Conservation of Critically Endangered Species

INDONESIA

FINAL REPORT

Distribution, Abundance and Habitat Selection of Flores Hawk-eagle *Nisaetus floris* in Sumbawa Island, West Nusa Tenggara, Indonesia

Photo by: MM

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PROJECT AND CLIENT DETAILS

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Description of report	This report describes key aspects of distribution, abudance and habitat selection of Flores Hawk-eagle in West Sumbawa Island, West Nusa Tenggara Indonesia. In includes the following key outputs: The distribution, abudance and habitat selection of Flores Hawk-eagle in Western Sumbawa (Newmonth Nature Reserve, Bersamak Forest Reserves and Batulanteh Protected Forest) with high results, where all's area surveyed has present and abundance of this birds.		

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Indonesia, January 2013
Best Wishes,

USEP SUPARMAN
Raptor Conservation Society (RCS)

Distribution, Abundance and Habitat Selection of Flores Hawk-eagle (*Nisaetus Floris*) in Sumbawa Island, West Nusa Tenggara, Indonesia

USEP SUPARMAN

Summary

The Flores Hawk-eagle *Nisaetus floris* is endemic on the Nusa Tenggara (Flores, Lombok, and Sumbawa island) in the Lesser Sunda (Indonesia) where it is the only resident diurnal raptor and critically endangered species (IUCN Red List 2005). A 15 day study in 2012 revealed that the spesies is present in high numbers throughout the island. The eagle's abundance was assessed by an island-wide survey and by sampling 889.210 hectare plots covering four habitat types. There was a strong positive correlation between abundance and contact time in plots. Compared with other habitat types, the number of, and contact time with flores hawk-eagle was higher in tall forest. The species was not recorded inmangrove and coastal forest. There was no correlation between the eagle's abundance and the nearest distance to village. Based on the distribution of forest and the abundance of adult pairs within these forests, the available habitat totals 889.210 hectare, in which some 58 adult flores hawk-eagle remain. Semi-structured interviews with the islanders revealed that gold mining the largest threat to the survival of the Flores Hawk-eagle, and that the increase in gold mining (illegally) was a relatively recent phenomenon. The forest on Sumbawa, including that in three reserves, is poorly protected and illegal/or legal gold mining. The low degree of habitat protection, the severe threat posed by illegally gold mining must be stopped immediately and the remaining habitat needs to be better protected. This probably best achieved by a conservation body in which local and regional authorities and NGOs cooperate.

1. BACKGROUND

The Flores Hawk-eagle *Nisaetus floris* is one of endemic and only found in Flores, Sumbawa and Lombok Island. These birds usually inhabit lowland forests and montane forests up to 1600 meters altitude above sea level. Currently, the population of Flores Hawk-eagle estimated no more than 250 adult male individuals (IUCN Red list, 2005), and only noted at some point just in Nusa Tenggara (Lombok Sumbawa and Flores Island). The Flores Hawk-eagle is general considered to be indicator for evaluating a healthy ecosystem (Ferguson-Lees and Christie, 2001). This is because the position of raptors as predators is at the top of many food chains. Indeed, raptors prey upon insects, other arthropods, amphibians, reptiles, other bird's species and some mammals. Therefore, they have roles to regulate the number of animals, maintain the balance of nature and maintain the diversity of habitat.

However, in the last century raptors all over the world haves been suffered from human prosecution, pollution like pesticides and habitat destruction because of the country development. The population was already low declined and their habitat was getting smaller and fragmented. Disturbance on bird of prey species will be affecting the chain and food in a ecosystem, both directly and indirectly. The eagle is one of the endemic bird of prey species occurring on Nusa Tenggara Islands which plays very important role in influencing the ecosystem in the Nusa Tenggara Islands.

Therefore, the effort to conserve much needed given the trend decline in the population. Obstacles in efforts to conserve this species include a very limited basic data; because this bird is one of the species of birds of prey which is least known. Another important constraint is the lack of sufficient intensive monitoring, the lack of local human resource development, and low public support and the local government's efforts towards conservation of birds and their habitats.

Degradation of environmental quality that occurred in some ecosystems is the main cause of biodiversity decline in conservation areas. Natural habitat for various animals has been damaged so there is no shelter to find food and to reproduce. Request on flora and fauna unique to this area remains high. By collectors willing to pay dearly for various types of unique and rare animals and plants, one of which is a type of bird of prey, namely Flores Hawk-eagle.

