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THE DISTRIBUTION AND STATUS OF GREEN PEAFOWL *Pavo muticus* IN JAVA

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Abstract

Green peafowl Pavo muticus *were once widespread throughout East and South-east Asia. Because of habitat destruction and excessive hunting, this species has now disappeared from most of its former range. In Java a few national parks in the lowlands form its last refuges, but small groups of birds still survive in vast teak plantations and rugged limestone hills in the central and eastern parts of the island. This paper gives a summary of an extensive survey of extant peafowl populations throughout Java. Recommendations for conservation action have been made: (1) awareness programmes accompanying improved law enforcement and development of ecotourism; (2) additional surveys to assess the importance of small reserves in peafowl areas; and (3) re-introduction of confiscated birds into suitable reserves.*

Keywords: green peafowl, *Pavo muticus*, Java, Indonesia, distribution, habitat, conservation status.

INTRODUCTION

The historical range of green peafowl *Pavo muticus* covers a large area in East and South-east Asia, from Bangladesh to Indo-China and Java. In most of its range, however, it is locally and patchily distributed, and it is probably extinct in some places, e.g., northeast India and Malaysia (Johnsgard, 1986). Though protected by law in a number of countries, e.g. Indonesia (Abdullah *et al.*, 1978), Thailand, Malaysia (Johnsgard, 1986) and Burma (Collar & Andrew, 1988), the species has continued to decline, due to excessive hunting for its feathers, meat or chicks (for sale, or to be kept as pets). Because of this, the species was nominated as 'vulnerable' in the revised BirdLife International world check-list of threatened birds (Collar *et al.*, 1994).

Some confusion exists in the literature about its status on Java, where it is reportedly restricted to essentially only a few isolated reserves in the provinces of West and East Java (Collar & Andrew, 1988), and with a total population of only 250 birds (Johnsgard, 1986). Numerous personal communications, and evidence in the form of peafowl offered for sale on bird markets in various parts of Java, suggested a more widespread occurrence. It was therefore considered necessary to obtain better information on the status and the distribution of the species. The results of this study have contributed to a re-assessment of the status of the green peafowl in Java (Collar *et al.*, 1994).

SURVEYS

In 1990–91, five 2–3 week surveys were done in areas from where recent verbal reports of peafowl had been received or which were mentioned by various authors (e.g. Sody, 1953; Manuputty, 1956) as historically supporting peafowl. Also written reports on recent wildlife inventories that were examined by us at local forestry district offices appeared to be very useful sources of up-to-date information on peafowl populations. These data were added to other surveys conducted in a more general forest bird survey by S. van Balen on Java from 1985 onward.

The presence of peafowl was established through sightings, signs (tracks, feathers, dusting wallows) and calls. Peafowl roosting sites were first located, either from information provided by local villagers and/or through listening for the birds' far-carrying pre-roosting calls in the morning and evening (Cox & Quinell, 1989; Indrawan, 1992). Because green peafowl generally favour particular trees for a roost, it was often possible to obtain an impression of the distribution of different

