

**FAUNA SURVEY AT NICKEL EXPLORATION AREA
OF PT GERBANG MULTI SEJAHTERA WIA WIA PROJECT,
SOUTH KONAWE DISTRICT, SOUTH EAST SULAWESI
PROVINCE**



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INTRODUCTION

Background

PT. GERBANG MULTI SEJAHTERA (GMS) has licensed area statement of exploration around 2588 ha at Wia-Wia area, Laonti subdistrict, Konawe Selatan District, South East Sulawesi Province. Nickel mining activities should not orient towards technical or economical aspects only, but also should consider ecological aspects. PT GSM has made commitment to minimize the negative impacts on environment at the initial stage of its exploration plan.

PT GMS will follow all regulations in Indonesia such as that concerning Biodiversity Convention and other regulations concerning impact assessments. In practice, PT GMS started with fauna survey at the project area to collect information and data in relation to fauna present at the property since beginning of the exploration project.

Sulawesi is one of the Wallacea archipelago, which it have typical faunas is influenced by fauna of Oriental and Australian. But the Sulawesi island is present many endemic species of wildlife different with both regions.

Objective of the Study

The fauna survey at the exploration area of PT GMS at Wia-Wia Project s to gain

1. Basic information and data are related with species diversity of wildlife at the site area
2. Local distribution and abundances of wildlife
3. The status of wildlife at site study

STUDY AREA

The nickel mining exploration concession area of PT. GERBANG MULTI SEJAHTERA (GMS) is located at Wia Wia kampong, Southeastern part of the South East of Sulawesi Province at ($8^{\circ}26'45''$ - $8^{\circ}47'00''$ latitude south and $112^{\circ}20'245''$ - $114^{\circ}36'00''$ longitude east). The topography of the project area is mostly mountainous. Very few at the property have flat area and many slope were mostly more than 45 %.

The project area is dissected by numerous small streams and the width around 2- 4 m. The drainage pattern of the rivers was dendritic. All of the river at GMS concession flow to the East direction and joint with Banda Sea.

The climate conditions is wet for about 7 months (>200 mm rainfall) and dry (<100 mm rainfall) for about 4 months of the year. The average annual precipitation was around 2.353 mm and the average rainfall days each year was around 117 days. The less precipitation was from October to December. Annual average temperature was 27.5°C and average humidity was around 85 %.

The soil at the project area have texture sandy loamy with red brown color. Soil physically was crumb and soil deep is shallow. The soil chemists at project area were classified a fertile soil.

The exploration area was developed on current vegetation mostly low land forest. Forest type of the project area can divided such as beach forest, low land forest at hilly area. Vegetation occurs at beach forest such as *Hibiscus tilliaceus*, *Callophyllum inophyllum*, and *Terminalia catappa*. The dominant vegetation at low land forest are, *Casuarina sumatrana*, *Gironiera subaqualis*, *Syzygium laxiflorum* Besides natural vegetation, coconut plantation and *Anacardium occidentale* were planted at surrounding the property.

Wildlife habitat types at the property are low land forest and coconut and *Anacardium occidentale* plantation also home garden.

METHODS

Location and Time

The study was conducted at PT GMS exploration area in Sangi-Sangi village, South Konawe District. At least nine days for get data and information related to wildlife diversity, from 21 – 29 November 2008. The observations were focused at forested area of Wia-Wia area, Sangi-Sangi village. The location of sample plot is mostly covered by tropical low land forest at hill area.

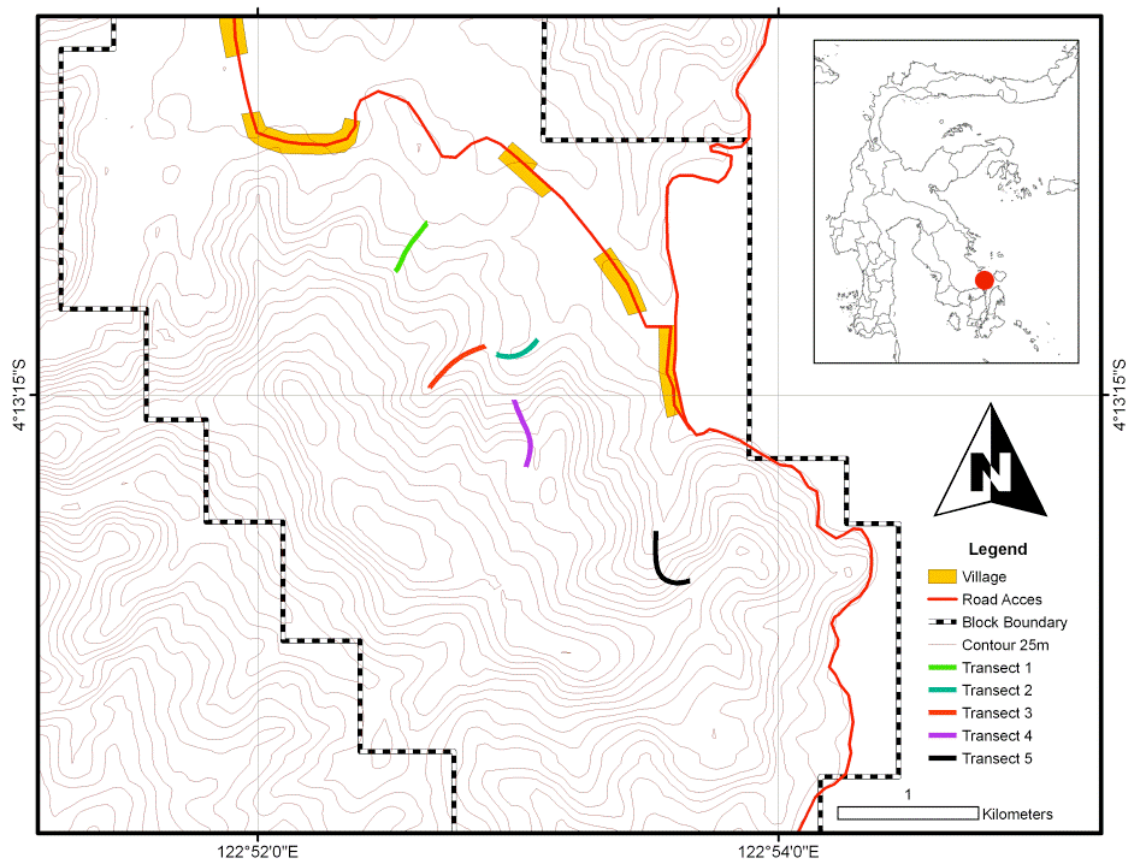


Figure 1. Wia-Wia Fauna Transect Sampling Site

Sample plot was selected from Wia-Wia project area 5 transects. The position of transects were recorded at table..