(1) BIODIVERISTY ISSUES

International attention has focused on Flores Hawk-eagle, because it's one of the Critically Endangered species birds in Indonesia. Specific concern is the future of the Flores Hawk-eagle (which is considered by IUCN Red List, 2005) to be Critically Endangered Species birds, and the fate of various threat habitats within Newmont Nature Reserve, Besemak Forest Reserve and Batulanteh Protected Forest (because of their high biodiversity and concerns about trade and forest destruction). Many of the threats of Flores Hawk-eagle (and its habitat) and the degradation of environmental quality that occurred in some ecosystems is the main cause of biodiversity decline in conservation areas. Natural habitat for various animals has been damaged so there is no shelter, find food and reproduce. Request flora and fauna unique to this day remains high.

(2) SPECIFIC OBJECTIVES

Determine distribution and abundance of flores hawk-eagle along the West Sumbawa island (Newmont Nature Reserve, Bersamak Forest Reserve, and Batulanteh Protected Forest), To identify habitat types as well as to make inventory of threats facing the species and it is habitat in each location and To list other birs of prey species possibly occur at each location surveyed.

2. STUDY AREA

Sumbawa is an Indonesia island, located in the middle of the Lesser Sunda Islands chain, with Lombok to the west, Flores to the east, and Sumba furtger to the southeast. It is in province of West Nusa Tenggara. Sumbawa is 15,448 km^2 (three times the size of Lombok) with 1,5 million people with coverage 516.242 ha or (48.67%). It marks the boundary between the islands to the west, which were influenced by religion and culture spreading from India, and the region to the east was not so influenced.

Four principalities in western Sumbawa were dependencies of the Majapahit Empire of eastern Java. Because of Sumbawa's natural resources it was regularly invaded by outside forces - Japanese, Dutch, Makassarese. The Dutch first arrived in 1605, but did not effectively rule Sumbawa until the early 20th century. The Balinese kingdom of Gelgel ruled western Sumbawa for a short period as well. It was also home to the Sultanate of Bima. Historical evidence indicates that people on Sumbawa island were known in the East Indies for their honey, horses, sappan wood for producing red dye, and sandalwood used for incense and medications. The area was thought to be highly productive agriculturally.

Sumbawa is divided into 4 regencies and kota (city). They are: West Sumbawa Regency, Sumbawa Regency, Dompu regency, and Bima Regency. To the west is Alas Strait, Saleh Bay in the middle, the Flores Sea in the middle. There are a number of smller surrounding islands, most nitably Moyi Island, Sangeang Island and Komodo Islands to the east. The island lies within the Pacific Ring of Fire. It is a volcanic island, including Mount Tambora (8°14'41"S, 117°59'35"E) which exploded in 1815, the most destructive volcanic eruption in modern history (roughly four times larger than the 1883 eruption of Krakatoa, between Java and Sumatra, in terms of volume of magma ejected). The eruption killed as many as 72,000. It also apparently destroyed a small culture of Southeast Asian affinity, known to archaeologists as the Tamboran kingdom. It launched 100 cubic kilometers of ash into the upper atmosphere, which caused 1816 to be the "year without a summer.

3. SAMPLING METHODS AND FIELD VISITS

3.1. Cluster sampling

The clusters sampling method decribed in the distribution and abundance of Flores Hawk-eagle (Fuller and Mosher. 1997, in Pendleton *et al*. 1987) was followed for the present of birds on field survey. The main assumption on 'clusters' that they have a considerable distance, and each survey location are considered one unit sampling, because the location and distance on the sites a far and couldn't to be on one trip. The methods of determining the observation point (*point count*) in each sampling unit at the point of view towards the most optimum forest / or location with a view are spacious and the main assumption that every point of view is the different region and is not expected to overlapping.

Tabel 1. Survey points of the sampling site in Newmont Nature Reserve, Besamak Forest Reserve, and Batulanteh Protected Forest, West Sumbawa Island.