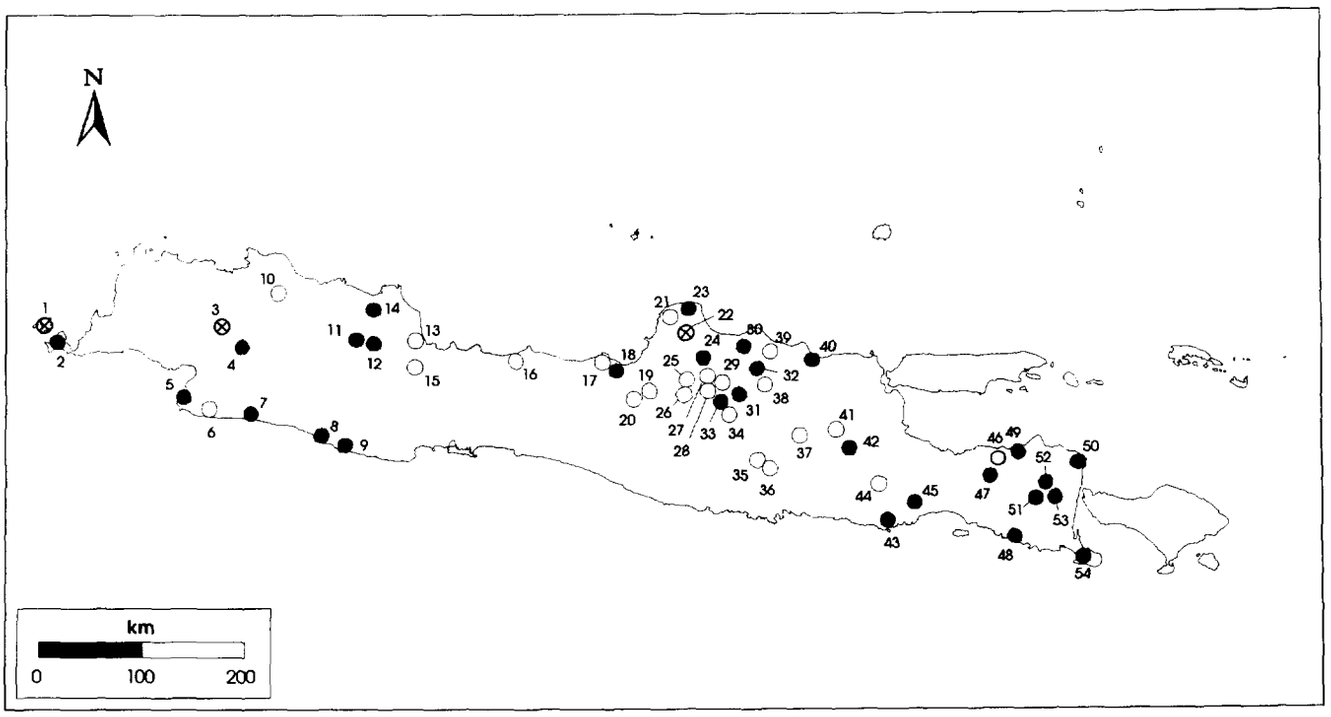

Fig. 1. Localities of green peafowl in Java. ○, historical records only; ●, recent records; ⊗, no recent records confirmed. Locality numbers as in Tables 1 and 2.

Table 1. Localities of green peafowl on Java before 1980, without recent observations

No.	Locality	Habitat[a]	Year	Status[b]	References[c]	Coordinates
West Java						
1.	Panaitan	LW	?	?	2	105 14 E; 6 40 S
3.	Tapos	?	1828	?	4	106 47 E; 6 36 S
6.	Ciseureuh	LW	1918	?	5	106 40 E; 7 25 S
10.	Karawang	?	1896	?	5	107 18 E; 6 19 S
13.	Cirebon	?	1940	?	4	108 33 E; 6 43 S
15.	Cilowa	?	1901	?	5	108 30 E; 6 59 S
Central Java						
16.	Pemalang	TF	1950s	M	3	109 24 E; 6 54 S
17.	Kendal	TF	pre-1940	?	7	110 12 E; 6 56 S
19.	Penawangan	TF	1880	?	1	110 35 E; 7 12 S
20.	Gedangan	TF	pre-1940	?	5/7	110 28 E; 7 16 S
21.	Banjaran	?	1936–38	?	9	110 46 E; 6 32 S
22.	Colo	TF	pre-1970	?	5/7/9	110 54 E; 6 41 S
25.	Purwodadi	?	1936–38	Q	9	110 55 E; 7 06 S
26.	Gundih	TF	1935–38	F/Q	6/7/9	110 54 E; 7 12 S
27.	Wirosari	TF	1880	Q	1	111 06 E; 7 04 S
28.	Kradenan	TF	1880	Q	1	111 06 E; 7 10 S
29.	Ngaringan	?	1936–38	?	9	111 12 E; 7 08 S
East Java						
34.	Walikukun	?	1936–38	R	9	111 15 E; 7 24 S
35.	Paringan	?	1936–38	?	9	111 33 E; 7 49 S
36.	Pulung	TF	1950s	M	3	111 38 E; 7 52 S
37.	Nganjuk	?	1936–38	?	9	111 56 E; 7 36 S
38.	Padangan	TF	pre-1940	<	7	111 37 E; 7 09 S
39.	Jatirogo	TF	1943–45	?	8	111 39 E; 6 53 S
41.	Jombang	?	1930s	<	9	112 15 E; 7 33 S
44.	Kebonagung	?	?	?	4	112 37 E; 8 02 S
46.	Besuki	?	1910	?	5	113 41 E; 7 44 S

[a] TF, teak forest; LW, lowland woodlands; G, grassland.
[b] R, rare; F, few; Q, quite common; M, many; <, decreasing; ?, not recorded or not possible to infer.
[c] 1, Bruinsma (1916); 2, Kal (1910); 3, Manuputty (1956); 4, Museum Zoologi Bogor; 5, National Natuurhistorisch Museum (Leiden); 6, S. Paryanti (pers. comm.); 7, Sody (1953); 8, Soepraptomo (1953); 9, de Voogd & R. H. Siccama (1939).

groups in an area. Their extreme alertness made close encounters very difficult, and only rarely was it possible to estimate group size. Where possible, notes were made of behaviour and social structure of the birds.