Table 1. Position of sample plot at PT GMS concession area

No	Transect	Coordinate Position	
		Latitude South	Longitude East
1	Transect 1	04° 12' 35.5"	122° 52' 39.0"
2	Transect 2	04° 12' 59.2"	122° 53' 06.3"
3	Transect 3	04° 13' 03.9"	122° 52' 52.2"
4	Transect 4	04° 13' 16.0"	122° 52' 59.2"
5	Transect 5	04° 13' 52.0"	122° 53' 34.3"

Equipment and Materials

Tools were used in this survey: Map of GMS concession area, GPS, compass, chronometer, binocular, tele-lens camera, and field guide to the birds of Wallacea (Coates B. J and D. Bishop, 1997), mist net and cage trap for rat.

Methods

The wildlife inventory was carried out by transect method combination with IPA count for birds. Five transect were made at Wia-Wia area. The Length each transect is 500 m. The counting of individual numbers was based on direct visual contact or the animal track. Besides direct observation to wild animal, interview with local people was done to know about fauna occur at project area.

Besides direct and indirect observation, cage trap for rat (20 piece) also was used to help on identification which the animal are difficult to get direct contact.

Bird Census

Five transects of 500 meter length in each, has been laid out the low land forest hill area of Wia-Wia area. At 100 m intervals along each transect, all bird calls or sightings within 100 m from the observer were recorded over 20 minute periods. This provided a quantitative measure of the relative abundance of species. Daily species lists have been prepared as an indication of the comprehensiveness of the inventory: fewer species will be added as the total list becomes more complete.

Interviews

Semi-structured interviews with local guides/inhabitants provided information to make more completely the data.

Data analysis

Data from the bird censuses were used to calculate the following ecological measures:

Species Diversity Index

The Shannon index (Magurran 1988) describes bird species diversity along the different transects:

$$H = -\sum p_i \ln p_i$$

in which p_i is the number of individuals of species divided by the total number of individuals. Species diversity is influenced by its components Species Richness (number of species in the sample) and Evenness (also called Equitability). The following formula was used:

$$E = H/H_{\max}$$

in which $H_{\max} = -\log 1/n$ (n = number of species in the sample).

Similarity indices

The Jaccard similarity index (S) (in Mueller-Dombois & Ellenberg 1974) shows the change in species composition among different samples (i.e., along the different transects):

$$S = c / a+b+c$$

in which a and b are numbers of species unique to samples 1 and 2 respectively, and c is species common to both.

Dendrogram was used for analysis clustering birds community in each habitat at sampling site. Minitab SPSS 14 was used on help process clustering analysis.

RESULTS AND DISCUSSION

RESULTS

Habitat

The wildlife/fauna type habitat developed at PT GMS concession area, are beach forest, low land forest hill area, coconut plantation, *Anacardium occidentale* plantation, shrubs & grassland area and home garden area. Most of fauna, which are found the project area, it have correlated with occurred of the forest at the project area.

Beach forest was dominated by vegetation such as, *Hibiscus tilliaceus*, *Terminalia cattapa*, and *Callophyllum inophyllum*. These forests occurred at long cost at eastern part, which it was direct bordered with Banda sea and it width is between 25 – 100 m. The forest has simple storey 1 – 2 layers. Wildlife species can be found at that habitat type such white bellied sea eagle, brahminy Kite and collared kingfisher. Coconut plantation was planted at Wia-Wia kampong. The plantation was planted at the beach area. The birds present at the coconut plantation such as brown throated sunbird, wood swallow and

Low land forest hill area is largest habitat type at the property. Vegetation dominant at concession area *Casuarina sumatrana*, *Ficus sp*, *Shorea sp*, *Dryopetes sp* and *cananga odorata*. The wildlife were found at the habitat type at least 39 species of bird 8 mammals species and .. of herpetofauna. Most of wildlife species were found low land forest hill area.

Anacardium occidentale plantation occurred and bordered at several places with the project area. Those plantation have simple structure only one layer canopy. The dominant fauna species were found at the plantation area are bird's species. In this habitat type were found 25 bird species.

Shrubs and grassland are one of wildlife habitat type at the concession area. The habitat is small portion at the project area. The grassland is usually bordered with low land forest.

Home garden is one of wildlife habitat composed by fruit tress such *Musa paradisiaca*, *Cocos nucifera*, *Artocarpus heterophylla*, *Mangifera indica*, and *Syzygium aquea*

Species Abundance

Base on direct observation and as well as interviews, species richness of wildlife/fauna in the project area is categories not high. Total species of wildlife were found 11 species of mammals, 49 birds species and 13 species of herpetofauna.

Table 2. Wildlife/Fauna species recorded at concession area of PT GMS

Wildlife (Fauna)	Found at Low Land Forest Hill Area (Species)	Found at Beach Forest and Coconut Plantation (Species)	Found at Anacardium occidentale Plantation (species)	Shrubs & Grassland (Species)	Found at Home Garden (Species)
Mammals	8	5	4	4	3
Birds	39	26	8	6	6
Herpetofauna	6	6	5	1	5

Mammals

Few mammals species can be found PT GMS concession area at least is 11 species as recorded at table 3. The protected species of mammals that were found at the concession area four species are: Draws Cuscus (*Phalanger celebensis*), Booted Macaque (*Macaca ochreata*) Anoa (*Anoa depressicornis*), and Timor Deer (*Cervus timorensis*).