No	Location	Altitude (a.s.l.)	Coordinat Geographical	Status
I	**Newmont NR**			
1	Tonggo	>500	9° 0'26.64"S - 116°48'4.08"E	Nature Reserve
2	Aik Kangkung	>500	9° 2'6.02"S - 116°50'8.67"E	Nature Reserve
3	Lunyuk	>400	9° 4'15.58"S - 117° 4'38.28"E	Nature Reserve
4	Tatar	>500	8°57'38.31"S - 117° 9'54.87"E	Nature Reserve
5	Town Site	>450	8°59'16.89"S - 116°45'32.02"E	Nature Reserve
6	Sekongkang 1	>450	8°57'29.31"S - 116°46'1.81"E	Nature Reserve
7	Sekongkang 2	>400	8°58'1.02"S - 116°43'58.63"E	Nature Reserve
8	Sekongkang 3	>500	8°56'17.25"S - 116°45'34.68"E	Nature Reserve
9	Sekongkang 4	>500	8°58'2.99"S - 116°45'48.89"E	Nature Reserve
II	**Besamak PF**			
1	Maluk	>400	8°52'24.52"S - 116°50'39.31"E	Forest Reserve
2	Jereweh	>400	8°54'36.41"S - 117° 0'1.13"E	Forest Reserve
3	Brang Rea	>400	8°42'55.66"S - 116°58'11.46"E	Forest Reserve
4	Taliwang	>400	8°46'19.41"S - 116°54'3.34"E	Forest Reserve
III	**Batulanteh FR**			
1	Alas 1	>700	8°34'5.28"S - 116°56'41.84"E	Protected Forest
2	Alas 2	>700	8°33'28.84"S - 117° 1'49.59"E	Protected Forest
3	Marente	>750	8°32'57.72"S - 117° 0'5.61"E	Protected Forest

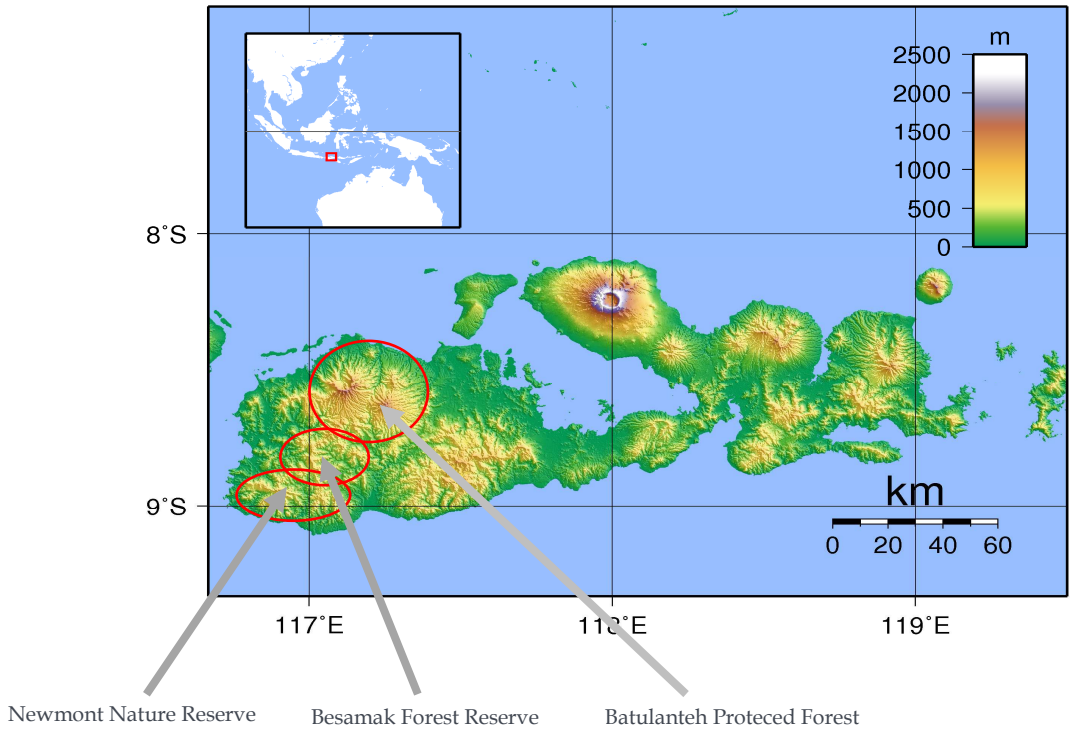
4	Batu Mega	>1000	8°37'44.52"S - 117° 2'29.72"E	Protected Forest
5	Buer	>600	8°29'41.72"S - 117° 3'2.71"E	Protected Forest
6	Sentigi	>650	8°27'22.18"S - 117°14'2.97"E	Protected Forest
7	Bedas	>750	8°29'38.72"S - 117°18'30.98"E	Protected Forest
8	Aik Bangku	>750	8°34'13.49"S - 117°19'30.95"E	Protected Forest
9	Sumbawa 148	>800	8°39'29.94"S - 117°21'52.85"E	Protected Forest
10	Sumbawa P2	>800	8°44'22.20"S - 117°17'15.09"E	Protected Forest
11	Sumbawa P3	>800	8°46'29.20"S - 117°11'35.79"E	Protected Forest

