FINAL REPORT

CONTINUED A SURVEY OF DISTRIBUION, POPULATION, HABITATS, AND ECOLOGICAL ASPECT OF FLORES HAWK EAGLE (*Nisaetus floris*) IN AND AROUND FLORES ISLAND, EAST NUSA TENGGARA, INDONESIA

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PROJECT AND CLIENT DETAILS

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Description of report	This Final Report describes key aspects of a study on distribution, population, habitats, and ecological aspect of Flores Hawk-eagle *Nisaetus floris* in and around Ruteng Nature Recreation Area and Mbeliling Forest Reserve, Flores Island, East Nusa Tenggara. In includes the following key outputs: The presence and abundance of Flores Hawk-eagle in and around Ruteng Nature Recreation Area and Mbeliling Forest Reserve with high results, where all's area surveyed has present and abundance of this birds.		

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Final Report of MBZ Species Conservation Fund

Distribution, Population, Habitat, and Ecological Aspect of Flores Hawk-eagle *Nisaetus floris* In and Around in Flores Island, East Nusa Tenggara, Indonesia

By: USEP SUPARMAN

ABSTRACT

The Flores Hawk-eagle *Nisaetus floris* is endemic and only found in Lesser Sunda (Flores, Sumbawa, and Lombok Island) where it is the Ctirically Endangered species diurnal raptor (IUCN Red List 2005). The continued survey of distribution, population, habitat, and ecological aspect of Flores Hawk-eagle *Nisaetus floris* was extended in East Nusa Tenggara (Flores Island) with grant support of MBZ Species Conservation Fund in 2011-2012. The study, aimed at determine of distribution and abundance of Flores Hawk-eagle and identify the habitat types as well as inventory level of main threats and knowledge of ecological aspect. The study area was focused in and around at Ruteng Nature Recreation Area and Mbeliling Forest Reserve. The habitat total of study were 47.245,60 (32.245,60 hectare in Ruteng Nature Recreation Area and 15.000 hectare in Mbeliling Forest Reserve). The total number of Flores Hawk-eagle in the studied is 126 individuals consisting of 63 pairs in Ruteng Nature Recreation Area and Mbeliling Forest Reserve. The Flores Hawk-eagle commonly occurs at elevation of >900 m a.s.l. in Ruteng Nature Recreation Area and >750 m a.s.l. in Mbeliling Forest Reserve while lower elevation <700 m a.s.l. is more dominated by Bonelli's Eagle *Hieraaetus fasciatus.* The habitat types is cultivation forest, sub-montane forest, and montane forest. Among the serious threat to the survival of the eagle are land use change, shifting cultivation, hunting practice by policemen, and collection of firewood and wood material for building and forest clearance for agriculture land.

Key words: Flores Hawk-eagle, *Nisaetus floris*, distribution, population, habitat, threat, ecology.

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Indonesia, April 2012
Best Wishes,

USEP SUPARMAN, *Chairman*
Raptor Conservation Society (RCS)

TABLE OF CONTENTS

Page

ACKNOWLEDGE ---------- 1
TABLE OF CONTENTS ---------- 2

1. INTRODUCTION ---------- 6
   1.1 BACKGROUND ---------- 6
   1.2 PROJECT CONTEXT ---------- 6
   1.3 OVERALL GOALS ---------- 7

2. STUDAY AREA ---------- 8
   2.1 RUTENG NATURE RECREATION AREA ---------- 8
   2.2 MBELILING FOREST RESERVE ---------- 9

3. SAMPLING METHODS AND FIELD VISIT ---------- 10
   3.1 RAPTOR CENCUSING ---------- 11
   3.2 THREAT ASSESSMENT ---------- 11
   3.3 ANALYSIS ---------- 11

4. RESULTS ---------- 12
   4.1 IDENTIFICATION AND PRESENCE ---------- 12
   4.2 DISTRIBUTION AND ABUNDANCE ---------- 12
   4.3 HABITAT USE ---------- 13
   4.4 THREATS---------- 14
   4.5 POPULATION ---------- 14
   4.6 ECOLOGY ASPECT ---------- 17