Figure 2. Boated Macaque (*Macaca ochreata*)

Table 3. Mammals species were recorded at PT GMS concession area

Family Species	Local Name	Common Name	Found and Frequency	Status	Document
Phalangeridae 1. <i>Phalanger celebensis</i> *	Kuskus	Draws Cuscus	+1Vr,+ 5Vr, ,	P	Iw, F, E
Pteropidae 1. <i>Cynopterus brachyotis</i>	Codot krawar	Short nosed Fruit Bat	+5Rr	NP	DO, F,
Cercopithecidae 1. <i>Macaca ochreata</i> *	Monyet	Booted Macaque	+1Rr, 2Vr	NP	DO, F & Fl, E
Scuiridae 1. <i>Callosciurus notatus</i> 2. <i>Callosciurus prevostii</i>	Bajing kelapa Bajing hutan	Plantain Squirrel Prevost Squirrel	+2Rr, + 3Vr +1Rr,	NP NP	Iw, F DO, F
Muridae 1. <i>Rattus sp</i>	Tikus	Rat	+5Rr	NP	Iw, F, Sf
Viveriidae 1. <i>Paradoxurus hermaphroditus</i> 2. <i>Viverra zangalla</i>	Musang Musang tenggalong	Common palm civet Malay Civet	?1Rr,+3Rr +4 Rr +1Vr,+2Vr,+3 Rr	NP NP	Iw, C, F Iw, C
Bovidae 1. <i>Anoa depressicornis</i> *	Anoa	Anoa	+1Vr, +4Vr	P	Iw, H, E
Cervidae 1. <i>Cervus timorensis</i> *	Kijang	Barking Deer	+1Rr,+2Fr,+4Vr	P	DO, H
Suidae 1. <i>Sus celebensis</i>	Babi hutan	Celebes Wild boar	+1Fr,+2Fr,+3Rr,+4Rr	NP	DO,O,E

Legend :

1. Low land Forest at hill area	+	= found at sampling area	NP = Non Protected species	Fr = frequently found
2. Beach Forest and Coconut plantation	++	= found at sampling site with abundance	P = Protected species	Rr = rarely found
3. Anacardium occidentale Plantation	-	= not found at sampling site	Sol = Solitary	Vr = Very rare
4. Shrubs & grassland	?	= not found at sampling site but most probably found	F = Fruit feeder	E = Endemic
5. Home garden	DO	= direct observation	Fl = Foliage feeder	H = Herbivores
I = insectivorous	Iw	= interview	Sf = Seed feeder	C = Carnivores

Sulawesi is one Wallacean area, contained many endemic species fauna (Whitten *et al.* 2002, Evans *et al.* 2003). Four endemic mammals species were found at the property such as Draw's Cuscus (*P. celebensis*), Booted Macaque (*M. ochreata*), Anoa (*A depressicornis*) and Celebes wildboar (*Sus celebensis*). But among others those mammals species, which are as introduced species at Sulawesi islands are Prevost Squirrel (*Callosciurus prevostii*), Malay Civet (*Viverra zangalla*), and Timor Deer (*C. timorensis*).

Dominancy

Species of mammals species which are dominant on number of frequency can be found at sample plot is Celebes wildboar (*Sus celebensis*). This species can be found at many transect at low land forest forest .

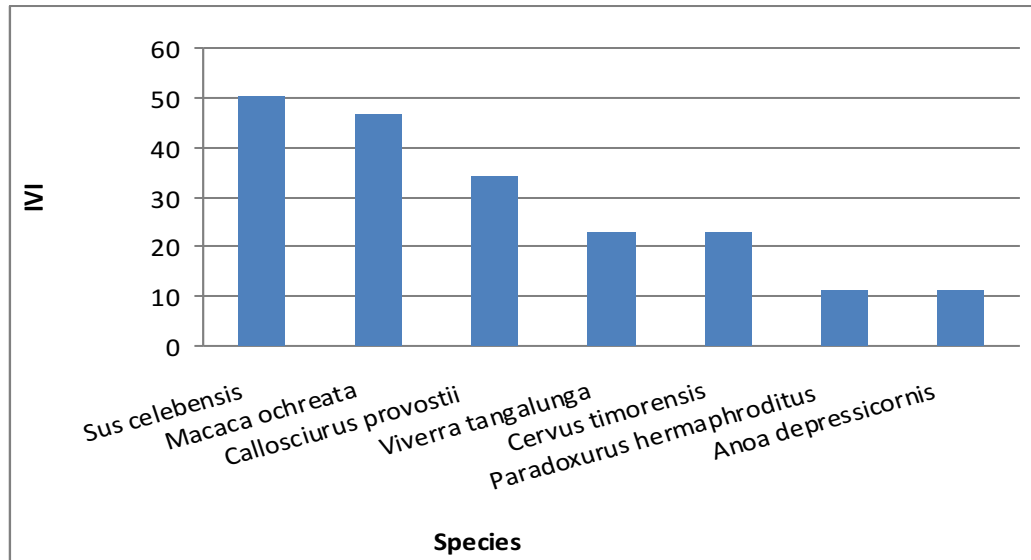


Figure 3. Relation between Important Value Index (IVI) of mammals and the species at sample plot

Birds

Sulawesi is area containing many endemic birds. The survey resulted seventeen birds endemic species (around 35 % of all birds species found). Those endemic birds species found at the property are Sulawesi Serpent Eagle (*Spilornis rufipectus*), Sulawesi Hawk Eagle (*Spizaetus lanceolatus*), Sulawesi Goshawk (*Accipiter griseiceps*), White bellied Imperial Pigeon (*Ducula forstenii*), Grey headed Imperial Pigeon (*Ducula radiata*), Sulawesi Hanging Parrot (*Loriculus stigmatus*), Ornate Lorikeet (*Trichoglossus ornatus*), Sulawesi Dwarf Kingfisher (*Ceyx fallax*), Purple winged Roller (*Coracias teminckii*), Knobbed Hornbill (*Rhyticeros cassidix*), Sulawesi Cicada Bird (*Coracina morio*), Piping Crow (*Corvus typicus*), Sulawesi Babbler (*Trichastoma celebense*), White necked Myna (*Streptocitta albicollis*), Yellow Side Flowerpecker (*Dicaeum aureolimbatus*), Grey Side Flowerpecker (*Dicaeum celebicum*), and Pale white Eyes (*Zosterops consobrinorum*)