Remaks: **NR**-Nature Reserve **FR**-Forest Reserve **P**F-Protected Forest

3.2. Raptor Censusing

I visited the survey location for 15 days in November 2012. Newmont Nature Reserve, Besamak Forest Reserve and Batulanteh Protected Forest is encircled by one main road and there are several smaller roads and numerous tracks running through the interior,

Figure 1. Flores Hawk-eagles: habitat use and conservation



allowing access to almost the entire observation point. Data on the Flores Hawk-eagle were collected during surveys across the location following roads, tracks and forest trails, mostly on foot and sometimes using motor bikes. Flores Hawk-eagle proved to be the only resident eagle on the survey area and soaring made it relatively easy to detect. Upon encounter, data were collected on exact location and altitude, habitat and behaviour of the eagle (flight or perching behavior, etc). I recognized four distinct habitat types, which are detailed below:

- Lowland and cultivation forest. This consists primarily of *Fabceae, Meliacear, protiim javanicum, Schleichera oleosa, Barringtonia acutangula, Eugenia operculata, Eugenia polyantha, Artocarpus elasticus*.

- Sub-montane forest. Primary and secondary forest often with large *Dyospyros sp*, *Aquilaria caryota*, *Instia bijuga*, *Tetrameles nudiflora*, *Serianthes sp*., *Longersroemia speciosa*, *Eugunia subglauca*. .
- Montane forest. Dominated of *Achleichera oleosa*, *Alstonia spp*, *Tomarindus spp*

3.3. Threat assessment

A qualitative assessment was made of the state of the eagle's habitat and human altitudes towards it's conservation. Data were collected on threats to both the forest and birds, including logging, firewood, burning, deforestation, and gold mining, and the degree of nature protection and forest reserve offered.

Additionally, data on threats were collected through semi-structural interviews and direct observation, conducted in Bahasa Indonesia with people around in the forest (farmers, and regional district government). The interview focused on past and present abundance of Flores Hawk-eagle, threats to the eagle, whether there has been a change in its abundance and, if so, what the possible causes might be.

3.4. Analysis

Home range sizes of Flores Hawk-eagles were estimated with a polygon method by ploting all sighting of two pairs on a map (scale 1:25.000). Given the limited time available for mapping home ranges (1-2 days per pair) these are almost certainly under estimates, and as such provide only an indication of densities at which the species may occur.

All data were checked to determine whether or not they significantly departed from a normal distribution; if they did, data were transformed so as to approach a normal distribution more closely. The relationship between the contact time with eagles and the number of eagles recorded on the plot was explored with a simple linear regression model. The influence of habitat type on Flores Hawk-eagle distribution was assessed firstly by comparing characteristics of plots where the eagle was recorded with those where it was not. Secondly, the eagles' frequency relative to the four habitat types was assessed, using a distribution to test for differences in the distribution of records by habitat. Expected values were generated based on a random distribution of birds proportional to the amount of each habitat sampled.

4. RESULTS

(1) Identification and presence

Most of West Sumbawa people are Tau Samawa trible who mostly recognize any kinds of eagles. They named Flores Hawk-eagle as *Kangkang*. They also named a small number of eagles such as ***Kailang*** for Short toed Snake-eagle and other raptors. Generally, the people in Sumbawa rarely see Flores Hawk-eagle, because this species is very difficult to see and more living on the forest.

The presence of Flores Hawk-eagle has been recorded in 24 location (Table 2) most location are primary and secondary forest, except Newmont Nature Reserve are open landscape dominated of mountain forest (sub-montane and montane). The total number of this birds in the studied areas are **118** Individuals consisting of **58** Pairs, i.e: **22** pairs in Newmont Nature Reserve **12** pairs in Besamak Forest Reserve and **25** pairs in Batulanteh Protected Forest. The highest number of individuals recorded in Batulanteh Forest Reserve.