The aim of the surveys was to assess the status, habitat and present threats to the survival of the green peafowl in the areas concerned.

Distribution and status

Figure 1 shows the localities where peafowl were recorded in historical times only and where they were seen recently. Especially in the western part of Java the distribution shows a very scattered pattern, with peafowl occurring mainly in remote coastal areas. In central and eastern Java, clusters are formed in the extensive teak *Tectona grandis* forests and rugged hill and mountain areas in the interior.

Table 1 lists the areas where peafowl occurred formerly, but where their presence has not been confirmed since 1980. Data on habitat and numbers are given, if available. Some of these localities have been surveyed recently, but no evidence of peafowl occupancy was found. All the other places still have to be revisited, and the potential presence of peafowl cannot be rejected. Table 2 lists all localities, including those visited during the survey, where the presence of peafowl has been recently confirmed. More notes on the habitat, conservation value of the area and, if available, numbers of peafowl present are given in the following section. Localities are listed according to the provinces in which they were situated. County names (*kabupaten*) are in brackets.

West Java

Panaitan (Pandeglang)

Kal (1910) and Johnsgard (1986), but not Hoogerwerf (1953), reported that Panaitan Island supported peafowl. Surveys in 1985, 1986 and 1988 by the Biological Science Club (Jakarta) and S.vB. did not find evidence of peafowl on the island.

Ujung Kulon (Pandeglang)

Hoogerwerf (1947, 1969, 1970) gave comprehensive accounts of the Ujung Kulon reserve area, including detailed information on peafowl. The population in the park was estimated at a maximum of 200–250 individuals (Hoogerwerf, 1970). The Ujung Kulon peninsula of 30 000 ha was established as a nature reserve in 1921, and in 1980 the area was declared a National Park (IUCN, 1992) containing offshore Panaitan Island and Mt Honje on the mainland besides the peninsula proper.

Table 2. Localities of green peafowl on Java with observations after 1980 (see text for references)

No.	Locality	Habitat[a]	Numbers of peafowl	Status of area	Coordinates
West Java					
2.	Ujung Kulon	LW/G	200–250	NP	105 20 E; 6 45 S
4.	Mt Gede/ Pangrango	H	<5	NP	106 58 E; 6 48 S
5.	Cikepuh	LW	<10	NR	106 25 E; 7 15 S
7.	Ciogong	LW/TF	5–10	P	107 03 E; 7 24 S
8.	Cikelet	?	?	—	107 41 E; 7 38 S
9.	Lw Sancang	LW/G	15–20	P/NR	107 52 E; 7 44 S
11.	Buahdua	TF	25–30	—	107 59 E; 6 44 S
12.	Sampora	TF	23–29	—	108 08 E; 6 46 S
14	Cikawung	TF	8	—	108 08 E; 6 28 S
Central Java					
18.	Alas Roban	TF	?	—	110 17 E; 6 58 S
23.	Clering	LW	<10	NR/–	110 56 E; 6 28 S
24.	South Pati	TF	10–25	—	111 04 E; 6 54 S
30.	Mantingan	TF	15	—	111 24 E; 6 51 S
31.	Randublatung	TF	70	—	111 23 E; 7 14 S
32.	Cepu	TF	104–167	—	111 35 E; 7 05 S
East Java					
33.	Alas Sengok	TF	5	—	111 12 E; 7 17 S
40.	Tuban	?	?	—	112 03 E; 6 53 S
42.	Wonosalem	C	?	—	112 22 E; 7 43 S
43.	Lebakharjo	LW	<10	PF/P	112 52 E; 8 23 S
45.	Ranu Darungan	H	<10	NP	112 56 E; 8 12 S
47.	Yang Highlands	H/G	25–50	NR	113 36 E; 7 58 S
48.	Meru Betiri	LW/C/G	25–50	NP	113 48 E; 8 30 S
49.	Pasirputih	LW/TF	75	RF/P	113 49 E; 7 43 S
50.	Baluran	LW	200	NP	114 22 E; 7 51 S
51.	Mt Raung	H/G	?	P	114 02 E; 8 06 S
52.	Krepekan	H/C	30	—	114 04 E; 8 03 S
53.	Lijen	H/C	10–20	—	114 11 E; 8 08 S
54.	Alas Purwo	LW/TF	25–50	NP	114 24 E; 8 41 S

[a]TF, Teak forest; LW, lowland woodlands; C, coffee plantations; G, grassland; H, woodlands at higher altitudes.
[b]NP, national park; NR, strict nature reserve; P, proposed reserve; PF, protection forest; RF, recreation forest.