5. DISSCUTION ---------- 17
6. RECOMENDATION ---------- 18

1. INTRODUCTION

1.1 BACKGROUND

Biodiversity conservation in Flores Island, was established in 1993 as an integrated conservation and development project (ICDP). It encompasses 32,000 ha of protected forest and 56,000 ha of buffer zone. The park preserves some of the best submontane and montane forests on the Flores Island and many important biological species such as endemic Komodo rats, endemic cave bats, birds, monkeys, wild boar, civets, asian cobras, and Russell's vipers are found here. The terrain within the park is rugged, with seven volcanic ridges ranging in elevation from 900 to 2,400 m. Two-thirds of these slopes have a grade of greater than 40%, creating a vital watershed for the district capital and surrounding villages and farms. Due to varying degrees of forest protection within the park, watersheds have faced deverential degrees of forest degradation.

The Millennium Ecosystem Assessment (MEA) finds that human have altered biodiversity and ecosystems more rapidly in the past 50 years than at any other time in human history (MA 2005a). The MA also concludes that the drivers of change show no evidence of decline and in many cases will increase in intensity. In addition to losses in globally important biodiversity, these changes severely endanger the flow of socially valuable goods and services that people depend upon for well-being. For example, healthy ecosystems provide society with food, Weber, and fodder; regulate air, water, and diseases; supply soil and biomass; and are spiritually valuable to many cultures. The loss of these goods and services hits hardest at the poor in developing countries because they are heavily dependent on natural systems and lack the resources to protect themselves from ecosystem changes.

1.2 PROJECT CONTEXT

In general, birds especially raptors can be used as the best indicators 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.

Flores Hawk-eagle is 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).

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.

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 Ruteng Nature Recreation Area and Mbeliling Forest Reserve (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.

1.3 THE OVERALL GOALS ARE:

This activity is intended to realize the conservation effort of the Critically Endangered species in Flores Island, East Nusa Tenggara, Indonesia. And the goals is:

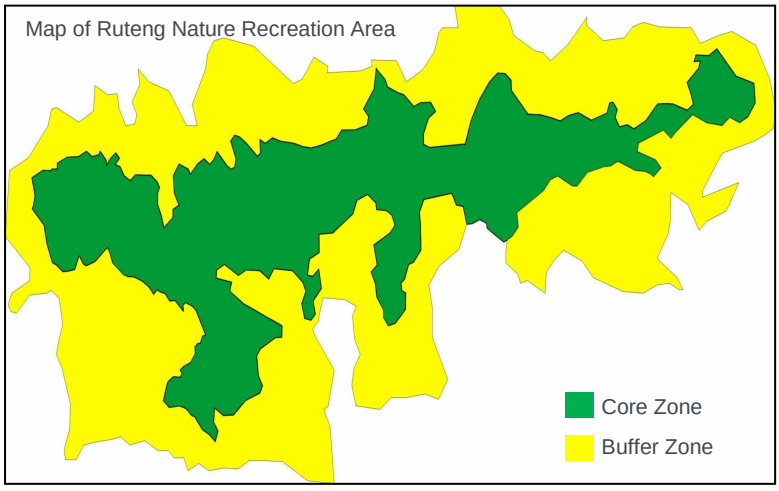
1. To collect data of distribution, and abundance, habitat use, and ecological aspect of Flores Hawk-eagle *Nisaetus floris* inhabiting conservation areas and other protected areas in and around Ruteng Nature Recreation Area and Mbeliling Forest Reserve.
2. To identify habitat types as well as to make inventory of threats facing the species and it is habitat in each location.
3. To list other birs of prey species possibly occur at each location surveyed.
4. To increase public awareness and to encourage involvement of many parties on conservastion effort of raptors and its habitats.

2. STUDY AREA

The present study area is Nusa Tenggara (Lesser Sunda) Island are stretch in the most south Wallacea region that are biodiversity poorly known. Most of the natural researches were done in 18th century to the early 1900's (Monk *et al*. 1997), and for the first time in 1990's several researches on biodiversity were conducted; such as research in Ruteng by Forestry Departement and Indonesia Institute of Science (LIPI), research on birds by BirdLife International-Indonesia Programme, and research on tree species by Bogor Agricultural Institute (IPB).