(2) Distribution and abundance

During the survey, I had 58 encounters with Flores hawk-eagle, or 1.1 ± 2.2 birds per day. The largest number of eagles observed in one day was four. Total visual contact time was 20 minutes per days. Flores Hawk-eagles were mostly observed as pairs (65%) and single birds (35%). Most were observed between 10hoo and 15hoo (Figure 3) and, generally, when the weathe was clear and sunny they could be seen soaring from afar. Hence, the Flores Hawk-eagle is an easily observable bird, allowing an accurate assessment of its presence.

The quantitative assessment of abundance using data of cluser sampling, where every unit sampling has a range on the 5-7 km² indicates that, in those sampling were the species presence was confirmed, 1.0 eagles per sampling were present a 1 pairs. There was a strong positive relationship the number of eagles in a sampling and total contact time with eagles and the number of eagle in a sampling and contact time per individual eagle. As the number of eagles per cluser sampling increase, the contact time with each individual eagle increase. Contact time per cluser sampling can thus be used a proxy for abundance in exploring habitat usage two adjacent pairs in the nort-westren part of the other sampling has a minimum home range of 3,5 km². Home ranges of all pairs were covered in a mixture of tall forest.

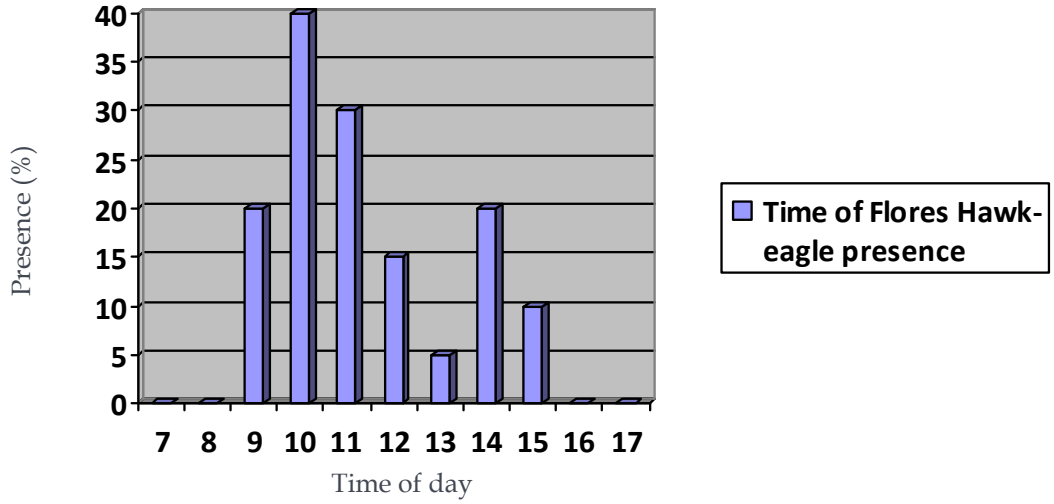


Figure 2. Distribution of time of first encounters with Flores Hawk-eagle *Nisatus floris* in Nopember 2012

(3) Habitat Use

Most eagles were observed in or above tall forest /or sub-montane forest (70%) and montane forest (25%) and cultivated land (5%). Birds were observed in or above forest. Even in areas where the forested hills bordered the cultivation forest very closely, soaring eagle did not once flying above the cultivation forest. Records of Flores Hawk-eagle in four habitat types (shrub and degraded forest) occur significantly never the present of birds and occur significantly more in tall forest (sub montane and montane forest). And the daily activity of this bird is perching (65%) and flying (35%). The Flores Hawk-eagles were recorded from sea level >700 m above sea level (a.sl.), and the elevation of unit sampling where the species was present (400 m a.s.l.) was significantly higher that of unit sampling where the species was absent. Whether

or not altitude present influences the distribution is not clear because, for instance, tall forests sampling (the species' preferred habitat) were situated are significantly higher elevations that the other habitat types combined. In unit sampling where the species' presence was confirmed, there was no correlation between the unit sampling altitude and number of eagle per unit sampling or altitude and contact time per sampling.this birds were frequently observed near village and distance to the forest or hamlet for sampling where the species was presence (400-700 m a.s.l.) was not different from that for sampling where the species was absent. For those sampling where the species was present, abundance showed correlation with the distance to nearest village. And the interview with local people, the birds has to hunting of the chicken in village.