There are no indications of a recent decline in the park, and peafowl are still common in the reserve itself, especially on and around the grazing fields of Cijungkulon and Cigenter. The *c.* 500-ha Peucang Island 500–800 m off the northwest coast of the peninsula has been mentioned as having an isolated population (Johnsgard, 1986; Collar & Andrew, 1988). However, the varying number of individuals on the island (Hoogerwerf, 1970) suggests that these are birds from the main population.

Tapos (Bogor)
A specimen collected by Macklot at Tapos in August 1828 is in the Bogor Museum. It is not clear whether this is Tapos near Cibinong, Jasinga or Leuwiliang, but all are near Bogor. The absence of wild peafowl at these localities is confirmed by S.vB. and D.M.P., who lived in Bogor for many years.

Mt Gede/Pangrango (Bogor, Cianjur, Sukabumi)
Van Heeckeren tot Walien (1912) mentioned the occurrence of peafowl in the Mt Gede area. Without records for the period between 1929 and 1992, a peacock was observed on the crater wall of this mountain in early 1992 (P. Jepson, pers. comm.), and in July 1992 a call was heard at 1200 m on the lower northwestern slopes of its twin volcano Mt Pangrango (I.W.A. Dirgayusa, pers. comm.). However, these observations most likely refer to stragglers from the local safari garden located 10–15 km to the northwest, where free-ranging peafowl are kept.

Cikepuh (Sukabumi)
Vorderman (1887) and Bartels (1902) described the plain where the Ciletuh river flows into the sea; the area was also called Zandbaai, and rhinoceroses and many peafowl occurred here. Rather few peafowl were reported by de Voogd and R. H. Siccama (1939) for the Cikepuh area, immediately south of the Ciletuh river. Peafowl were observed in the 1980s in this area (D. S. Hadi, pers. comm.). The Cibanteng reserve in the northern part of the area and Cikepuh game reserve (together >8500 ha) were established in 1925 and 1973 (MacKinnon *et al.*, 1982; IUCN, 1992). The habitat is mostly secondary forest, with patches of primary forest and grassland.

Ciogong (Cianjur)
Van Maarseveen (1940) reported peafowl in the Sindangbarang region on the south coast. In February 1987, we surveyed the lowland forest plot of Ciogong in the same region. This 1000 ha forest is bordered to the north and west by teak plantations; inside the area two plots of 8 ha and 20 ha were logged in the late 1950s. A few rivulets flow through the forest, which has been proposed as a nature reserve. Peafowl were not seen, but reports by the local warden (Didin, pers. comm.) of small numbers were regarded as reliable.

Cikelet (Garut)
The presence of peafowl was reported in 1991 by local people for the northern part of the district of Cikelet, west of Pameungpeuk (D. Holmes, pers. comm.)

Leuweung Sancang (Garut)
Leuweung Sancang contains a 2157 ha lowland nature reserve established in 1978 (IUCN, 1992) along the south coast. Lush rain forest and edges to surrounding plantations are the favourite habitat for peafowl. There are plans to extend the reserve area to include 3000 ha of the Cipatujuh area in the east (MacKinnon *et al.*, 1982). During a visit on 3–5 June 1987 two birds without trains were seen at the edge of the Leuweung Sancang lowland forest reserve bordering a coconut *Cocos nucifera* plantation. On a follow-up visit in May 1991, we saw 20 peafowl distributed in four sites along the northern border.

Buahdua (Sumedang)
Peafowl were reported in 1993 as common but being heavily hunted at Buahdua on the lower northeastern slopes of Mt Tampomas (Sujatnika, pers. comm.).

Sampora (Sumedang)
In the forestry district of Sampora 23–29 peafowl were seen at seven study plots (Gunawipura, 1986).

Cikawung (Indramayu)
Van der Vegte and Bartels (1937) gave information on peafowl observed near Losarang. Few were reported from the Indramayu forestry district by de Voogd and R.H. Siccama (1939). In November 1993, eight peafowl in three forest blocks were observed at Cikawung; the birds were heavily hunted with air rifles, snares and sometimes poisoned; eggs and young were sold (Setiawan & Nurdiana, 1993).

