiple Range Test showed a significant difference in the birds' mean abundance among the habitat types as shown in Table 2.

The Duncans' post hoc test showed that the abundance of the Javan green peafowl differed by habitat type in Alas Purwo National Park. The Javan green peafowl was distributed in a higher number in Sadengan grazing area with a lowland tropical forest (TRF) as compared to other habitat types. A plausible explanation for this is that the Sadengan grazing area with lowland tropical forest provided more availability of food resources, sheltering site, roosting site, and cover site (Supratman 1998; Hernowo and Wasono 2006; Yuniar 2007; Risnawati 2008; Hernowo et al. 2011).

Analysis of determinant factors of habitat component in Baluran National Park (BNP)

Analysis of variance of habitat component variables was done for several habitat types in Baluran National Park (BNP). The analysis result showed that eight variables of habitat component could be grouped into two principal components with represent value of 61.50% (Table 3).

Based on values of loading factors, the first principal component consisted of the density of shelter (x_7), and the second principal component consisted of the density of food (x_2), the number of roost trees (x_3), and the height of roost trees (x_4). The determinant factors of Javan green peafowl habitat in Baluran National Park were the density of shelter (x_7), density of food (x_2), the number of roost trees (x_3), and the height of roost trees (x_4) (Table 4 and Figure 3).

The result of PCA analysis above suggests that there were two principal components of the determinant factor that influenced the individual abundance of Javan green peafowl. The first principal component of habitat determinant factor was the density of shelter site and the second principal components were the density of food, number of roost trees and high of roost trees. During hot days, the Javan green peafowl is sheltering under a lush tree at Savanna Bekol (Pattaratuma 1977; Mulyana 1988; Winarto 1993; Hernowo 1995; Hernowo 1999; Yuniar 2007; Risnawati 2008; Hernowo et al. 2011). The density of shelter sites in BNP is critical during the dry season. In the dry season, most of the area in BNP becomes harsh, and the Javan green peafowl is usually sheltering from 9.30 a.m – 14.00 p.m as they need the availability and density of the housing site (Hernowo 1995; Hernowo 1999).

The density of food in savanna Bekol is high in forms of grasses and shrubs species (Pattaratuma 1977; Mulyana 1988; Winarto 1993; Hernowo 1995; Hernowo 1999; Yuniar 2007; Risnawati 2008; Septania 2009; Hernowo et al. 2011). Leaves and fruits or seeds of grasses and shrubs are the main diet for green peafowl. There were 19 species of grasses and 16 shrubs recorded to be eaten by green peafowl in BNP. The green peafowl feeds on leaves, flower, and seeds of the grasses and shrubs. The Javan green peafowl feeds on quite broad range of species of grasses and shrubs (Rini 2005). The Javan green peafowl also belongs to polyphagous species, meaning that this bird feeds on a quite wide range of kinds of food (Septania 2009). The green peafowl sleep on the tree (Pattaratuma 1977; Mulyana 1988; Ponsena 1988; Hernowo 1995). According to Hernowo (1999), the trees selected by the Javan green peafowl as roost site at BNP were 12 – 20 m high, and the preferred roost trees were Pilang (*Acacia leucophloea*) and dead Gebang (*Corypha utan*) (Figure 2).

Analysis of determinant factors of habitat component in Alas Purwo National Park (APNP)

Analysis of component variables at several habitat types in Alas Purwo National Park (APNP) showed that eight variables habitat components could be grouped into three principal components, representing a value of 62.30% proportion (Table 5).

Based on the eight habitat component variables we analyzed, three principal components became the determinant factors. The first principal component was the number of roost trees (x_3) and the second principal component was the height of roost trees (x_4). The third principal component was the number of continuous water (x_5). The determinant factors of Javan green peafowl habitat in Alas Puwo National Park were the number of roost trees (x_3), the height of roost tree (x_4), and the number of continuous water (x_5) (Table 6).

Table 3. Eigen factors analysis of several habitat types of the Javan green peafowl in Baluran National Park, East Java, Indonesia year 2006 and 2007

Habitat Component Variables*	Eigen Vector		
	Total	**% Proportion**	**% Cumulative**
X_1	**2.0062**	0.251	0.251
X_2	**1.7171**	0.215	0.465
X_3	**1.1999**	0.150	0.615
X_4	0.9732	0.122	0.737
X_5	0.7996	0.1000	0.8370
X_6	0.6044	0.0760	0.9130
X_7	0.4396	0.0550	0.9670
X_8	0.2601	0.0330	1.0000

Note: Number of food species (x_1), Density of food (x_2), Number of roost tree (x_3), Height of roost tree (x_4), Number of continuous water (x_5), Size of dancing area (x_6), Density of shelter site (x_7), Density of cover site (x_8).