(4) Threats

Newmont Nature Reserve, Besamak Forest Reserve and Batulanteh Protected Forest is approximately one-third covered in forest, with an additional covered in production forest, community forest and other forest-like plantations and rice field. Burning of the under growth and illegal trade occurs frequently in the community forest but also in, and surrounding, the strict nature reserve. Many of the larger trees in the community forest had recently been (illegally) logged, and illegal logging in the remaining natural forest was widespread. Since Flores Hawk-eagle do not seem to make use secondary forest, the two small off shore strict nature reserves are of no relevance to the protection of the eagle. Some good forest remained in the terrestrial forest reserve but it was completely surrounded by cultivated land. Access was open, collection of firewood was widespread. Of the 10 interviewees (all living around the bordered forest, average age 40-60 years), the Flores Hawk-eagle to be less common at present than in the past where and rare. Of the interviewees who could identify a possible cause of the decline, pointed as secondary causes deforestation and gold mining. In addition, the high couse of gold mining, both legal and illegal is one of the cousing factor on the Flores Hawk-eagle habitats.

(5) Population statistics

Based on the distribution of forest, the abundance of the Flores Hawk-eagle, and especially the distribution of displaying pairs,seem to be production forest that still offer good habitat. These sections are by and large covered in tall forest, with smaller sections in shrub and degraded forest. The largest of these situated in the central mountainous part and includes both the strict nature reserve and forest reserve.

The population of a species is not easy to count, especially by direct method, so some approaches were described to estimate the population of Flores Hawk-eagle in Flores Islands, one the approach which is based on the home range a pair within a certain area. Based on the distribution of forest, the abundance of the Flores Hawk-eagle, and especially

the distribution of displaying pairs, there all sections of the forest in and around at Batulanteh Forest Reserve and Newmont Nature Reserve that still offer good habitat. These sections are by large covered in tall forest, with smaller sections in scrub and degraded forest.

The largest of these measures some 50 km^2, is situated in the west mountainous part and includes both the strict nature reserve and community forest. To smaller sections are south section is a wide band of marginal habitat covering essentially all land >700 m a.s.l. this includes mostly shrub and degradation forest and community forest. The available habitat, both 'good' and 'marginal'. A working density of 1 pair per 3 km^2 for 'good' habitat and 1 pairs per 5 km^2 for 'marginal' habitat leads to a total population size of 30 pairs in Newmont Nature Reserve, Besamak Forest Reserve, and Batulanteh Protected Forest. If we add some 4-7 pairs for small forest patches not included in the above estimate and based on fine the nest active of Flores Hawk-eagle then taken a distance point between nest was only 2-3 km, the total population comprises some 66-78 paired adults.

Tabel 2. Population of Flores Hawk-eagle in Newmont NR, Besamak FR and Batulanteh PR, West Sumbawa

Observation Point	Total Individual			Estimated Pairs	Total Individual	Locations (view)	Other Raptors
	Pairs	Floater	Juvenile				
Newmont NR							
Tonggo	1	-	-	1	**2**	Nature Reserve	OHB, OSP, STE
Aik Kangkung	2	-	-	2	**4**	Nature Reserve	OHB, PF, STE
Lunyuk	2	-	-	2	**4**	Nature Reserve	OHB, STE
Tatar	1	-	-	1	**2**	Nature Reserve	OHB, STE, SK
Town Site	-	2	-	1	**2**	Nature Reserve	OHB, PF, STE, SK
Sekongkang 1	-	2	-	1	**2**	Nature Reserve	OHB, BK, STE, GFE
Sekongkang 2	-	2	-	1	**2**	Nature Reserve	OHB, BK, STE
Sekongkang 3	-	2	-	1	**2**	Nature Reserve	OHB, BK, STE
Sekongkang 4	1	-	-	1	**2**	Nature Reserve	OHB, BK, STE, CG
Besamak PF							
Maluk	1	1	-	1	**2**	Forest Reserve	OHB, CG, SK
Jereweh	1	1	-	1	**2**	Forest Reserve	OHB, CG, SK
Brang Rea	2	-	-	2	**4**	Forest Reserve	OHB, CG, SK
Taliwang	1	2	-	2	**4**	Forest Reserve	OHB, CG, SK
Batulanteh FR							
Alas 1	1	-	-	1	**2**	Protected Forest	OHB, CG, SK, BK
Alas 2	1	-	-	1	**2**	Protected Forest	OHB, CG, SK, BK
Marente	2	1	-	1	**2**	Protected Forest	OHB, CG, SK, BK
Batu Mega	4		-	2	**4**	Protected Forest	OHB, CG, SK, BK
Buer	-	1	-	-	**1**	Protected Forest	BK, SK
Sentigi	1	-	-	1	**2**	Protected Forest	BK, SK, CG
Bedas	1	-	-	1	**2**	Protected Forest	OHB, CG, SK, BK
Aik Bangku	1	-	-	1	**2**	Protected Forest	OHB, CG, SK, PF
Sumbawa 148	2	-	-	2	**4**	Protected Forest	OHB, CG, SK, PF
Sumbawa P2	1	-	-	1	**2**	Protected Forest	OHB, CG, SK, PF
Sumbawa P3	1	-	-	1	**2**	Protected Forest	OHB, CG, SK, PF
Total	**26**	**14**	**-**	**29**	**58**		