2.1. RUTENG NATURE RECREATION AREA

Ruteng Nature Recreation Area (TWA) is an Flores Islands, located in the central Manggarai district, East Nusa Tenggara province, on elevation is 500-2.350 m a.s.l. The first status of this area is: protected forest with coverage 17.876 hectare and production forest is 14.388 hectare, because the environment unique was appointed of integrated conservation area as a Nature Recreation Area 32,264 hectare (SK Menhut No.456/Kpts.II/1993, dated August 24, 1993). The purpose of integrated conservation management is maintain of biodiversity sustainability on the trofical forest ecostyem in the world's to provide of local people economical benefit. In 1995-2020, the Ruteng Nature Recreation Area have a management action plan, and the priority management is biodiversity research. The diversity of flora and fauna on this area is 252 species plan, 21 species of mammals, 9 species of reptiles, 13 species of amphibians, and 65 species of birds (7 species endemic) (*Eka Pratama PT. Citra Gems and LIPI, 1994*).



The geographic is 8°30' - 8°42' Southern and 120°15' - 120°50 Western. The total area is 2.245,6 hectare or 0,45% on Manggarai district (7.136,40 km^2), from the south at about 15 km and 35 km from the north. This is an area of the mountain range as Ruteng Mountain. Consists of seven peaks, ie: Ranamese with the height 1,790 m a.s.l., Poco Nembu 2,030 m a.s.l., Poco Mandosawu 2.350 m a.s.l., Poco Ranaka 2.140 m a.s.l., Poco Leda 1.990 m a.s.l., Ponte Nao 1.920 m a.sl., and Golocurunumbeng 1.800 m a.sl. Most of the Ruteng Nature Recreation Area (TWA) is an area with a height 1,000 m a.s.l. With topography state bumpy, steep, and not flat, and has a 40% more than steepness (LIPI 1994). The main habitat types are cultivation sub tropical forest with high a 500 - 2.350 m elevation. The habitat types is: (1) secondary forest with the domination trees is *Eucalyptus urophylla* and *Calliandra calothyrsus:* (2) lowland forest with the domination trees is *Artocarpus*; (3) sub montane forest with the domination trees is *Syzgium, Prunus* and *Elaeocarpus*; and (4) montane forest with the domination trees is *Podocarpus imbricatus* and *Prunus arborea. (Forestry Department, 1995)*.

Ruteng Nature Recreation Area with bordered is 57 village on 9 sub-district at central Manggarai. The total population is 133.175 people living around in Manggarai district. The rural economy is based on agriculture (86%), and shifting cultivation is still practiced throughout around in Manggarai district. Although paddy rice is cultivated in some lowland areas, less than 2% of the arable land is suitable for irrigation. Farming system is largely based on maize and cassava as the staple crops. In drier areas, maize is replaced with sorghum or millet as the principal grain. Extensive grazing of livestock (cattle, water buffalo, goats, and sheep) is practiced throughout the region. A variety of forestry and horticultural species (tamarind, candlenut, coffee, cacao, etc.) are an important source of income, particularly during the frequent far mines and a crop shortfall, which occurs during periods of drought, small industries, and tourism are increasingly important sectors of the economy.

2.2. MBELILING FOREST RESERVE

Mbeliling Forest Reserve located in the west Manggarai district, East Nusa Tenggara province, on elevation 500-1.230 meter above sea level. This area which spans over an area of 15,000 hectares, is the habitat of numerous endemic plant species and birds. The height of mount Mbeliling Forest Reserve is 1,230 m above sea level and the topography state bumpy, step, and not flat, and has a 40% more than steepness. The main habitat types are lowland forest, cultivation forest and sub-montana forest with the height 600-1.230 meters above sea level with domination of trees *Eucalyptus urophylla, Calliandra calothyrsus, Artocarpus, Syzgium, Prunus, Elaeocarpus, Podocarpus imbricatus* and *Prunus arborea.* The mountain is located only 20 km away from Labuan Bajo on the Transflores 'highway'.

