ConocoPhillips

BIODIVERSITY ASSESSMENT STUDY: AVIFAUNA

AT BUNGIN FIELD DEVELOPMENT PROJECT AREA SOUTH JAMBI B BLOCK
CONOCOPHILLIPS (SOUTH JAMBI) LTD.

BY

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SUMMARY

Biodiversity Assessment Survey for avifauna in Bungin Field Development project area of ConocoPhillips (South Jambi) Ltd. is conducted to collect and analyze data on species diversity, abundance and community structure as well as conservation status category. Based on the survey result, the total number of bird species identified in the study area are 72 species.

Since, the diversity of birds has correlation with habitat types, the avifauna survey is designed in different types of habitat found in the study area . There are eight of habitat types determined for the avifauna survey at Bungin area, which include (i) oil palm plantation, (ii) mixed rubber plantation, (iii) shrubs, (iv) secondary growth, (v) pocket of degraded remnant forest, (vi) riparian forest, (vii) timber estate plantation & pocket remnant forest and (viii) logged over forest.

The highest number of bird species are found at timber estate plantation and pocket remnant forest. Meanwhile the lowest bird diversity is observed in shrubs area. With regards to conservation status, from the total bird species identified, there are 14 species classified as protected by Government of Indonesia (GOI - Government Regulation 7/1999); 10 species are classified as near threatened by red list of IUCN[1]; and 10 species are listed as Appendix II by CITES[2].

The protected birds listed in GOI regulation are 1) Little egret (*Egretta garzetta*), 2) Oriental honey-buzzard (*Pernis ptilorhynchus*), 3) Crested serpent eagle (*Spilornis cheela*), 4) Chinese goshawk (*Accipiter soloensis*), 5) Black eagle (*Ictinaetus malayensis*), 6) Black tighed falconet (*Microhierax fringilarius*), 7) White throated kingfisher (*Halcyon smyrnensis*), 8) Wreathed hornbill (*Aceros undulatus*), 9) Black hornbill (*Anthrococeros malayanus*), 10) Rhinoceros hornbill (*Buceros rhinoceros*), 11) Brown throated sunbird (*Anthreptes malacensis*), 12) Purple napped sunbird (*Hypogramma hypogrammicum*), 13) Olive backed sunbird (*Nectarinia jugularis*), and 14) Little spiderhunter (*Arachnothera longirostra*).

Neared threatened birds classified in IUCN Red List Database are 1) Crested fireback (*Lophura ignita*), 2) Long tailed parakeet (*Psittacula longicauda*), 3) Black hornbill (*Anthacoceros malayanus*), 4) Rhinoceros hornbill (*Buceros rhinoceros*), 5) Red throated barbet (*Megalaima mystacophonos*), 6) Yellow crowned barbet (*Megalaima henricii*), 7) Fairy minivet (*Pericrocotus igneus*), 8) Rufous crowned babbler (*Malacopteron magnum*), 9) Fluffy tit babbler (*Macronous ptilosus*), and 10) Brown fulvetta (*Alcippe brunneicauda*).

The bird species categorized as Appendix II of CITES are 1) Oriental Honey-buzzard (*Pernis ptilorhynchus*) , 2) Crested serpent eagle (*Spilornis cheela*), 3) Chinese goshawk (*Accipiter soloensis*), 4) Black eagle (*Ictinaetus malayensis*), 5) Black tighed falconet (*Microhierax fringilarius*), 6) Long tailed parakeet (*Psittacula longicauda*), 7) Blue crowned hanging parrot (*Loriculus galgulus*), 8) Wreathed hornbill (*Aceros undulatus*), 9) Black hornbill (*Anthacoceros malayanus*), 10) Rhinoceros hornbill (*Buceros rhinoceros*).

[1] IUCN: International Union for Conservation of Nature
[2] CITES: Convention on International Trade in Endangered Species of Wild Fauna and Flora

Based on feeding guid analysis, the bird community observed at the study area is dominated by insectivorous birds.

PREFACE

ConocoPhillips (South Jambi) Ltd. (COPI), a production Sharing Contract's Contractor of Upstream Oil and Gas Executive Agency (BPMigas) plans to develop new gas processing station in Bungin Field of South Jambi B Block. The proposed project area is located in Musi Banyuasin Regency (South Sumatra Province); Batanghari and Muaro Jambi Regencies (Jambi Province).

In order to minimize environment impacts, beside developing Environmental Management and Monitoring Plan (RKL-RPL), COPI also performes Biodiversity Assessment Study to gather and assess data and information of flora and fauna diversity at Bungin Field Development Area, which focused on vegetation (flora), big mammals and avifauna (birds) components. The Biodiversity Assessment Study is commissioned by ConocoPhillips (South Jambi) Ltd. to Bogor Agricultural University (IPB), Centre for Environmental Research. This study is carried out in several habitat types located at Bungin Field Area and its vicinity.