Central Java

Alas Roban (Semarang)
Before World War II, 180 birds were reported by Sody (1953) for the teak forests in Semarang county; a few other old records (Gedangan, Penawangan) are listed in Table 1. A record in 1991 of chicks offered for sale at Alas Roban near Semarang town (A. Saksono, pers.comm.) suggests that peafowl still occur in the area.

Colo (Jepara)
Paryanti (pers.comm., 1991) reported peafowl in teak forest on the southern slope of Mt Muriah near Colo a decade ago, but local foresters interviewed on the present survey have not seen peafowl there since 1970.

Clering (Jepara)
MacKinnon *et al.* (1982) reported peafowl for the Mt Clering forest reserve; in June 1991, peafowl were seen at Giding near Clering. In the area, two reserves, Keling I–III (essentially three patches of forest, totalling 60 ha), and Clering (1379 ha), were established in, respectively, 1919 and 1973.

South Pati (Pati)
Frequent egg collecting was reported for the southern part of Pati county (de Voogd & R.H. Siccama, 1939), where peafowl were most common in Kwawur, Guyangan and Selotanah (Manuputty, 1956). On the present survey, peafowl were observed at Kedungwesi, Brati and Kalangan in the Kapur Utara hills, and local reports were received of the presence of peafowl at Guyangan and Selotanah.

Mantingan (Rembang)
Fifteen birds in three locations were reported by local foresters for the first quarter of 1991 in the Mantingan area, where hunting pressure is high; only one bird was seen at Bedingan (Kali Nanas) in one of the three places visited in June 1991. Two tiny reserves, Gunung Butak (45 ha) and Sumber Semen (17 ha), were established in 1975 (MacKinnon *et al.*, 1982) on the Kapur Utara limestone hills.

Randublatung (Blora)
Peafowl were reported as 'regular' in the Randublatung area (de Voogd & R. H. Siccama, 1939); before World War II, 25 and 165 birds were recorded in the northern and southern parts of this teak plantation area by Sody (1953). In June 1991, peafowl were seen here at three sites, Menden, Kedungsambi and Bodoh, where about 70 birds were reported by the local forestry office.

Cepu (Blora)
Sody (1953) reported an estimated pre-World War II population of 300 birds in the teak forests at Cepu. On the present survey peafowl were observed at Nglebur and Bleboh in June 1991 and reportedly caught by local people in the Nglebur region and Ngasahan; local foresters reported 104–167 birds in the Cepu area in 1990 and 76 birds (in 18 sites) in early 1991.

East Java
Alas Sengok (Ngawi)
An increasing number of peafowl was reported for Ngawi by De Voogd and R. H. Siccama (1939), with 75 birds before World War II (Sody, 1953). In June 1991, five birds were seen in the teak forest at Alas Sengok.

Tuban (Tuban)
In 1992 local foresters reported peafowl from the Tuban area (I. Setiawan, pers. comm.).

Wonosalem (Jombang)
Wallace (1869) recorded peafowl in 1861 near Wonosalem, at 350–500 m on the west slope of Mt Arjuno, where coffee plantations, bamboo thickets and coarse grasses dominated the vegetation. Here his assistant collected some peafowl. Vorderman (1899) described a bird taken as young from the same area. Peafowl were reported from the area in February 1993 (V. H. Gepak, pers. comm.).

Lebakharjo (Malang)
Baerveldt (1950) saw two peafowl families near Lebakharjo, where the Manjing and Glidik rivers meet. Though not heard or seen by us on 25–28 October 1989, local villagers reported peafowl from the vicinity of the Teluk Lenggasana (or Lebakharjo) protection forest. The 16 000 ha of lowland rainforest is still largely in good condition, despite being intersected by enclave plantations. It has been proposed as a nature reserve (Bekkering & Kucera, 1990).

Ranu Darungan (Malang)
A small number of peafowl were reported in 1991 in the Ranu Darungan area at 800–900 m in the southern foothills of Mt Semeru (J. Wind, pers. comm.). Ranu Darungan is included in the Bromo-Tengger-Semeru National Park (57 606 ha), established in 1982 (IUCN, 1992).