Mount Mbeliling Forest Reserve with bordered is 27 village on sub-district at West Manggarai. The total population is 33.000 people, as well as buffer of water spring. The rural economy is based on agriculture, and shifting cultivation is still practiced throughout around in Mbeliling Forest Reserve. A variety of forestry and horticultural species (tamarind, candlenut, coffee, cacao, etc) are an important source of income, particularly during the frequent far mines and a crop shortfall, which occurs during periods of drought, small industries, and tourism development are main potential by local people around in Mbeliling, because as has tourist attraction and culture, one of all is bird watching tour.

3. SAMPLING METHODS AND FIELD VISITS

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/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 and around Ruteng Nature Recreation Area and Mbeliling Forest Reserve.

QN	Ref.	Location	Alt (m)	Coordinat Geographical	Status
1	R-1	Lunggar	1350	8°41'50.99"S - 120°27'16.14"E	NRA
2	R-2	Ulumbu	1370	8°43'17.93"S - 120°27'55.55"E	NRA
3	R-3	Carep	1300	8°37'16.96"S - 120°29'47.38"E	NRA
4	R-4	Robo	1330	8°37'9.97"S - 120°31'20.50"E	NRA
5	R-5	Poco Ranaka	2140	8°38'12.74"S - 120°31'45.78"E	NRA
6	R-6	Tontoda	1340	8°37'14.87"S - 120°26'18.09"E	NRA
7	R-7	Golo Lusang	1300	8°39'14.64"S - 120°28'6.72"E	NRA
8	R-8	Danau Ranamese	1320	8°38'31.81"S - 120°33'33.91"E	NRA
9	R-9	Lento	1250	8°41'37.16"S - 120°33'38.01"E	NRA
10	R-10	Todo	1100	8°39'22.24"S - 120°22'17.50"E	NRA
11	R-11	Cancar/Wae Leang	1005	8°38'33.75"S - 120°19'45.87"E	NRA
12	R-12	Panglembor	1300	8°40'43.15"S - 120°18'4.86"E	NRA
13	R-13	Rangga Lembor	1270	8°42'30.21"S - 120°16'41.80"E	NRA
14	R-14	Waerebo-1	1360	8°48'46.36"S - 120°18'3.94"E	NRA
15	R-15	Waerebo-2	1200	8°47'0.64"S - 120°21'29.05"E	NRA
16	M-16	Melo	710	8°35'21.18"S - 119°59'24.26"E	FR
17	M-17	Cecer	700	8°36'16.31"S - 119°57'53.76"E	FR
18	M-18	Puarlolo	800	8°36'30.52"S - 120° 1'4.68"E	FR
19	M-19	Wae Wuul	700	8°38'3.61"S - 119°50'45.67"E	FR
20	M-20	Tabedo	700	8°31'29.97"S - 119°57'49.70"E	PF
21	M-21	Roi	700	8°30'19.03"S - 119°58'54.46"E	PF
22	M-22	Rareng	700	8°31'1.15"S - 120° 0'21.16"E	PF
23	M-23	Wate	700	8°28'29.01"S - 120° 0'50.00"E	PF
24	M-24	Terang	650	8°37'49.66"S - 120° 2'16.89"E	P F
25	M-25	Werang	600	8°41'48.54"S - 120° 0'43.71"E	F R
26	M-26	Cunca Rame	750	8°37'17.01"S - 120° 0'21.82 "E	FR
27	M-27	Cunca Lolos	750	8°36'55.12"S - 120° 0'42.3 6"E	FR
28	M-28	Sanongoang	750	8°41'3.62"S - 119°57'57.28 "E	FR

Remaks: **NRA**-Nature Recreation Area **FR**-Forest Reserve **P**F-Protected Forest

3.1 RAPTOR CENCUSING

I visited the survey location for 28 days in February-March 2012. Ruteng Nature Recreation Area and Mbeliling Forest Reserve is encircled by one main road and there are several smaller roads and numerous tracks running through the interior, 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/perching behavior, etc). I recognized four distinct habitat types, which are detailed below:

- Lowland and cultivation forest. This consists primarily of *Aleurites moluccana* , *Eucalyptus urophylla*, *Callianra calothyrsus*, and *Artocarpus*.
- Sub-montane forest. Primary and secondary forest often with large Lempang Paji *Ehretia timorensis*, Uluwae *Knema cinerea*, Nggalakleleng *Elaeocarpus* sp., Gololalong *Prunus* Sp., and Mona *Litsea* Sp.
- Montane forest. Dominated by *Podocarpus imbricatus* and *Prunus arborea*

3.2 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 hunting, and the degree of protection the nature recreation area 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 governmental officials (forestry department). 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.