The bird species has been found at the project area are 72 species. The diversity of birds has relation to habitat types. Eight of birds habitat types occurred at Bungin area such as oil palm plantation, rubber mixture plantation, shrubs, secondary growth, pocket of degraded remnant forest, riparian forest, timber estate plantation also pocket remnant forest, and log over forest. The highest number of bird species found at timber estate plantation and pocket remnant forest birds' habitat types. Meanwhile, the lowest bird diversity was at shrubs area.

Among the birds have been identified, there are 14 birds species as protected birds in Indonesia, also 10 species as near threatened by red list of IUCN, and 10 as Appendix II by CITES. The bird diversity varied, and it has relation with habitat types. In general the birds diversity was influenced by the existence of forest at the project area. Dominant bird at project area is insectivores' bird. Most of bird species at the study area is non forest dependent bird.

The results of Biodiversity Assessment Study at Bungin Field will be used as baseline to improve environmental management and monitoring program as well as to protect and conserve biological diversity as an essential component of COPI's health, safety and environment commitments.

Jakarta, December 2011
ConocoPhillips (South Jambi) Ltd.

Phil Webb
VP Operations

CHAPTER I
INTRODUCTION

1.1. Background

ConocoPhillips (South Jambi) Ltd. (COPI) intends to develop new gas processing station and facilities at Bugin Field Area of South Jambi B Block. These facilities are located in Batanghari Regency and Muaro Jambi Regency of Jambi Province and Musi Banyuasin Regency of South Sumatera Province. In relation to this planned development, COPI performes Biodiversity Assessment Study to gather and assess the biological diversity condition in and around the proposed project area to ensure the implementation of mitigation planning processes aimed at reducing the effects of its activities on the environment and conserve biodiversity. The study is focused on vegetation, big mammals and avifauna components.

Bungin Field Area is bordered with other concession areas such as oil palm plantation, timber estate, settlement, and restoration forest of PT Restorasi Ekosistem Indonesia (PT REKI). Therefore, to obtain comprehensive data and information on flora and fauna, the survey is designed in different habitat types occurred in the study area.

From beginning state of Bungin Field development, COPI will ensure its compliance towards applicable regulations as governed by Government of Indonesia (GOI) related to environmental and sustainable development issues including protection and conservetaion of biodiversity.

1.2. Objectives

The avifauna survey is conducted at the Bungin Field Development Area and its vicinity area located in Batanghari Regency and Muaro Jambi Regency of Jambi Province and Musi Banyuasin Regency of South Sumatera Province. The objectives of this study include:

1. To gather basic information and data related with birds species diversity at study area.
2. To establish data on birds abundances and community structure.
3. To obtain and list the conservation status of birds species at study area.

1.3. Study Team

Initiator Identity

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PPLH-IPB Competence Registration No. 0020/LPJ/AMDAL-1/LRK/KLH

CHAPTER II
STUDY AREA

The Bungin Field Development area is administratively located in Bajubang District of Batanghari Regency and Sungai Bahar District of Muaro Jambi Regency in Jambi Province; and Bayung Lencir District of Musi Banyuasin Regency in South Sumatera Province . The topography of the Bungin area is mostly gently undulating with slope of 8-15 %.

There are two rivers found in the project area, Bayat and Lalan Rivers. These two rivers are used by local community for their daily needs. Most of the creeks and streams at Bungin Field flow to Sungai Lalan and Bayat .

The average annual precipitation at Bungin Field is around 3,702 mm at altitude < 45 m above sea level and 2,561 mm at lowland area. The highest precipitation occurs during December to March. Annual average temperature is 22 ^{o}C at high altitude; while at lowland area, the average temperature is around 27 ^{o}C with average humidity around 80%.

The soil at the study area has texture of sandy loamy to silty clay loamy with podsolic area, dominated by yellow and red colors. Physical soil parameter is crumb with depth categorized as not sallow. The chemical soil parameter at study area is classified as low soil fertility.

Bungin project will be developed in an area with no naturally forested area. The vegetation observed are mostly oil palm plantation, pocket of mixed rubber plantation, shrubs, bushes, and logged over area at riparian of Lalan River and proposed gas plant area.

CHAPTER III
METHODS

3.1. Location of Study

The data and information related to birds diversity at Bungin area is collected within a week, from 15 – 21 October 2011. The observations are focused at vegetation types occurred at the project area such as oil palm plantation, pocket of mixed rubber plantation with secondary growth, riparian forest, and forested area at proposed gas plant. The sample plot location is dominated by oil palm plantation.