Yang Highlands (Probolinggo, Bondowoso, Jember)
Formerly reported as 'very abundant' (Sody, 1953), peafowl appear to have decreased seriously on the grassy plains of the Yang highlands. Hoogerwerf (1974) thought that this could be partly due to the destruction of eggs and limitation of peafowl food resources (e.g. grass seeds) by fires. The 14 145 ha area became a game reserve in 1962 (IUCN, 1992), but heavy poaching drastically reduced the local deer population, and left few peafowl. Van der Zon and Supriadi (1979), however, reported peafowl as 'very common' and groups of 5–10 were often seen. On 1–5 July 1989, only two or three birds were heard and a cock with a long train was seen at *c.* 2300 m asl, an exceptionally high altitude for this species.

Meru Betiri (Jember, Banyuwangi)
We visited the Meru Betiri forest reserve on the south coast on 11–17 October 1990. Meru Betiri was declared a Wildlife Reserve in 1972 (MacKinnon *et al.*, 1982) and is now a National Park (IUCN, 1992). Its lush lowland rainforest alternating with enclave plantations and grazing fields covers 58 000 ha and is good habitat for green peafowl. These were heard mainly near Sumbersari in the central part of the park (where at least two roosts were discovered), and near the 30-ha grazing field of Rajegwesi. Peafowls were also reported by the local wardens at the Sukamade camping ground.

Pasirputih (Panarukan)
On 16 December 1987, three trainless peafowl were observed in mangrove shrubs, at the edge of teak forest along the coast, some kilometres west of Pasirputih. In 1991–92, despite heavy hunting, at least 75 birds were seen southeast of Pasirputih, in the Mt Ringgit area, a small forested hill, with teak forest and village gardens in the valley. Pasirputih is a tourist resort and small nature reserves of 4000 and 2000 ha were proposed by MacKinnon *et al.* (1982) on the nearby Mt Beser (1368 m) and Mt Ringgit (1000 m).

Baluran (Panarukan)
Robinson and Kloss (1924) collected peafowl at Bajulmati, along the east coast, just south of Baluran. Very high numbers were reported from Baluran in 1941, but these were disappointingly low in 1971 (Hoogerwerf, 1974). The extensive savanna woodland and monsoon forest offer ideal peafowl habitat, attested by the large number of birds that this area supports. Population estimates of up to 200 birds have been made (Johnsgard, 1986). It is likely that illegal hunting along the borders suppresses numbers considerably, but overall numbers in the park may still reach 200. In the dry season conditions become harsh at Baluran and part of the peafowl population moves into evergreen kapok *Ceiba pentandra* plantations in an area of wells with a permanent river. Baluran was established as a game reserve in 1937, and upgraded to national park in 1980 (MacKinnon *et al.*, 1982; IUCN, 1992). It covers 25 000 ha; the kapok plantations are outside the protected area.

Mt Raung (Banyuwangi, Bondowoso, Jember)
Considerable numbers of peafowl were reported by local campers at Mt Raung in the south part of the mountain complex. We did not visit this area. A 60 000 ha reserve is proposed for Mt Raung (MacKinnon *et al.*, 1982).

Krepekan and Lijen (Bondowoso, Banyuwangi)
On 24 June–10 July 1990, we visited the Ijen crater and the lower parts of its foothills where coffee plantations border the eastern (Lijen) and western forest (Krepekan). At least six different roosts were discovered in the Krepekan area and three in Lijen (Indrawan & van Balen, 1991). All were in or near coffee plantations and forest edge outside the reserve area, and some were close to villages. The Ijen crater is included in the 2560 ha Kawah Ijen/Merapi/Ungup-Ungup area, which has been a nature reserve since 1920 (MacKinnon *et al.*, 1982).

Alas Purwo (Banyuwangi)
Sody (1953) reported peafowl as very abundant in the Alas Purwo forest reserve, a game reserve since 1939 (IUCN, 1992), and recently declared a national park. It consists of limestone forest and areas cleared for grazing. The 20 000-ha park is bordered by teak and mahogany plantations. Between 15 and 30 May 1990 we located five peafowl sites in the Alas Purwo reserve and saw groups of 3–12 birds, with the largest group in the 75-ha Sadengan area. Good shelter is provided here by the surrounding forest. Groups of up to eight were observed in the teak forest and in the north of the Sagara Anak estuary (H. Prins, pers. comm.).

DISCUSSION

Population numbers and habitat

Sody (1953) attempted to make an estimate of total numbers of green peafowl in Java. Sporadic figures from local forestry reports on teak forests led him to a minimum estimate of 2000–3000 birds, but no estimate could be made for woodlands as only information such as 'scarce' or 'rather many', was available to him. The present survey does not allow an accurate count either. The estimated number of 915–1149 birds observed during the past few years (Table 2) is only a part of the total population of which the size is unknown and therefore only general remarks can be made.