Remaks: OHB (Oriental Honey-buzzard), STE (Short toed snake-eagle), BK (Brhaminy Kite), SK (Spotted Kestrel), PF (Perigrine Falcon), OSP (Osprey), CG (Chinese Goshwak), GFG (Grey-headed Fish Eagle)

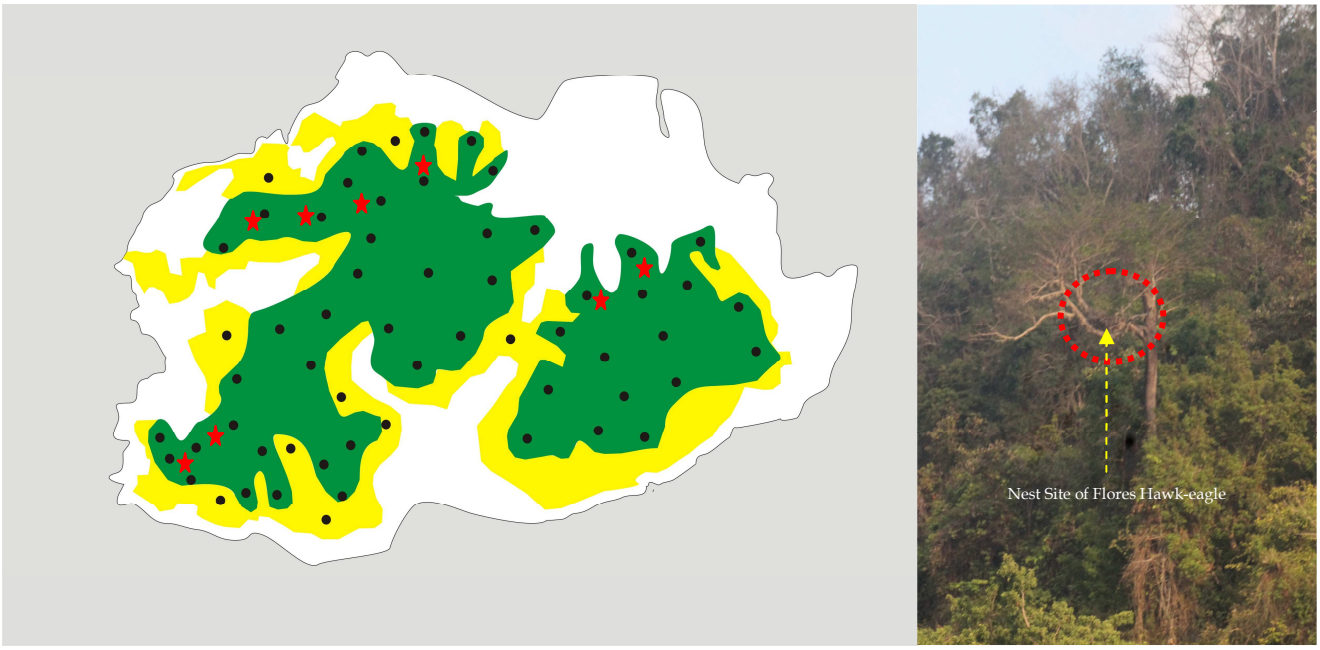


Figure 3. Distribution of Flores Hawk-eagle Nisaetus floris with an assessment of habitat quality. In green area areas covered in good habitat (nature reserve and forest reserve) and in yellow those with marginal habitat (production forest). Dots refer to sightings of eagle upon first encounter. And the red (★ is nest site of flores hawk-eagle.