3.2. Equipment and Materials

Equipments used in this survey consists of Map of Bungin Field Development Project Area, GPS, compass, chronometer, binocular, tele-lens camera, and field guide to the birds of Sumatera, Kalimantan, Java and Bali (Mackinnon,2000).

3.3. Methods

The birds inventory was carried out by transect method combination with IPA count. Nine transect were made at Bungin area (**Table 3.1**). Each transect established is 400 m length. The counting of individual numbers is based on direct visual contact or bird sound. Besides direct observation of bird species, interview with local people was done to know about the bird species existing at project area.

Table 3.1. Transects applied for Avifauna study at Bungin area

No	Transect Location	Habitat Type	Coordinate Position	
			Latitude North	Longitude East
1	Tie In (VW 1),	rubber mix plantation, oil palm plantation	02°07'51.7''	103°41'11.1''
2	Timber Estate of Bumi Persada Permai (HTI BPP) Sumpal	timber estate and pocket remnant forest	02°14'43.9''	103°36'18.4''
3	Timber Estate of Pakerin (HTI Pakerin Pangkalan Buyat)	timber estate and pocket remnant forest	02°09'35.2''	103°35'41.1''
4	Riparian of Bayat river	Riparian	02°07'30.2''	103°37'39.8''
5	Oil palm plantation and Shrubs area	Oil palm and shrubs area	02°10'42.5''	103°27'00.8''
6	Pocket of degraded remnant forest and Shrubs	Pocket remnant forest degraded and shrubs area	02°11'07.5''	103°27'06.5''
7	Forest log over area + riparian of Lalan River	Log over forest and riparian	02°11'45.9''	103°27'09.3''
8	Oil palm plantation + shrubs area of proposed gas plant	Oil palm and shrubs area	02°10'25.1''	103°26'21.7''
9	Oil palm and shrubs area of Trunkline	Oil palm and shrubs area	02°09'15.1''	103°31'09.0''

Sampling plot of bird survey at Bungin Field area, South Jambi B Block is presented at **Figure 3.1.**