Furthermore, the number of protected birds is also quite high (12 species), around 33 % of the total number of bird species observed within GSM property. The number birds protected species were found at the project area is 25 species such as Brahminy Kite (*Haliastur indus*), White bellied Sea Eagle (*Haliaeetus leucogaster*), Sulawesi serpent eagle (*S. rufipectus*), Sulawesi Goshawk (*A. griseiceps*), Sulawesi haw eagle (*S. lanceolatus*), Black Eagle (*Ictinaetus malayensis*), Sulawesi Dwarf Kingfisher (*C. fallax*), Collared Kingfisher (*Halcyon chloris*), Knobbed Hornbill (*R. cassidix*), Brown throated Sunbird (*Anthreptes malacensis*), Olive backed Sunbird (*Nectarinia jugularis*), and Black Sunbird (*Nectarinia aspasia*)



Figure 4. Knobbed hornbill (*Rhyticeros cassidix*) perch on Ara tree (*Ficus* sp)

Table 4. Bids species were found at PT GMS concession area

Family Species	Local Name	Common Name	Found and Frequency	Status	Documer
Accipitridae 1. <i>Haliastur indus</i> * 2. <i>Haliaeetus leucogaster</i> * 3. <i>Spilornis rufipectus</i> * 4. <i>Accipiter griseiceps</i> * 5. <i>Spizaetus lanceolatus</i> * 6. <i>Ictinaetus malayensis</i> *	Elang Bondol Elang Laut Elang Ular Sulawesi Alap kepala Abu Elang Sulawesi Elang hitam	Brahminy Kite White Bellied Sea Eagle Sulawesi Serpent Eagle Sulawesi Goshawk Sulawesi Haw Eagle Black Eagle	+2Rr +2Rr, +1Rr,+2Rr,? +1Vr, +1Rr,+ 2Rr +1Rr,+2Rr,	P P P P P P	C, Fs C, Fs C, E C, E C, E C
Phasianidae 1. <i>Gallus gallus</i>	Ayam hutan merah	Red Jungle fowl	+1Vr,+4Rr	NP	Sf, I
Columbidae 1. <i>Treron griseicauda</i> 2. <i>Ptilinopus melanosphila</i> 3. <i>Macropygia amboinensis</i> 4. <i>Ducula forsteni</i> 5. <i>Ducula radiata</i> 6. <i>Ducula aenea</i>	Punai Penganten Walik Kembang Uncal Ambon Pergam Tutu Pergam Kepala Abu Pergam hijau	Grey-cheeked Green-Pigeon Black napped Friut-Dove Slender bill Cuckoo-Dove White bellied Imperial Pigeon Grey headed Imperial Pigeon Green Imperial Pigeon	+3Rr +1Fr,+2Fr, +1Rr,+2Rr, +1Rr +1Rr, +1Rr, +2Rr,	NP NP NP NP NP NP	F F F F, E F, E F
Psittacidae 1. <i>Loriculus stigmatus</i> 2. <i>Trichoglossus ornatus</i>	Serindit Sulawesi Perkici Dora	Sulawesi Hanging Parrot Ornate Lorikeet	+1Rr,+2Rr, +1Rr,	NP NP	F, E F, E
Cuculidae 1. <i>Cacomantis merulinus</i> 2. <i>Centropus bengalensis</i>	Wik-wik Bubut Alang	Plaintaive Cuckoo Lesser Coucal	+1Rr, +2Rr +4Fr	NP NP	I I
Apodidae 1. <i>Collocalia infuscata</i>	Walet Maluku	Moluccan Swiftlet	+1Rr,+2Rr	NP	I