Of the village of Jereweh, Brang Rea, and Taliwang (5 km²) and near Mount Besamak. Surrounding these sections is a wide band of marginal habitat covering essentially all land >400 m a.s.l. This includes mostly shrub and degraded forest and illegally and agricultural. The available habitat, both 'good' and 'marginal', there for total some aworking density of 1 pair per 3 km2 for good habitat and 1 pair per 5 km2 for 'marginal' habitat leads to a total population size of 29-35 pairs. If we add some 4-7 pairs for small forest partches not included in the above estimate, the total population comprises some 66-78 paired adults.

5. DISCUSSION

(1) Distribution and abundance

Although the present survey was short in duration (15 days), the big size of West Sumbawa and its accessibility combined with the ease of observation of the Flores Hawk-eagle allows a relatively accurate assessment of its distribution and abundance to be made. The eagle was observed in all parts of the forest and was recorded almost daily. The total number of this birds in the studied areas are **118** Individuals consisting of **58** Pairs, i.e: **22** pairs in Newmont Nature Reserve **12** pairs in Besamak Forest Reserve and **25** pairs in Batulanteh Protected Forest. The highest number of individuals recorded in Batulanteh Protected Forest.

(2) Threat assessment

Unlike the situation on 2002, where especially habitat loss and capturing eagles for the domestic per trade are the main threats to eagles, the most prominent threat to the Flores Hawk-eagle appears to be deforestation. However, the situation on 2012, the threat on Flores Hawk-eagle habitats are not visible, but a small proportion the habitat loss in community forest. Many of the larger trees in the community forest had recently been (illegally) logged, and illegal logging in the remaining natural forest was widespread on the gold mining.

More than half the interviewees who indicated that the Flores Hawk-eagle was experiencing a decline in abundance considered this a recent phenomenon. The coincided with illegally and legal gold mining conducting wildlife poaching in the forest area and the low a lack enforcement by forestry management to be the highest threat of Flores Hawk-eagle in their habitat.

Gold Mining on the Flores Hawk-eagle Habitats in Newmont Nature Reserve

(3) Population status and management

For comparison with the current population estimate, it is worthwhile assessing what the original population size of the Flores Hawk-eagle may have been. There are no indicators that the species occour on any other protected area in the Sumbawa Islands. If densities in these pristine conditions were 1,5 times as high as at present in 'good' habitat (i.e. 1 pair per 2-3 km^2 as they would probably reach higher densities is large, continous stretches of forest and persecution by human be absent), a maximum of a hundred pairs may have been present. Some 40% of this estimated original total remains.

(4) Other Raptor

During the survey, we found 7 (seven) other raptor, i.e: Short toes Snake-eagle, Bramhiny Kite, White-bellied Sea-eagle, Oriental Honey-buzzard, Chinese Goshwak, Perigrine Falcon, and Spotted Kestrel.

6. RESEARCH RECOMMENDATION

When planning for the habitat needs of wildlife species it is important that they be managed over large spatial and temporal scale, and that cumulative impacts of major industrial activities (gold mining) and natural disturbance be considered. the results of this research point to several specific management and research recommendations that could incorporated into lomg-term planning for forest harvesting and other industrial activities occurring in flores hawk eagle habitats.

Recommendation #1 – Conduct A long-term study of flores hawk-eagle during breeding biology.
One of the important periods in the life cycle of the Flores Hawk-eagle *Nisaetus floris* is its breeding periode. However, during this periode the eagles are very sensitive to any kind of disturbance from human activities.

Recommendation #2 - Collect nest distribution of flores hawk-eagle data with distance estimate on the gold mining areas (Newmont Nature Reserve).
Our results suggest that flores hawk-eagle distribution on the West Sumbawa, especially on the Newmont Nature Reserve distributed on the gold mining habitats. Population size, number of occurrences, distribution, threats to populations and threats to habitat. in support of this designation, mour study has show that flores hawk eagle are widely distributed with very low estimated densities and population size on the Newmont Nature Reserve. Similary, habitat attributes required by flores hawk-eagle are also preferred by the gold mining, indicating a potential threat.

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