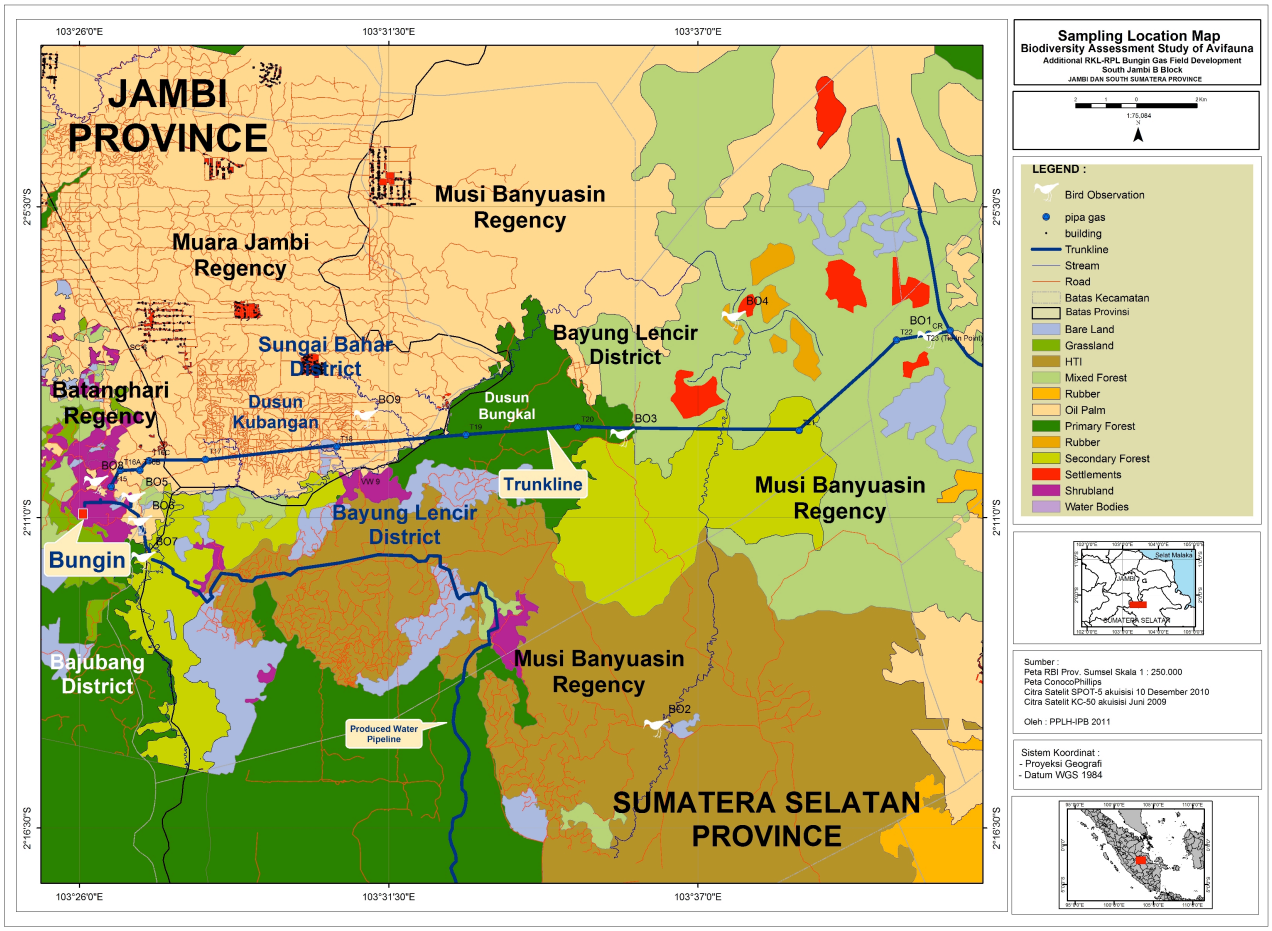

Figure 3.1. Sampling location of bird survey at Bungin Field Area, South Jambi B Block

3.3.1. Bird Census

Nine transects of 400 meter length are determined as sample observation. At every 100 m intervals along the transect, all bird calls or sightings are recorded over 20 minutes. This is conducted to provide a quantitative measure of species relative abundance. Bird species identified are listed during daily observation to obtain comprehensive inventory. Fewer species will be added as the total list becomes more complete.

3.3.2. Interviews

Interviews are conducted with local guides and communities to obtain more comprehensive data on bird species inventory.

3.3.3. Data analysis

Data from the bird census are used to calculate the following ecological measures:

Species Diversity Index

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

$$H = -\Sigma\, p_i \ln p_i$$

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 is used:

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

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

Similarity Index

The Jaccard similarity index (S) (in Mueller-Dombois and 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 that is unique to samples ***1*** and ***2*** respectively, and ***c*** is species common to both.

Dendrogram was used for clustering analysis of bird community in each habitat at sampling site. Minitab SPSS 14 is used to help process clustering analysis.

CHAPTER IV
RESULT AND DISCUSSION

4.1. Result

4.1.1. Bird Habitat

The habitat type of birds survey is divided into several types such as: oil palm plantation, mixed rubber plantation, shrubs, secondary growth pocket of degraded remnant forest, riparian forest, timber estate plantation also pocket remnant forest, and logged over forest. Most of birds species found in the study area have correlation with the existing habitat.

A. Oil Palm Plantation

The oil palm plantation area is one of bird habitat at Bungin area (**Figure 4.1**). Most of lands around the Bungin Field Area are surrounded by young stages (1-3 years) of oil palm plantation. Between the plantation rows, there grows grasses, fern and sometimes shrubs that are observed during the survey. Some birds species found at this area are Yellow vented bulbul (*Pycnonotus goiavier*), Bar wing prinia (*Prinia familiaris*), and Yellow bellied prinia (*Prinia flaviventris*).

(a) (b)

Figure 4.1. Young stage of oil palm plantation (a) White throated kingfisher at new developed area for oil palm plantation (b)

Birds species existed at this habitat types such as Spotted dove (*Streptopelia chinensis*), White throated kingfisher (*Halcyon smyrnensis*), and White breasted waterhen (*Amaurornis phoenicurus*).

B. Mixed Rubber Plantation

Mixed rubber plantation as one of habitat types for bird species is observed at *tie-in* area of Bungin Field project (**Figure 4.2**). Besides rubber plantation, other vegetations that grow at this habitat are *Vitex pubescens*, *Artocarpus elasticus*, *Macaranga* spp, *Syzygium* sp., and

Ficus sp. The birds species occurred at this habitat types such as Ashy tailor bird (*Orthotomus ruficeps*), and Yellow vented Bulbul (*Pycnonotus goiavier*).

(a) (b)

Figure 4.2. Mixed rubber plantation bird habitat type (a) Yellow vented bulbul at new rubber mixture plantation (b)

Furthermore, other species found in this habitat are Pink necked green-pigeon (*Treron vernans*), Sooty headed bulbul (*Pycnonotus aurigaster*), and Ashy tailor bird (*Orthotomus ruficeps*).

C. Shrubs

For ***shrubs area***, this birds habitat types is found at remnant area of oil palm plantation which is undeveloped (**Figure 4.3**). The bird occurred at this area such as Ashy tailorbird (*Orthotomus ruficeps*), Yellow vented bulbul (*Pyconotus goiavier*), and Yellow bellied prinia (*Prinia flaviventris*).