Hemiprocidae 1. <i>Hemiprocne longipennis</i>	Tapekong jambul	Grey rumped Treeswift	+1Rr,+2Rr,	NP	I
Alcedinidae 1. <i>Ceyx fallax</i> * 2. <i>Halcyon chloris</i> *	Raja udang Merah Sulawesi Cekakak Sungai	Sulawesi Dwarf Kingfisher Collared Kingfisher	+1Rr, +1Rr,+2Rr,+3Rr,+4Rr	P P	Fs,I, E Fs, I
Coraciidae 1. <i>Coracias teminckii</i>	Tiong Lampu Sulawesi	Purple winged Roller	+1Vr,	NP	I, E
Bucerotidae 1. <i>Rhyticeros cassidix</i> *	Julang Sulawesi	Knobbed Hornbill	+1Fr,	P	F, E
Hirundinidae 1. <i>Hirundo tahitica</i>	Layang Batu	Pacific Swallow	+4Rr,	NP	I
Campephagidae 1. <i>Coracina morio</i> 2. <i>Lalage sueurii</i>	Kepudang Sungu Sulawesi Kapasas sayap putih	Sulawesi Cicada Birds White shouldered Triller	+1Rr, +1Rr,+2Vr	NP NP	I, E I
Pycnonotidae 1. <i>Pycnonotus aurigaster</i>	Kutilang	Sooty headed Bulbul	+1Rr,+2Rr,+4Rr	NP	F, I
Dicruridae 1. <i>Dicrurus hottentottus</i>	Srigunting jambul	Hair Drongo	+1Rr,+2Rr	NP	I
Oriolidae 1. <i>Oriolus chinensis</i>	Kepodang	Black napped oriole	+1Rr,	NP	F
Corvidae 1. <i>Corvus typicus</i> 2. <i>Corvus enca</i>	Gagak Sulawesi Gagak hutan	Piping Crow Slender bill Crow	+1Vr, +1Rr,+2Rr,	NP NP	O,E O
Timaliidae 1. <i>Trichastoma celebensis</i>	Pelanduk Sulawesi	Sulawesi Babbler	+1Rr,+2Rr,	NP	I, E
Turdidae 1. <i>Saxicola caprata</i>	Decu	Pied Bush Chat	+2Rr, +4Rr	NP	I
Sylviidae 1. <i>Cisticola juncidis</i>	Cici padi	Zitting Cisticola	+1Fr, +4Rr	NP	I
Muscicapidae 1. <i>Cyornis rufigastra</i> 2. <i>Culicicapa helianthea</i>	Sikatan Bakau Sikatan mentari	Mangrove blue Flycatcher Citrine Flycatcher	+1Rr,+2Rr, +1Rr,+2Rr,	NP NP	I I
Artamidae 1. <i>Artamus leucorhynchus</i>	Kekep	White-breasted Wood-Swallow	+1Rr,+2Rr,	NP	I
Sturnidae 1. <i>Aplonis panayensis</i> 2. <i>Streptocitta albicollis</i>	Perling kumbang Blibong Pendeta	Asian glossy Starling White necked Myna	+2Rr +1Rr	NP NP	F,I F,I, E
Nectariniidae 1. <i>Anthreptes malacensis</i> * 2. <i>Nectarinia jugularis</i> * 3. <i>Nectarinia aspasia</i> *	Br Madu Kelapa Br Madu Kuning Br Madu Hitam	Brown throated Sunbird Olive backed Sunbird Black Sunbird	+1Rr,+2Rr,+3Rr,+5Rr +1Rr,+2Rr,+3Rr,+5Rr +1Fr,+2Rr,+3Rr,+5Rr	P P P	Hs, I Hs Hs
Dicaeidae 1. <i>Dicaeum aureolimbatum</i> 2. <i>Dicaeum celebicum</i>	Cabe panggul kuning Cabe panggul kelabu	Yellow sided Flowerpecker Grey sided Flowerpecker	+1Rr,+2Rr,+3Rr +5Rr +1Rr,+2Rr,+3Rr +5Rr	NP NP	F, I, E F, I, E
Zosteropidae 1. <i>Zosterops chloris</i> 2. <i>Zosterops consobrinorum</i>	Br Kacamata lemon Br Kacamata Sulawesi	Oriental white Eyes Pale bellied white Eyes	+1Rr,+2Rr, +1Rr,+3Rr +5Rr	NP NP	I I, E

Legend :

1. Low land Forest at hill area	+ = found at sampling area	NP = Non Protected species	Fr = frequently found
2. Beach Forest and Coconut plantation	++ = found at sampling site with abundance	P = Protected species	Rr = rarely found
3. Anacardium occidentale Plantation	- = not found at sampling site	Sol = Solitary	Vr = Very rare
4. Shrubs & Grassland	? = not found at sampling site but most probably found	E = Endemic	I = insectivorous
5. Home garden	DO = direct observation	F = Fruit feeder	H = Herbivorous
Hs = Honey sucker	Iw = interview	Sf = Seed feeder	Fs = Fish eater
C = carnivore	O = omnivore		

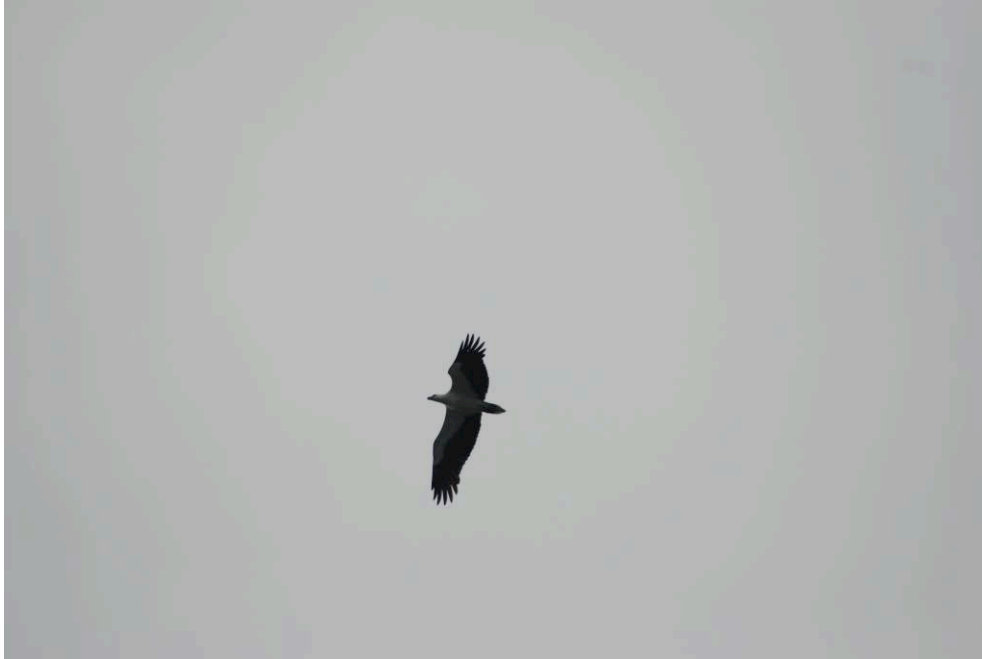


Figure 5. White bellied Sea Eagle (*Haliaeetus leucogaster*) fly above beach forest



Figure 6. Sulawesi Cicada Bird (*Coracina morio*) perch on branch of tree at open area

Bird Structure

The bird's structure communities at project area can be derived from trophic level or bird guild structure. The bird guild at sample area of Wia-wia project was recorded at table 5. Insectivore's bird is dominant species at GSM concession area.