Forest reserves
Three national parks, Ujung Kulon, Alas Purwo and Baluran, include substantial areas of peafowl habitat and together they support the major part of the peafowl population within protected areas in Java. In addition, the Yang Highlands Nature Reserve and Meru Betiri National Park contain small peafowl populations. The two nature reserves of Ciogong and Kawah Ijen only have peafowl at the edges of their forest. A general feature of areas supporting peafowl is a 'parkland' landscape created either naturally by banteng grazing, by park management or by enclaves of plantations. When abandoned either by the wild cattle or by humans, these fields become overgrown with shrubs and trees and become less attractive to peafowl. This was seen in Leuweung Sancang, where the peafowl moved to the planted rubber *Hevea brasiliensis* forest north of the reserve after the grazing fields inside the reserve became less suitable through natural afforestation.

Teak forests
The teak forests which cover a large part of the 1 121 300 ha of plantation forest on Java and Bali (RePPProT, 1990) have long been known for their peafowl. Junghuhn (1850–1853) noted that 'few birds other than peafowl inhabited these forests'. Cordes (1881) pointed to the local abundance of the birds, especially where the teak forest alternates with small patches of alang-alang grass fields. Koningsberger (1911–1915) only mentioned peafowl for the remote areas, but stated that secondary woods were actually more suitable than the teak stands because, in the dry season, the birds liked to perch in the bare trees. Quarterly reports by forestry district offices, as well as our survey, show that peafowl are still widespread in the teak plantations, despite hunting pressure throughout the region. However, numbers are generally low and the scattered populations may be under immediate threat of extinction. Even when local people themselves do not hunt the birds because of taboos, the birds are not secure as hunters often come from elsewhere.

Open woodlands
Excellent examples of this habitat are found in some of the reserves mentioned above, e.g. Baluran, Yang Highlands. Outside the protected areas some other woodlands offer suitable habitat. This is especially the case in the rugged limestone hill ranges of Kapur Utara and Kendeng, which cross the boundary of Central and East Java, and where pockets of open woodland occur, often interspersed with teak plantations. Other steep,

relatively inaccessible hills include Mt Ringgit and the foothills near Krepekan, and it is in these refuges that scattered populations of peafowl survive in the otherwise densely populated lowlands and hills of Java.

Nearby supplies of good and plentiful water were mentioned as indispensable by Johnsgard (1986). However, in Baluran the rivers are dry for most of the year and only a few peafowl visit wells nearby. The same is true for Alas Purwo. Also the birds may not be as sensitive to cold weather as thought by Johnsgard (1986) because we found peafowl up to 2300 m in the Yang Highlands, and there are even reports of peafowl up to almost 3000 m asl.

Conservation

For centuries, perhaps, hunting must have been the most serious threat to peafowl. In the 1930s and 1950s overhunting of eggs and birds was reported from Pati, Walikukun and Jombang (de Voogd & R. H. Siccama, 1939; Manuputty, 1953). Early this century, at the height of the worldwide plumage trade, they were killed for their train feathers, from which fashionable hats, fans and cigar cases were made (de Graaff & Stibbe, 1918). The feathers were regarded as trophy by the European hunters, but in general as bringing ill fortune to Javan possessors (Hoogerwerf, 1970). In some areas, hunting of peafowl, in whatever form, is still taboo, e.g. Leuweung Sancang and Clering. However, in others (notably Ponorogo), the popular and traditional *reog* dance requires, amongst other items, feathers from a peacock's train, of which 2000–5000 are used in a single dancing outfit (Mujib, 1992). There is an increasing demand on the Indonesian market for the feathers for ornamental purposes and because single feathers sell for up to US$0.50, they are very much sought after. Because of decreasing domestic peafowl numbers, Indian peafowl feathers are reportedly imported through Jakarta to meet the demand (Mujib, 1992). In captivity it has been shown that the moult of the 156 train feathers is completed in less than 1 month, with an average of six feathers shed per day (Kuroda, 1936). Near Mt Ringgit, local villagers search for moulted feathers in September–December during the moult. However, the large number of plumes obtained from a bird in the hand and the higher market value of fresh rather than shed feathers result in peacocks being hunted with snares and guns. Because of the additional meat, seldom is the 'goose with the golden eggs' spared. Peafowl eggs, laid in clutches of three or four, rarely five, are another source of protein for hunters. They are also often sold to be incubated by domestic fowl, because the chicks are a highly valued (though illegal) commodity. Peafowl are regularly offered for sale in most local bird markets, and prices of up to US$ 75–100 for 7–8 month old birds have been recorded (Basuni & Setiyani, 1989).