(a) (b)

Figure 4.3. Shrubs area bird habitat type (a) Yellow belied prinia at shrubs area habitat (b)

Other birds species identified at this habitat types are Scaly breasted munia (*Lonchura punctulata*), Bar winged prinia (*Prinia familiaris*), and Lesser coucal (*Centropus bengalensis*).

D. Secondary Growth area

This habitat types are observed around proposed gas plan of Bungin Field project area (**Figure 4.4**). Dominant vegetation observed such as *Macaranga giganthea, Trema orientalis, Vitex pubescens* and *Mallotus paniculatus*. Birds species found at this habitat types are Ashy tailor bird (*Orthotomus ruficeps*), Yellow vented bulbul (*Pyconotus goiavier*), and blue throated bee-eater (*Merops viridis*).

(a) (b)

Figure 4.4. Secondary growth bird habitat type (a) Ashy tailor bird at secondary growth habitat (b)

E. Riparian area

Riparian ferers to areas adjacent to a water body, including lakes, rivers, streams and ponds. While in the study area, this habitat types is located at the river bank sides inhabited by vegetations (**Figure 4.5**). Riparian habitats that are observed include river bank of Lalan River and Bayat Rivers. The bird found at this habitat types are Black headed bulbul (*Pycnonotus atriceps*), Orange bellied flowerpecker (*Dicaeum trigonostigma*), Pacific swallow (*Hirundo tahitica*), and Brown throated sunbird (*Anthreptes malacensis*).

(a) (b)

Figure 4.5. Riparian bird habitat type (a) Black headed bulbul at riparian habitat (b)

F. Timber Estate Plantation and Pocket Remnant Forest

There are two concessions of estate plantation observed at the study area, PT Bumi Persada Permai and PT Pakerin (**Figure 4.6**). The two main vegetation species planted at these areas are Akasia (*Acacia mangium* and *Acacia crassicarpa*), which is mostly dominated by *Acacia mangium*. The bird species found at this habitat types such are Yellow vented bulbul (*Pyconotus goiavier)*, Bar wing prinia (*Prinia familiaris*), and Ashy tailorbird bird (*Orthotomus ruficeps*). Furthernore, there are several birds species found at pocket remnant forest such as……

(a) (b)

Figure 4.6. Timber estate bird habitat type (a) Bar wing prinia at timber estate habitat (b)

G. Pocket of degraded remnant forest

This bird habitat types is only found near the proposed gas plant at Bungin Field (**Figure 4.7**). The area width is approximately 0.25 ha and mostly occupied by pioneer vegetation species such as *Macaranga spp*, *Piper aduncum* and *Mallotus paniculatus.* The birds identified at this habitat types are such as Pink necked green-pigeon (*Treron vernans*), Red eye bulbul (*Pycnonotus brunneus*), and Raffles malkoha (*Phaenicophaeus chlorophaeus*).

(a) (b)

Figure 4.7. Pocket of degraded remnant forest bird habitat type (a) Pink necked green-pigeon at the forest habitat (b)

H. Logged Over Forest

Figure 4.8 shows logged over forested habitat type found at the study area**.** The bird found at this habitat are Rhinoceros hornbill (*Buceros rhinoceros*), Wreathed hornbill (*Aceros undulatus*), Crested serpent-eagle (*Spilornis cheela*), Black eagle (*Ictinaetus malayensis*), Fairy minivet (*Pericrocotus igneus*), Blue eared barbet (*Megalaima australis*), and Greaterracket-tailed drongo (*Dicrurus paradiceus*).

(a) (b)

Figure 4.8. Log over forest bird habitat type (a) Crested serpent eagle at forest habitat (b)

4.1.2. Species Abundance

Base on direct observation and interviews, species richness of bird in the project area is categorized as medium level, but significant on number of bird species at forested habitat types. Total species of bird was found 72 birds species (**Table 4.1**).

Table 4.1. Number of bird species recorded at habitat types at Bungin area

Wildlife	Oil Palm Plantation (Species)	Rubber Mixture Plantation (Species)	Shrubs Area (Species)	Secondary Growth (Species)	Riparian Forest (Species)	Timber Estate Plantation & Pocket Remnant Forest (Species)	Pocket of Degraded Remnant Forest (Species)	Log Over Forest (Species)
Birds	26	23	10	13	13	33	13	29