Table 5. Birds guild at GSM concession area

No	Guild	Number of Species	Percentage
1	Insectivores	26	53.06
2	Frugivores	15	30.61
3	Fischivores	4	8.16
4	Carnivores	6	12.24
5	Honey sucker	3	6.12
6	Omnivores	2	4.08
7	Seed Feeder	1	2.04

Dominancy

The dominant of bird species occur at the project area are black-napped fruit-dove (*Ptilinopus melanospilla*), Grey Side Flowerpecker (*D. celebicum*), Knobbed Hornbill (*R. cassidix*), Sulawesi Hanging Parrot (*L. stigmatus*), Black Sunbird (*N. aspasia*) Grey Rumped Tree-Swift (*Hemiprocne longipennis*), Brown throated Sunbird (*A. malacensis*) and Yellow Side Flowerpecker (*D. aureolimbatum*).

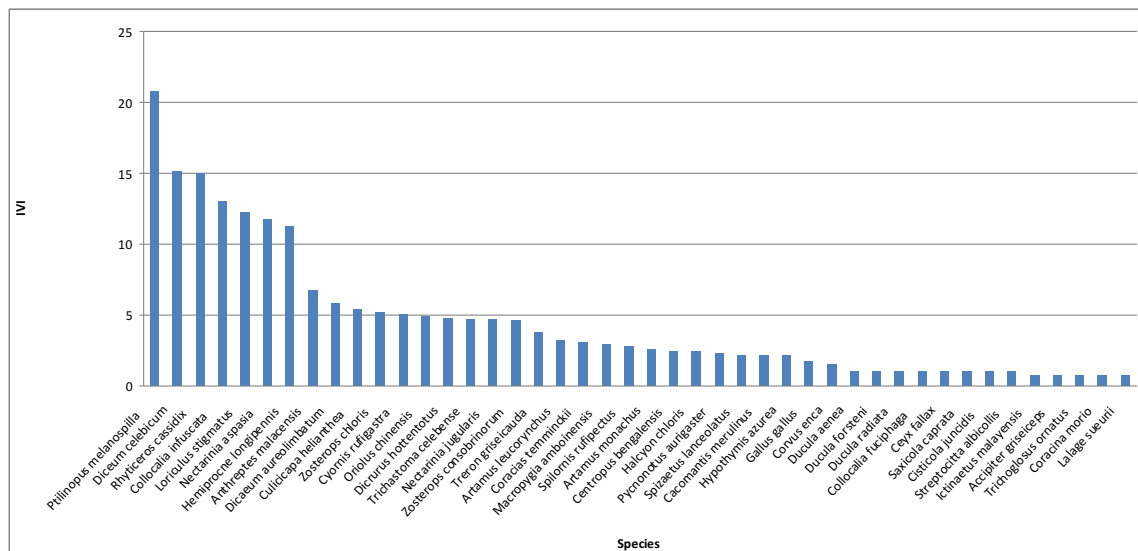


Figure 7. Relation between important value index and bird species at the project area

Bird Species Diversity

The bird species diversity at the sample area shown that index varied, but at transect 4 resulted the lowest index and the highest index was transect 5 (table 2). The transect 5 and transect 1 have relatively high diversity index because in both transect bordered with open grassland and shrubs area. The both transect have more ecotone compare the others. The diversity of habitat is main factor to support availability of food resources, cover, shelter and nesting area for bird's species.

Table 6. Birds diversity index of sample transect at PT. GMS concession area

No.	Transect	Species Number	H'	E
1	Transect 1	30	3,0231	0,8888
2	Transect 2	19	2,5367	0,8615
3	Transect 3	12	2,3502	0,9458
4	Transect 4	13	2,2909	0,8932
5	Transect 5	28	3,0087	0,9029

legend: H' = diversity index E = equitability index

Similarity of Bird Community

The similarity of birds community at sample area of PT GMS concession area shown at figure.. Birds community clustering at sample area divided into 4 cluster, there are **cluster 1** is transect wia 2 and transect wia 4 (similarity around 79.48 %), **cluster 2** is transect wia 2-4 and wia 5 (Similarity around 59.50 %), and **cluster 3** transect wia 2-4-5, linkage with transect wia 1 (similarity around 57.60 %). Linkage between clusters 2-4-5-1 and transect wia 3 are with similarity 43.44 %).

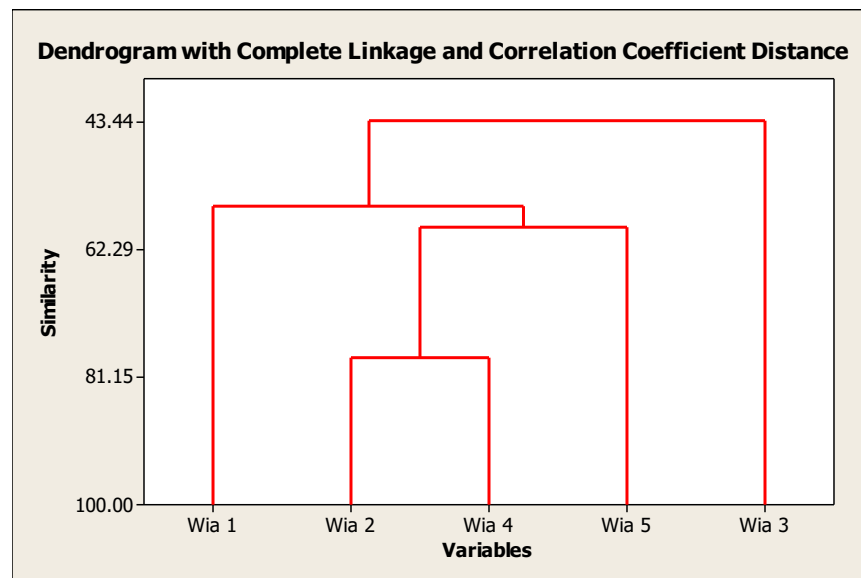


Figure 8. Dendrogram bird community at PT GMS concession area

Herpetofauna (Reptiles and Amphibian)

Only few species of herpetofauna species can be found at the concession area of GMS. The commonest of herpetofauna species was found at the property is Ruogh Mabuya (*Eutropis rudis*).