3.3 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

4.1 IDENTIFICATION AND PRESENCE

Most of the people in Manggarai, Flores Islands (locally called 'Ngada') mostly recognize any kind of eagle. They named Flores Hawk-eagle as ***Ntangis***. They also name a small number of eagles such as ***Jumburiang*** for Bonelli's Eagle *Hieraaetus fasciatus.* Generally, the people in Flores rarely see Flores Hawk-eagle, because this species is very difficult to see and more living on the forest and there are no records of hunting on the village, but the more dominant Bonelli's Eagle *Hieraaetus fasciatus* are often flying on the rice field and villages to hunt for domestic chickens. It means that the presence of Flores Hawk-eagle is rarely known by people.

In general, Flores Hawk-eagle has different characteristic compared to other eagles, they have collared feather all over, including head and belly to the lower part, and five black stripes on the tails. When perching, the white color of this birds seen contrast and also when flying above canopy or on sky. There is a black contrast line on the tip of the wing. Based on the field observation, Flores Hawk-eagle are often seen flying together (pair), and rarely flying alone. This maybe happen because during our observations (February-March) are the period in which territory is being maintained.

The presence of Flores Hawk-eagle has been recorded in 28 location (Table 2 & 3) most location are primary and secondary forest, except Ruteng Nature Recreation Area are open landscape dominated of mountain forest (sub-montane and montane). The total number of this birds in the studied areas are 126 Individuals consisting of 63 Pairs, i.e: 36 pairs in Ruteng Nature Recreation Area and 27 pairs in Mount Mbeliling Forest Reserve. The highest number of individuals recorded in Ruteng Nature Recreation Area (Ulumbu, Poco Ranaka, Tontodo, Panglembor, Waerebo 1, Waerebo 2), and Mbelling Forest Reserve (Sanongoang, Tobedo, and Cunca Lolos).

4.2 DISTRIBUTION AND ABUNDANCE

A bird survey was conducted from February till March 2012 in and around Ruteng Nature Recreation Area and Mbeliling Forest Reserve (central and western Manggari district). The site include lowland forest which provide habitat for Flores Hawk-eagle. A total 280 hours (*10 hours per day*) were spent in 28 survey sites. The survey area covered different habitat types such as; lowland forest, cultivation forest, sub-montane forest and montane forest. A total of 126 Individual (63 pairs) of Flores Hawk-eagle were recorded from the study area representing.

The quantitative assessment of abundance using data of cluser sampling, where every unit sampling has a range on the 5-7 km^2 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 km^2. Home ranges of all pairs were covered in a mixture of tall forest.

4.3 HABITAT USE

Most eagles were observed in or above tall forest/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%).

Flores Hawk-eagles were recorded from sea level >900 m above sea level, and the elevation of unit sampling where the species was present (600 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.

Flores Hawk-eagles were frequently observed near village and distance to the forest or hamlet for sampling where the species was presence (200-500 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 no correlation with the distance to nearest village. And the interview with local people, the birds has to hunting of the chicken in village.