4.1.3. Bird Status

The total birds species found at the property are listed at **Table 4.2**. The number birds species protected by GOI found at the study area is 14 species, they are 1) Little egret (*Egretta garzetta*), 2) Oriental honey-buzzard (*Pernis ptilorhynchus*), 3) Crested serpent eagle (*Spilornis cheela*), 4) Chinese goshawk (*Accipiter soloensis*), 5) Black eagle (*Ictinaetus malayensis*), 6) Black tighed falconet (*Microhierax fringilarius*), 7) White throated kingfisher (*Halcyon smyrnensis*), 8) Wreathed hornbill (*Aceros undulatus*), 9) Black hornbill (*Anthrococeros malayanus*), 10) Rhinoceros hornbill (*Buceros rhinoceros*), 11) Brown throated sunbird (*Anthreptes malacensis*), 12) Purple napped sunbird (*Hypogramma hypogrammicum*), 13) Olive backed sunbird (*Nectarinia jugularis*), and 14) Little spiderhunter (*Arachnothera longirostra*).

Other three birds species are recorded as migratory birds from northern hemisphere also identified at the study area. Those birds are Oriental honey-buzzard (*Pernis ptilorhynchus*), Chinese goshawk (*Accipiter soloensis*), and Tiger shrike (*Lanius trigrinus*).

Ten bird species found at the project area are classified as near threatened bids according to IUCN Red List database such as 1) Crested fireback (*Lophura ignita*), 2) Long tailed parakeet (*Psittacula longicauda*), 3) Black hornbill (*Anthacoceros malayanus*), 4) Rhinoceros hornbill (*Buceros rhinoceros*), 5) Red throated barbet (*Megalaima mystacophonos*), 6) Yellow crowned barbet (*Megalaima henricii*), 7) Fairy minivet (*Pericrocotus igneus*), 8) Rufous crowned babbler (*Malacopteron magnum*), 9) Fluffy tit babbler (*Macronous ptilosus*), and 10) Brown fulvetta (*Alcippe brunneicauda*).

Furthermore, there are ten bird species categorized at CITES Appendix II, those are 1) Oriental Honey-buzzard (*Pernis ptilorhynchus*), 2) Crested serpent eagle (*Spilornis cheela*), 3) Chinese goshawk (*Accipiter soloensis*), 4) Black eagle (*Ictinaetus malayensis*), 5) Black tighed falconet (*Microhierax fringilarius*), 6) Long tailed parakeet (*Psittacula longicauda*), 7) Blue crowned hanging parrot (*Loriculus galgulus*), 8) Wreathed hornbill (*Aceros undulatus*), 9) Black hornbill (*Anthacoceros malayanus*), 10) Rhinoceros hornbill (*Buceros rhinoceros*).

Table 4.2. Birds Species Found at Bungin Field Area, South Jambi B Block

Family/Species	Local Name	Common Name	Found and Frequency	Status	Feeding Guilds
Ardeidae					
1. *Egretta garzetta**	Kuntul Kecil	Little Egret	+1Rr,	P	I, Fs
Accipitridae					
1. *Pernis ptilorhyncus**	Sikep-madu asia	Oriental Honey-buzzard	+8Vr,	P, Ap II, M	C,
2. *Spilornis cheela* *	Elang-ular bido	Crested Serpent-eagle	+8Rr,+5Rr,+6Rr	P, Ap II	C,
3. *Accipiter soloensis* *	Elang-alap cina	Chinese Goshawk	+8Vr,	P, Ap II, M	C,
4. *Ictinaetus malayensis* *	Elang hitam	Black Eagle	+8Vr	P, Ap II	C
Falconidae					
1. *Microhierax fringillarius* *	Alap alap capung	Black-tighed Falconet	+2Rr,+6Rr	P, Ap II	C
Phasianidae					
1. *Lophura ignita*	Sempidan biru	Crested Fireback	+6Vr	NP, NT	H
3. *Gallus gallus*	Ayam hutan merah	Red jungle fowl	+6Vr,+1Rr	NP	H
Turnicidae					
1. *Turnix suscicator*	Gemak loreng	Barred Buttonquail	+1Rr,+3Rr,+6 Rr	NP	H
Rallidae					
1. *Amaurornis phoenicurus*	Kareo padi	White breasted waterhen	+1Fr,+3Rr	NP	I
Columbidae					
1 *Treron vernans.*	Punai gading	Pink necked Green-Pigeon	+2Rr,+4Rr,+5Fr,+7Rr,+6Rr	NP	F
2. *Ducula aenea*	Pergam hijau	Green imperial Pigeon	+2Rr, 6 Rr	NP	F
3 *Streptopelia chinensis*	Tekukur	Spotted Dove	+1Rr,+2Fr,	NP	Sf
4.*Geopelia striata*	Perkutut	Peaceful Dove	+1Rr	NP	Sf
5.*Chalcophaps indica*	Delimukan	Emerald-Dove	+1Rr, +6Rr	NP	Sf
Psittacidae					
1.*Psittacula longicauda*	Betet ekor panjang	Long tailed Parakeet	+6Rr	NP, NT, Ap II	F,
2.*Loriculus galgulus*	Serindit malayu	Blue crowned Hanging Parrot	+8Rr, +6Rr,+5Rr	NP, Ap II	F
Cuculidae					
1. *Phaenicophaeus chloropheus*	Kadalayan selaya	Raffles Malkoha	+7Fr,	NP	I
2. *Centropus bengalensis*	Bubut Alang	Lesser Coucal	+1Fr, +3Rr, +5Rr	NP	I, C, E
Apodidae					
1. *Collocalia maxima*	Walet sarang hitam	Black nest Swiftlet	+2Fr,+6Rr	NP	I
2. *Cypsiurus balasiensis*	Walet palem Asia	Asian Palm Swift	+6Rr	NP	I
Hemiprocnidae					
1. *Hemiprocne longipennis*	Tapekong Jambul	Grey rumped Tree Swift	+2Rr	NP	I
Alcediniidae					
1. *Halcyon smyrnensis**	Cekakak belukar	White throated Kingfisher	+1Rr,+4Rr	P	I, Fs
Meropidae					
1. *Merops viridis*	Kirik-kirik biru	Blue throated Bee-Eater	+1Vr,+4 Rr	NP	I