Table 4. Loadings factors of principles component at several habitat types of the Javan green peafowl in Baluran National Park, East Java, Indonesia year 2006 and 2007

Habitat Component Variables	Value of Principles Component	
	1	**2**
Number of food species (x_1)	0.391	-0.086
Density of food (x_2)	0.472	**0.540**
Number of roost trees (x_3)	0.094	**0.506**
Height of roost trees (x_4)	0.140	**-0.578**
Number of continuous water (x_5)	0.396	-0.126
Size of dancing area (x_6)	0.141	0.177
Density of shelter sites (x_7)	**0.632**	-0.252
Density of cover sites (x_8)	-0.138	0.026

Table 5. Eigen factors analysis at several habitat types of the green peafowl in Alas Purwo National Park, East Java, Indonesia year 2006 and 2007

Habitat Component Variable*	Eigen Vector		
	Total	**% Proportion**	**% Cumulative**
X_1	**2.1724**	0.272	0.272
X_2	**1.6374**	0.205	0.476
X_3	**1.1766**	0.147	0.623
X_4	0.8920	0.111	0.735
X_5	0.7357	0.0920	0.8270
X_6	0.6307	0.0790	0.9060
X_7	0.4248	0.0530	0.9590
X_8	0.3304	0.0410	1.0000

Note: Number of food species (x_1), Density of food (x_2), Number of roost tree (x_3), Height of roost tree (x_4), Number of continuous water (x_5), Large of dancing area (x_6), Density of shelter site (x_7), Density of cover site (x_8).

A **B**

Figure 2. A) Female Javan green peafowls are roosting at dead gebang; B) Female Javan green peafowls are feeding at Savanna Bekol in Baluran National Park, East Java, Indonesia

A **B**

Figure 3. A) Male of java green peafowl is roosting at teak; B) Male bird is drinking on puddle filled up with water

Table 6. Determinant factors of principles component at several habitat types of the Javan green peafowl in Alas Purwo National Park, East Java, Indonesia year 2006 and 2007

Habitat Principles Component	Value of Principles Component		
	1	**2**	**3**
Number of food species (x_1)	-0.398	0.487	-0.086
Density of food (x_2)	-0.401	0.347	-0.352
Number of roost trees (x_3)	**-0.547**	-0.185	-0.149
High of roost trees (x_4)	-0.056	**-0.572**	-0.024
Number of continuous water (x_5)	0.075	-0.255	**-0.710**
Large dancing area (x_6)	0.342	0.336	-0.389
Density of shelter site (x_7)	-0.333	-0.321	-0.217
Density of cover site (x_8)	-0.381	0.008	0.379

In APNP, water was continuously available at Sadengan grazing area because the water was flowing from water resources of Basori cave. This finding is similar to other studies that found the number of green peafowl in Dak Lak Province, Vietnam was more abundant when closed to the river bank (Brickle 2002). Ponsena (1988) also stated that the individual number of green peafowl at Huai Kang Khaeng Wildlife Sanctuary was more abundant in the riparian area.

In Sadengan grazing area of APNP, Apak was mostly preferred by the Javan green peafowl as a roosting site (Supratman 1998; Hernowo and Wasono 2006; Yuniar 2006; Risnawati 2008). Subramanian and John (2001) reported that the Indian blue peafowl (*Pavo cristatus*) at

Reserve forest of Deer Park, Tirunevelvi Tamil Nadu preferred roosting on tamarind (*Tamarindus indicus*), vagai (*Albizia lebbeck*), neem (*Azadirachta indica*), usilai (*Albizia amara*), and palmyra (*Borassus flabellifer*) and also less frequently on manjanathi (*Morinda tenctoria*) and velvelam (*Acacia leucophloea*). At Vivekananda Kendra, the bird primarily preferred roosting on coconut palm (*Cocos nucifera*), while tamarind, neem, manggo (*Mangifera indica*), and umbrella thorn (*Acacia planifrons*) were the second choice. Even telecommunication pylons are used as a roosting site. Pilang (*Acacia leucophloea*) and dead Gebang (*Corypha utan*) as the preferred roost trees were sporadically distributed and low in density, especially those with height above 12 m.

Based on the results of this study, we concluded that the determinant factors of the Javan green peafowl habitat in Baluran National Park were the density of shelter, the density of food, the number of roost trees and height of roost trees. Meanwhile, in Alas Purwo national park, the determinant habitat factors were the number of roost trees, the height of roost trees, and the number of continuous water.