Table 7. Herpetofauna species were found at PT GMS concession area

Family Species	Local Name	Common Name	Found and Frequency	Status	Document
Boidae 1. <i>Phyton reticulatus</i>	Ular Sanca	Reticulate python	+1Vr,+2Vr,	NP	C,
Colubridae 1. <i>Dendrolapis pictus</i>	Ular Lidah Api	Common bronzeback	+3Rr	NP	C,
Varanidae 1. <i>Varanus salvator</i>	Biawak	Common monitor	+2Rr	NP	C
Scincidae 1. <i>Eutropis multifasciata</i> 2. <i>Eutropis rudis</i> 3. <i>Lipina quadrivittata</i> 4. <i>Sphenomorphus variegatus</i>	Kadal Kadal Coklat Kadal Lorek Ekor biru Kadal Lorek kecil	Many line s sun skink Rough Mabuya Blue tailed sun skink	+5Rr +1Fr,+2Fr,+3Fr,+4Fr,+5Fr +3Fr,+5Fr +1Rr	NP NP NP NP	I I, E I, E I, E
Geckkonidae 1. <i>Hemidactyllus freynatus</i>	Cicak	Spiny talied house gekko	+5Rr,	NP	I
Agamidae 1. <i>Draco sp</i>	Cicak terbang	Gliding lizard	+1Rr,+2Rr,+3Rr	NP	I
Rhacoporidae 1. <i>Polypedates leucomystax</i>	Katak pohon	Striped Tree Frog	+3Rr	NP	I
Ranidae 1. <i>Fajervarya cancrivora</i> 2. <i>Limnonectes modestus</i>	Katak sawah Katak	Rice field frog Frog	+5Rr,+2Rr +1Rr,+2Rr,+5Rr	NP NP	I I, E
Bufonidae 1. <i>Bufo celebensis</i>	Kodok budukSulawesi	Sulawesi Toad	+1Rr	NP	I, E

Legend :

1. Low land Forest at hill area
2. Beach Forest and Coconut plantation
3. Anacardium occidentale Plantation
4. Shrubs & grassland
5. Home garden
- I = insectivorous

- + = found at sampling area
 ++ = found at sampling site with abundance
 - = not found at sampling site
 ? = not found at sampling site but most probably found
 DO = direct observation
 Iw = interview

- NP = Non Protected species
 P = Protected species
 Sol = Solitary
 C = Carnivores

- Fr = frequently found
 Rr = rarely found
 Vr = Very rare
 E = Endemic
 H = Herbivorous



Figure 8. Rouh Mabuya (*Eutropis rudis*) at commonest reptiles at sampling area

Dominancy

Species of herpetofauna species which are dominant on individual number at sample plot is Rough Mabuya (*Eutropis rudis*). Figure .. shown that which herpetofauna species has high important value index (IVI)

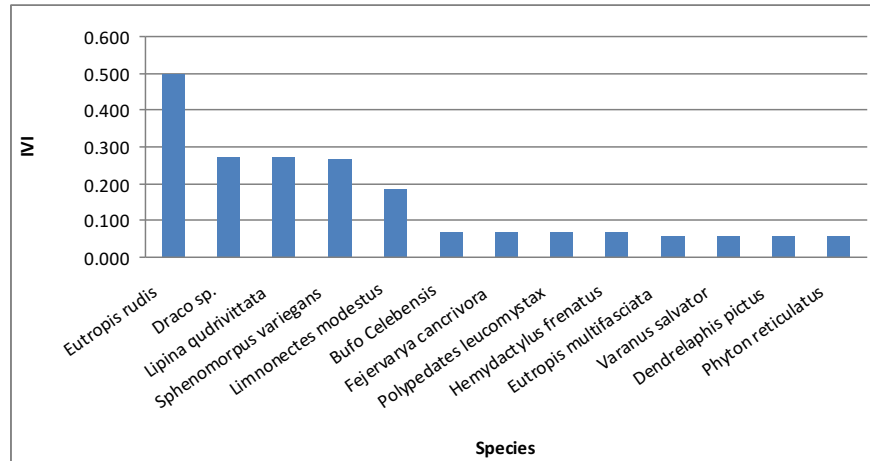


Figure 9. Relation between IVI of Herpetofauna and the species at the property



Figure 10. Herpetofauna habitat type at the property (A), Anacardium plantation (B) Grassland (c) Low Land Forest (D) Beach Forest

Despite the mabuya was dominant, they are also wide spread at the sample transect at the concession area. Herpetofauna which are endemic species found at the property such as Rough mabuya (*E. rudis*), blue tailed sun skink (*Lipina quadrivittata*), (*Sphenomorphus variegatus*), (*Limnonectes modestus*) and Sulawesi Toed (*Bufo celebensis*)



Figure 11. (A) *Bufo celebensis*, (B) *Limnonectes modestus* (c) *Sphenomorphus variegatus* (D) *Lipina quadrivittata*

DISCUSSION

Mammal

Mammals species at PT GMS concession area is around 36 % having status as protected animals. Those of protected mammal's species are quite important such as, Anoa and Cuscus. PT GMS should be considering to having plan for conserve the protected species of mammals, if the concession owner will exploitation the area.

Beside the protected species, quite high number of endemic mammals species present at the property is around 36 %. Most of mammals species can be found at the concession area are having relation to covered forest at the concession area. The protected and endemic mammal's species are forest dependent animals.

Bird

The number of birds protected species is quite high around 33 % from total species can be found at the concession area. It is indicator that the property is important, because containing many protected birds species. Despite the protected species, it is around 35 % as bird endemic species. Base on endemic and protected bird species at the project area are high, the concession owner should be consider to having plan for conserve those birds. Most of the bird's species are having relation to forest habitat.

Factors which have influenced to bird species diversity is variety of habitat type, variation species vegetation and number of forest layer. The highest diversity of the bird was at low land forest. It seems the forest has supported to availability of food resources, cover and shelter also nesting area.