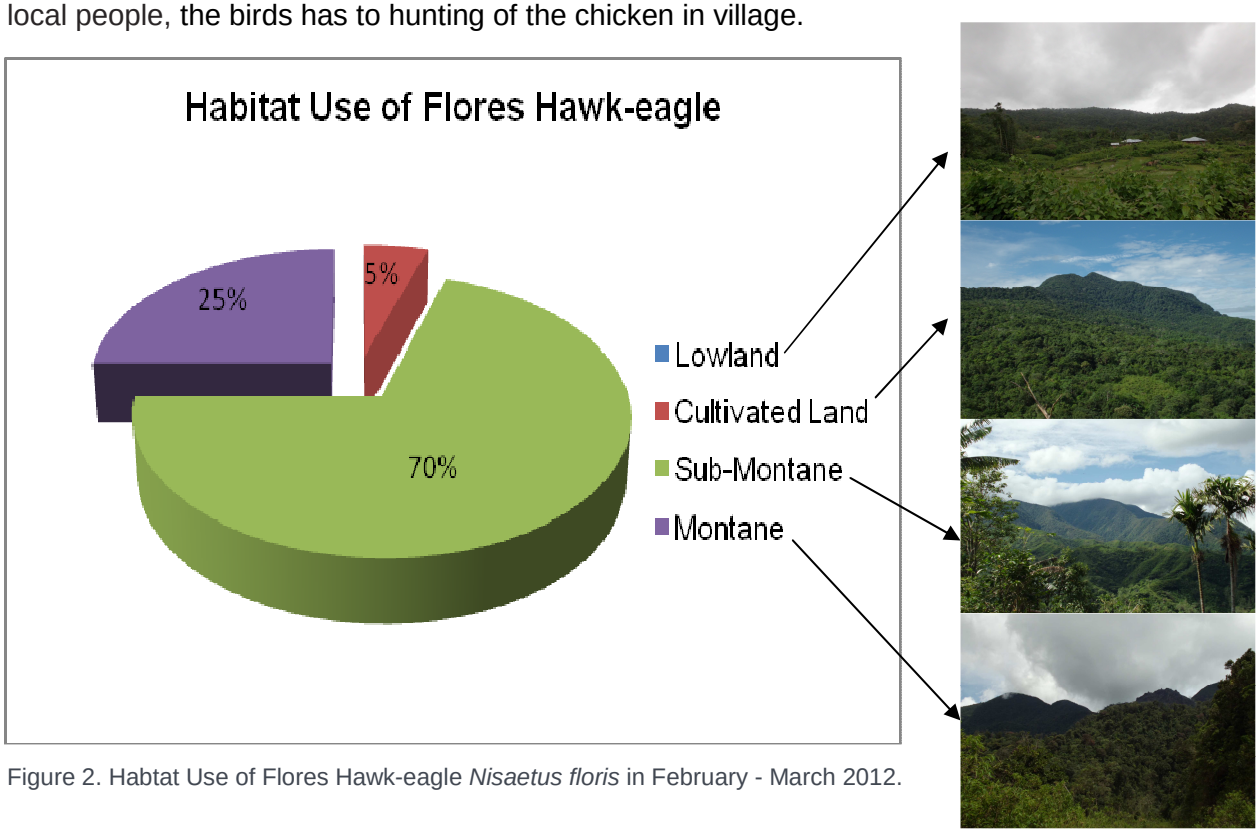


Figure 2. Habtat Use of Flores Hawk-eagle *Nisaetus floris* in February - March 2012.

THREATS

Ruteng Nature Recreation Area and Mbeliling Forest Reserve 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 nature reserve but it was completely surrounded by cultivated land. Access was open, collection of firewood was widespread. Of the 23 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 logging. During the surveys in the forest, 1 man without hesitation to an increase in (recreation) hunting of dears, pigs and birds (pigeon). The hunting activity are often carried out by some parties are a hobby activity. Informed from local people aroung in the forest area, hunting activities are monstly of the policemen on weekend.

4.4 POPULATION

Based on the distribution of forest, the abundance of the Flores Hawk-eagle, and especially the distribution of displaying pairs, there seem to be three sections of the island 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 the wildlife reserve. Two smaller sections are south of the village of Cancar and near Mount Sanarmese. Surrounding these sections is a wide band of marginal habitat covering essentially sub-montane forest >900 m a.s.l. This includes mostly rain forest.

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 Ruteng Nature Recreation Area and Mbeliling Forest 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 Ruteng Nature Recreation Area and Mbeliling Forest Reserve. 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 60-70 paired adults.