Family/Species	Local Name	Common Name	Found and Frequency	Status	Feeding Guilds
Bucerotidae					
1. *Aceros undulatus**	Julang emas	Wreathed Hornbill	+8Vr,	P, Ap II	F
2. *Anthracoceros malayanus**	Kangkareng hitam	Black Hornbill	+8Vr	P, NT, Ap II	F
3. *Buceros rhinoceros**	Rangkong Badak	Buceros Hornbill	+8Vr	P, NT, Ap II	F
Capitonidae					
1. *Megalaima mystacophonos*	Takur warna warni	Red throated Barbet	+8Vr,	NP, NT	F
2. *Megalaima henricii*	Takur topi emas	Yellow crowned Barbet	+8Vr	NP, NT	F
3. *Megalaima australis*	Takur tenggeret	Blue eared Barbet	+8Vr,	NP	F
4. *Megalaima haemacephala*	Takur ungkut-ungkut	Coppersmith Barbet	+8Vr	NP	F
Picidae					
1. *Picus miniaiceus*	Pelatuk merah	Banded Woodpecker	+8Vr,	NP	I
2. *Chrysocolaptes validus*	Pelatuk tunggir emas	Greater Goldenback	+8Vr	NP	I
Hirundinidae					
1. *Hirundo tahitica*	Layang Batu	Pacific Swallow	+1Fr,+2Fr,+4Rr,+5Rr+6Rr+7Rr+8Fr	NP	I
Campephagidae					
1. *Hemipus hirundinaceus*	Junjing Batu	Black winged Flycather Shrike	+2Fr, +4Rr	NP	I,
2. *Pericrocotus igneus*	Sepah Tulin	Fiery Minivet	+2Rr,8Rr	NP, NT	I,
Chloropseidae					
1. *Aegithina tiphia*	Cipo kacat	Common Iora	+2Rr,+4Rr	NP	
2. *Chloropsis sonnerati*	Burung daun Besar	Greater Green Leafbird	+6Vr	NP	
3. *Chloropsis cochinchinensis*	Burung daun Sayap Biru	Blue winged Leafbird	+6Vr	NP	
Pycnonotidae					
1. *Pycnonotus atriceps*	Kuricang	Back headed Bulbul	+2Rr,+5Rr	NP	F, I,
2. *Pycnonotus aurigaster*	Kutilang	Sooty headed Bulbul	+1Rr,+2Rr,+4Rr,5Rr,+6Rr,+7Rr	NP	F, I
3. *Pyconotus goiavier*	Cerucuk	Yellow vented Bulbul	+1Fr, +2Fr,+3Rr,+4Rr,+5Fr+6Fr,+7Fr	NP	F, I,
4. *Pycnonotus bunneus*	Merbah Corok	Red eye Bulbul	+1Rr,+7Rr,+8Rr	NP	F, I
5. *Pycononotus simplex*	Merbah Corok	Cream vented Bulbul	+1Rr,+7Rr,+8Rr	NP	F, I
Dicruridae					
1. *Dicrurus paradiceus*	Srigunting batu	Greater racket tailed Drongo	+8Rr	NP	I
Corvidae					
1. *Corvus enca*	Gagak Hutan	Lasser slender bill Crow	+2Rr	NP	I,
Timaliidae					
1.*Malacopteron magnum*	Asi Besar	Rufous crowned Babbler	+8Vr	NP, NT	I
2. *Stachyris erythroptera*	Tepus Merbah	Chesnut-winged Babbler	+4Vr,	NP	I
3. *Macronous gularis*	Ciung-air coreng	Striped Tit-babbler	+1Rr,+3Vr	NP	I
4. *Macronous ptilosus*	Ciung-air pongpong	Fluffy-backed Tit-babbler	+1Vr,	NP, NT	I
5. *Alcippe brunneicauda*	Wergan coklat	Brown Fulvetta	+8Vr	NP, NT	I
Turdidae					
1. *Copsychus saularis*	Kucica	Magpie Robin	+1Rr,	NP	I