In the teak forest areas of Central and East Java, where the standard of living is very low, hunting pressure is especially high. The meat is consumed locally; the feathers, live birds, and sometimes eggs, are traded throughout Java.

Another threat may come from the use of pesticides, where peafowl come in close contact with agricultural practices. An incident in the village of Wanabaja (East Java), where one farmer deliberately poisoned a large number of crop-raiding peafowl with DDT in the early 1980s (Imamudin, pers. comm.), may be not an isolated case.

Green peafowl do not always suffer under the extensive habitat alteration by man. On the contrary, they often take advantage of the 'parkland' landscapes created. The frequent fires mentioned by Hoogerwerf (1974) may have suppressed numbers in the Yang Highlands, but at the same time they maintained suitable habitat by the prevention of forest encroachment in the grasslands.

CONCLUSIONS AND RECOMMENDATIONS

Table 1 shows the localities on Java from where peafowl have or may have disappeared this century. The number of places for which absence could be confirmed is too small to draw conclusions about the relative size and causes of the decline. The situation appears to be more favourable than is suggested by recent publications on the species' status on Java, or the gloomy prediction by Beebe (1931) that 'the birds are becoming rarer in Java, and before many years, as the plantations increase, they will become extinct'. Nonetheless, the Javan green peafowl is correctly considered endangered by the Mace–Lande category of threat, following the CAMP workshop held at Antwerp in February 1993 (Mace & Lande, 1991; van Balen & Holmes, 1993).

Habitat changes seem to be of minor importance as habitat that is tolerated (or favoured) by peafowl, e.g. teak forest and forest edges along plantations, is still extensive on Java. Numbers seem to fluctuate considerably (e.g. Baluran, Yang Highlands; see above), and the species may well tolerate local small population sizes for prolonged periods, as their tolerance towards man-made environments and far-carrying advertising calls facilitate the exchange of birds amongst separate populations. The gradual disappearance of local taboos on peafowl hunting, and the improved accessibility of remote areas, has undoubtedly caused the most important impact on peafowl numbers throughout Java.

Pending more field surveys, the following recommendations are made:

(1) *Awareness.* The installation by the Indonesian Government of new, much improved environmental laws in 1990 could without doubt ameliorate the present situation, if properly enforced. However, peafowl are mainly distributed in regions with the lowest per capita incomes, and the relatively high prices paid for feathers and live specimens continue to be an irresistible temptation. Extension programmes should accompany law enforcement, and in areas such as Pasirputih the birds could be promoted as a tourist attraction (already done in Baluran), from which the

local people could take some profit as guides, etc.

(2) *Surveys.* Many of the established as well as proposed nature reserves, national parks, and other forest areas for which there were unconfirmed reports of the occurrence of peafowl have been visited during the present survey. Undoubtedly many more areas support the species, especially in the extensive teak plantations of Grobogan and Ponorogo in Central and East Java, and these areas should therefore be surveyed. Moreover, the role of the smaller reserves of 17–45 ha, of which a number are located in peafowl area, should be studied. They may very well provide refuges in the otherwise much less hospitable teak monocultures.

M. Indrawan is currently studying the use of roost-calling patterns of the males for developing an index for quick population estimates (van Balen *et al.*, 1993).

(3) *Reintroductions.* Peafowl chicks are regularly confiscated by the Department of Nature Conservation (PHPA) at local bird markets. The zoological gardens where the birds are normally deposited are presently saturated. Sometimes it is decided to release confiscated birds into areas with peafowl, e.g. more than 20 in Baluran in 1991. However, this may introduce diseases in the wild birds, although it is difficult to assess the associated risk (Hillgarth *et al.*, 1989). An alternative could be the reintroduction of peafowl into areas where the species disappeared in recent times, for example Mt Muriah (Colo). A 12 000 ha reserve is proposed (MacKinnon *et al.*, 1982) for the 1620 m dormant volcano of Mt Muriah (or Muryo), where the peafowl used to occur before the 1970s. Alternatively, though no historical accounts of its presence could be found, a good place for such translocations would be the Pangandaran nature reserve (West Java), where grazing fields surrounded by dense forest form suitable habitat. An additional argument for Pangandaran is that it is much visited by tourists.

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