Tabel 2. Population of Flores Hawk-eagle in and around Ruteng Nature Recreation Area, Central Manggarai, Flores Islands

Observation Point	Total Individual			Estimated Pairs	Total Individual	Locations (view)	Other Raptors
	Pairs	Floater	Juvenile				
Lunggar	2	-	-	2	**4**	Poco Leok NR	RBE
Ulumbu	3	-	-	3	**6**	Poco Leok NR	RBE, MK
Carep	2	-	-	2	**4**	Poco Ranakah NRA	RBE,CG
Robo	2	-	-	2	**4**	Poco Ranakan NRA	BE. MK
Poco Ranaka	2	1	-	3	**6**	Poco Ranakah NRA	BE, MK
Tontoda	2	1	-	3	**6**	Poco Mandawawu NR	RBE, MK
Golo Lusang	2	-	-	2	**4**	Golo Lusang NR	RBE
Danau Ranamese	2	-	-	2	**4**	Poco Ranakah NRA	MK
Lento	2	-	-	2	**4**	Poco Ranakah NRA	RBE, MK, BK
Todo	2	-	-	2	**4**	Sanarmese NR	RBE, MK, BK
Cancar	2	-	-	2	**4**	Sanarmese NR	MK
Panglembor	2	1	-	3	**6**	Sanarmese NR	RBE, MK
Rangga Lembor	2	1	-	2	**4**	Sanarmese NR	RBE, MK
Waerebo 1	2	1	-	3	**6**	Sanarmese NR	RBE, MK, CG
Waerebo 2	3	-	-	3	**6**	Sanarmese NR	RBE, MK, CG
Total	**32**	**5**	**-**	**36**	**72**		

Remaks: MK (Molucan Kestrel); RBE (Rofous Bellied-eagle); CG (Chinese Goshawk); BE (Bonelli's Eagle)

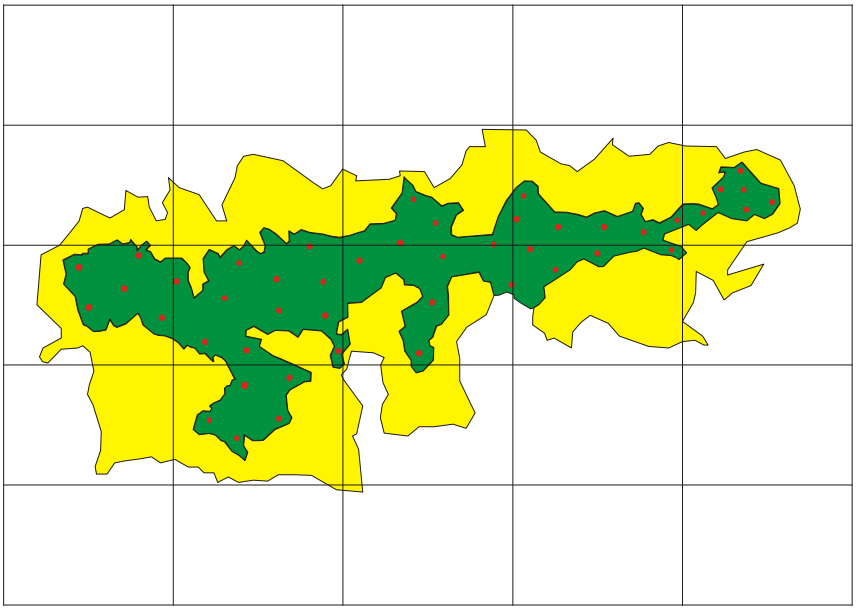


Figure 1. Map of distribution and abundance of Flores Hawk-eagle in and around Ruteng Nature Recreation Area, Central Manggarai, Flores Island.

Tabel 3. Population of Flores Hawk-eagle in and around Mbeliling Forest Reserve

Observation Point	Total Individual			Estimated Pairs	Total Indivual	Locations (views)	Other Raptors
	Pairs	Floater	Juvenile				
Melo	1	-	-	1	**2**	Mount Mbeliling FR	CG, BE
Cecer	1	-	1	1	**3**	Mount Mbeliling FR	BE, MK
Puarlolo	1	-	-	1	**2**	Mount Mbeliling FR	BE
Wae Wull	2	-	-	2	**4**	Mount Mbeliling FR	BE
Tabedo	2	1	-	3	**6**	Mount Mbeliling FR	BE
Roi	2	-	-	2	**4**	Mount Mbeliling FR	BE, RBE
Rareng	2	-	-	2	**4**	Mount Mbeliling FR	BE, GHFE
Wate	2	-	-	2	**4**	Mount Mbeliling FR	BE, GHFE
Terang	2	-	-	2	**4**	Mount Mbeliling FR	BE, MK
Werang	2	1	-	3	**4**	Mount Mbeliling FR	BE
Sanongoang	3	-	-	3	**6**	Mount Wai Sano FR	BE, MK
Cunca Rame	2	-	-	2	**4**	Mount Mbeliling FR	BE, MK
Cunca Lolos	2	1	-	3	**6**	Mount Mbeliling FR	BE, MK
Total	**24**	**3**	**1**	**27**	**53**		