REFERENCES

Brickle NW. 2002. Habitat use, predicted distribution and conservation of green peafowl (*Pavo muticus*) in Dak Lak Province, Vietnam. Biol Conserv J 105: 189-197. DOI: 10.1016/S0006-3207(01)00182-3

Hernowo JB and Wasono WT. 2006. The population and habitat of green peafowl (*Pavo muticus* Linnaeus 1766) at Alas Purwo National Park, East Java. Media Konservasi 9 (3): 83-88. DOI: 10.29244/medkon.11.3.%25p

Hernowo JB, Alikodra HS, Kusmana C, Mardiastuti A. 2011. Population analysis of Javan green peafowl (*Pavo muticus muticus* Linnaeus 1758) in Baluran and Alas Purwo national park, East Java. Biodiversitas 12: 99-106. DOI: 10.13057/biodiv/d120207

Hernowo JB, Hernawan E. 2003. Population and habitat study of Javan green peafowl (*Pavo muticus muticus* Linnaeus 1758) at Ciawitali teak forest plantation of BKPH Buahdua and BKPH Songgom, KPH Sumedang. Media Konservasi 8 (3): 117-126

Hernowo JB. 1995. Ecology and Behaviour of the Green Peafowl (*Pavo muticus* Linnaeus 1766) In the Baluran National Park. East Java, Indonesia. [Thesis]. Faculty of Forestry Science, Goerg August University Gottingen. Germany.

Hernowo JB. 1997. Population study of Javan green peafowl (*Pavo muticus muticus* Linnaeus 1758) with three different methods in Baluran National Park, East Java Indonesia. Media Konservasi 5 (2): 61-66.

Hernowo JB. 1999. Habitat and local distribution of Javan green peafowl (*Pavo muticus muticus* Linnaeus 758) in Baluran National Park, East Java. Media Konservasi 6 (1): 15-22. DOI: 10.29244/medkon.6.1.%25p

Mulyana. 1988. Habitat study of green peafowl (*Pavo muticus* Linnaeus 1766) at Bekol Resort, Baluran National Park, East Java. [Hon. Thesis]. Department Forest Resources Conservation, Faculty of Forestry, Bogor Agricultural University. Bogor [Indonesian]

Pattaratuma A. 1977. An Ecological Study On The Green Peafowl, "Burung Merak" (*Pavo muticus* Linn.) In The Game Reserve Baluran Banyuwangi, East Java, Indonesia. Technical Paper No 2. Department of Forest Biology. Faculty of Forestry, Kasetsart University Bangkok. Bangkok.

Ponsena P. 1988. Biological characteristic and breeding behaviours green peafowl (*Pavo muticus* Linnaeus) in Huai Kha Khaeng Wildlife Sanctuary. Thai J For 7: 303-313.

Rencher AC. 2002. Methods of Multivariate Analysis. John Wiley & Sons, Canada. DOI: 10.1002/0471271357

Rini IS. 2005. Feeding Ecology and Feeding Behavior of Green Peafowl (*Pavo muticus* Linnaeus 1766) at Alas Purwo National Park, East Java. (Honours Thesis). Department Forest Resources Conservation and Ecotourism, Faculty of Forestry, Bogor Agricultural University. Bogor [Indonesian].

Risnawati R. 2008. Population and Habitat Analysis of Green Peafowl (*Pavo muticus* Linnaeus, 1766) at Alas Purwo and Baluran National Park, East Java. [Hon. Thesis]. Department Forest Resources Conservation and Ecotourism, Faculty of Forestry, Bogor Agricultural University. Bogor. [Indonesian]

Septania KA. 2009. Potential Plants as Food of Javan Green Peafowl (*Pavo muticus muticus* Linnaeus 1766) at Baluran National Park East Java. [Thesis]. Graduate School, Bogor Agricultural University, Bogor. [Indonesian].

Subramanian KS, John MC. 2001. Roosting and nesting habits of free ranging Indian peafowl (*Pavo cristatus*) in Southern Tamil Nadu. Zoos' Print J 16 (7): 537-538. DOI:10.11609/JOTT.ZPJ.16.7.537-8

Supratman A. 1998. Distribution and habitat characteristic study of green peafowl (*Pavo muticus* Linnaeus 1766) on non-breeding season at Rowobendo Resort Alas Purwo National Park, East Java. [Hon. Thesis]. Department Forest Resources Conservation, Faculty of Forestry, Bogor Agricultural University, Bogor. [Indonesian].

Winarto R. 1993. Some ecological aspects of green (*Pavo muticus* Linnaeus 1766) on breeding season at Baluran National Park, East Java. [Hon. Thesis]. Department Forest Resources Conservation, Faculty of Forestry, Bogor Agricultural University, Bogor. [Indonesian].

Yuniar A. 2007. Population and Habitat Study of Green Peafowl (*Pavo muticus* Linnaeus 1766) at Alas Purwo National Park and Baluran National Park, East Java. [Hon. Thesis]. Department Forest Resources Conservation and Ecotourism, Faculty of Forestry, Bogor Agricultural University, Bogor. [Indonesian]