Herpetofauna

Endemic of herpetofauna species can be found at PT GMS concession is around 38 % from the total number which are found. Only one species of reptile have local distribution spread out over of the concession area is rough mabuya (*E. rudis*). Many species (77%) of herpetofauna at the project area are insectivores animal.

CONCLUSIONS & RECOMMENDATIONS

1. The wildlife/fauna has been found at the project area 11 species of mammals, 49 birds species and 13 species of herpetofauna. The diversity of wildlife was categorized medium, but significant high at endemic species
2. Among the wildlife has been identified, 4 species of mammals, and 12 birds species as protected species in Indonesia and 4 endemic mammals species and 17 endemic birds also 5 endemic herpetofauna species occur at the project area.
3. If the nickel mining project will be developing at the project area should be considered to the protected and endemic species.

REFERENCES

- BirdLife International (2001). Threatened Birds of Asia: the BirdLife International Red Data Book, Cambridge, UK: BirdLife International
- Coates B.J and Bishop K.D 1997. A Guide To The Bird : Birds Of Wallacea, Sulawesi, The Moluccas, Lesser Sunda Island, Indonesia. Dove Publications. Dai Nippon Co Ltd. Hongkong
- De Rooij, N. 1915. The reptiles of Indo-Australian Archipelago. I. Lacertilia, Chelodina, Emydosauria. E. J. Brill, Leiden.
- De Rooij, N. 1917. The reptiles of Indo-Australian Archipelago. II. Ophidia. E. J. Brill, Leiden
- Heyer, W.R., M.A. Donnely, R.W. McDiarmid, L.C. Hayek and M.S. Foster (eds). 1994. Measuring and monitoring biological diversity: Standard methods for amphibians. Smithsonian Institution Press. Washington. 364 p.
- Magurran, A.E. (1988). Ecological diversity and its measurement. London & Sydney, Croom Helm,
- Whitten, A.J., M. Mustafa and G.S. Henderson. 2002. The ecology of Sulawesi. Periplus Editions. Hong Kong

APPENDIX

Appendix ... Selected Species List

In the following account species are listed that have a globally threatened status: vulnerable and near-threatened (BirdLife International 2001) also endemic species.

Brahminy Kite *Haliastur indus*

Global status Vulnerable (BirdLife International 2001). Field notes – Single bird fly at shore of Sangi-Sangi beach, 26 & 27 November 2008

White bellied - See Eagle *Haliaeetus leucogaster*

Global status – Vulnerable (BirdLife International 2001). Field notes – adult birds fly above the Sangi-Sangi beach, 23, 24 & 25 November 2008

Sulawesi serpent Eagle *Spilornis rufipectus*

Global status – Vulnerable (BirdLife International 2001) endemic to Sulawesi. Field notes – A single bird saw fly and calling uphill area. 22 & 24 November 2008

Sulawesi Goshawk *Accipiter greiseiceps*

Global status – Vulnerable (BirdLife International 2001) endemic to Sulawesi. Field notes – A single bird flying transect 5. On 26 November 2008 .

Black Eagle *Ictinaetus malayensis*

Global status – Vulnerable (BirdLife International 2001). Field notes – A single bird flying at transect 3 on 25 November 2008 .

Sulawesi Haw Eagle *Spizaetus lanceolatus*

Global status – Vulnerable (BirdLife International 2001) endemic to Sulawesi. Field notes – On 22 February 2008 a single bird crossing transect 1

Black Napped Fruiting Dove *Ptilinopus melanospilla*

Global status – Insufficient data. Field notes – commonest birds at project area, widespread over lowland forest at Wia-Wia project area.

White bellied imperial Pigeon *Ducula forsteni*

Global status – Endemic to Sulawesi. Field notes – pair bird flying over the low land forest at hill area at transect 1. On 22 February 2008

Grey headed imperial Pigeon *Ducula radiata*

Global status – Endemic to Sulawesi. Field notes – pair bird flying over the low land forest at hill area at transect 2. On 23 February 2008

Sulawesi Hanging Parrot *Loriculus stigmatus*

Global status - Endemic to Sulawesi. Field notes – Locally Common in the low land forest at hill area of Wia-Wia project area

Sulawesi Dwarf Kingfisher *Ceyx fallax*

Global status – Endemic to Sulawesi. Field notes –pair bird perch at tree transect 5 low land forest hill area on 26 November 2008

Purple winged Roller *Coracias teminckii*

Global status – Endemic to Sulawesi. Field notes –pair bird perch at tree closed to village area on 22 November 2008

Knobbed Hornbill *Rhyticeros cassidix*

Global status – Vulnerable (BirdLife International 2001). Field notes –common bird at low land forest at hill area at Wia-Wia project area

Sulawesi Cicada Bird *Coracina morio*

Global status –Endemic to Sulawesi. Field notes – single bird at ecotone of low land forest at hill area of transect 1 and teak plantations on 22 November 2008.

Piping Crow *Corvus typicus*

Global status –Endemic to Sulawesi. Field notes – single bird fly at ecotone of low land forest at hill area closed to village area on 23 November 2008.

Sulawesi Babbler *Trichastoma celebense*

Global status –Endemic to Sulawesi. Field notes –bird at forest floor and bushes of low land forest at hill area of transect 2 and 3 of Wia-Wia project area

White necked Myna *Streptocitta albigollis*

Global status –Endemic to Sulawesi. Field notes –pair bird perch on trees at low land forest at hill area of transect 1 on 23 November 2008.

Grey Side Flowerpecker (*Dicaeum celebicum*)

Global status –Endemic to Sulawesi. Field notes – common bird at low land forest at hill area at Wia-Wia project area

Yellow Side Flowerpecker (*Dicaeum aureolimbatum*)

Global status –Endemic to Sulawesi. Field notes –single bird singing and perch on trees at low land forest at hill area of transect1 & 3 on 22, 25 November 2008

Pale white Eyes (*Zosterops consobrinorum*)

Global status –Endemic to Sulawesi. Field notes – small group bird fly at low land forest at hill area of transect 2, 5 on 24 and 26 November 2008