Remaks: CG (Chinese Goshawk); BE (Bonelli's Eagle); MK (Moluccan/Spotted Kestrel); GHFE (Grey Headed Fish-eagle)

Figure 2. distribution and abundance of Flores Hawk-eagle in and around Mbeliling Forest Reserve. Western Manggarai, Flores Island.

4.5 ECOLOGYCAL ASPECT

There are interesting ecological aspects of Flores Hawk Eagle such us, every flying these birds are often pairing - maybe this behavior is often shown during maintaining of territory. In addition, the eagles were often seen perching (65%) than flying (35%). They perched for 1-5 hours. The eagles often appear to fly when temperature is favorable with not strong wing (10.00 to 11.00 in the morning and 15.00 to 16.00 in the afternoon).

Similar to others raptors (Javan Hawk-eagle and Changeable Hawk-eagle). The Flores Hawk-eagle when flying more flopping and soaring until they reach certain altitude to make gliding. While, the hunting behavior was to hunt on open areas in the villages to capture of the chicken. A case study on 2008 around Mbeliling Forest Reserve (Cecer Village), the farmer cought of Flores Hawk-eagle when the birds capture of chicken.

5. DISCUSSION

Identification and presence

The local people in Manggarai, Flores Islands (locally called “Ngada”) mostly any kind of eagle. They named of Flores Hawk-eagle as ***Ntangis***. 28 location has been recorded of Flores Hawk-eagle in central Manggarai (Ruteng Nature Recreation Area), and western Manggarai (Mbeliling Forest Reserve). The presence of this bird a most location are primary, secondary and cultivation forest and dominated on sub-montane forest. The highest number of individual are recorded in Ulumbu, Poco Ranaka, Tontodo, Panglembor, Waerebo, Sanongoang, Tobedo, and Cunca Lolos.

Distribution and abundance

The distribution and abundance of Flores Hawk-eagle in Ruteng Nature Recreation Area and Mbeliling Forest Reserve, Flores Island is 103 individual. Flores Hawk-eagle are most common in sub-montane forest that are adjacent to cultivation forest where Flores Hawk-eagle are abundance.

Region closest to Mbeliling ara influenced to some degree by the habitat types and milder weather condition; thus, flores hawk-eagle may be more common in these regions because of milder weather an more accessible for hunting of prey. Conversely, Flores Hawk-eagle distribution in regions central of the Flores (Ruteng Nature Receation Area) appear to be limited by moren severe continental trofical forest conditions, which result in a shorter breeding season. Areas with densest populations of Flores Hawk-eagle of the western Manggarai (Mbeliling Forest Reserve) also may be more diverse and seasonally vulnerable prey bases than the majority of cultivation forest.

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.

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 hunting activities by police officers 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. Although, the hunting acitivies are not focused of eagle, but could be impact of the eagles.

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 Flores 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.

Other raptor

During the survey, we found 6 (six) other raptor, i.e: Bonelli's Eagle, Rofous Bellied-eagle, Moluccan/Spotted Kestrel, Grey Headed Fish-eagle, Brahminy Kite, and Chinese Goshawk.

6. RECOMENDATION

- Sustainability survey of Flores Hawk-eagle in and around Sumbawa Island, West Nusa Tenggara;
- Nest search and protection of Flores Hawk-eagle at each locations has been a survey to supporting the ecology data and actual population per years;
- Strengthening of Regional Agency for the Conservation of Natural Resource (BKSDA) officers/staffs and local people around forest boundary with Raptor Identification Training;
- Development of environmental education related to target species conservation and awareness media (leaflet, brochure, poster, etc);

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