Family/Species	Local Name	Common Name	Found and Frequency	Status	Feeding Guilds
Sylviidae					
1. Orthotomus atrogularis	Cinenen belukar	Dark-necked Tailorbird	+1Rr,+4Rr	NP	I
2. *Orthotomus ruficeps*	Cinenen kelabu	Ashy Tailorbird	+1Fr,+2Fr,+3Rr,+4Fr,+5Fr,+6Fr,+7Fr,+8Rr	NP	I
3. *Prinia flaviventris*	Prenjak rawa	Yellow bellied Prinia	+1Rr,+2Fr,+3Rr,+4Fr,+5Fr	NP	I
4. *Prinia familiaris*	Prenjak jawa	Bar winged Prinia	+1Rr,+2Fr,+3Rr,+4Fr,+5Fr,+6Fr	NP	I
5. *Cisticola juncidis*	Cici padi	Zitting Cisticola	+1Rr,	NP	I
Artamidae					
1. *Artamus leucorhynchus*	Kekep Babi	White breated Wood Swallow	+1Rr,	NP	I
Motacillidae					
1. *Anthus novaeseelandiae*	Apung tanah	Common Pipit	+1Rr	NP	I
Laniidae					
1. *Lanius tigrinus*	Bentet Loreng	Tiger Shrike	+2Rr,	NP, M	I
2. *Lanius schach*	Bentet Kelabu	Long tailed Shrike	+1Rr,+2Rr	NP	I
Sturnidae					
1. *Acridotheres javanicus*	Kerak Kerbau	Javan Myna	+1Rr	NP	F, I, Ms
2. *Gracula religiosa*	Tiong Emas	Hill Myna	+2Vr	NP	F, I
Nectariniidae					
1. *Anthreptes malacensis**	Br Madu Kelapa	Brown throated Sunbird	+8Rr,+5Rr	P	N, I
2. *Hypogramma hypogrammicum**	Br Madu Rimba	Purple napped Sunbird	+5Vr	P	N, I
3. *Nectarinia jugularis**	Br Madu Sriganti	Olive backed Sunbird	+2 Rr	P	N, I
4. *Arachnothera longirostra**	Pijantung Kecil	Little Spiderhunter	+8 Rr,	P	N, I
Dicaeidae					
1. *Prionochilus maculatus*	Pentis Raja	Yellow breasted Flowerpecker	+1Rr,+2Rr,+5Rr	NP	F, I, E
2. *Dicaeum trigonostigma*	Br Cabe bunga api	Orange bellied Flowerpecker	+2Rr,+5Rr	NP	
Ploceidae					
1. *Lonchura punctulata*	Bondol Peking	Scaly breasted Munia	+1Fr,+2Fr,+3Rr,+4Fr,+5Fr,+6Fr,+7Fr,+8Rr	NP	Sf
2. *Lonchura maja*	Bondol Haji	White headed Munia	+6Rr	NP	Sf

Note:

Habitat Type:
1. Oil palm plantation area
2. Rubber mixture plantation area
3. Shrubs area
4. Secondary Growth area
5. Riparian area
6. Timber estate & Pocket remnant forest
7. Pocket degraded forest
8. Log over forest

Frequency of Species Found during Observation:
++ = found at sampling site with abundance
- = not found at sampling site
? = not found at sampling site but most probably found
Fr = frequently found
Rr = rarely found
Vr = Very rare
Sol = Solitary

Conservation Status:
P = Protectedby GOI
NP = Non Protected by GOI
NT = Near Threatened

Feeding Guild:
Hs = Honey sucker
Sf = Seed feeder
I = insectivorous
O = omnivores
Fs = Fish eater
C = carnivore
Ms = Mollusk eater
H = Herbivorous
F = Fruit feeder

Remarks:
Sol = Solitary
E = Endemic
M = Migrant

(a) (b)

Figure 4.9. Rhinoceros hornbill (a) and Black hornbill (b) are protected by GOI and listed in CITES Appendix II

(a) (b)

Figure 4.10. Red throated barbet (a) and Fiery minivet (b) are pecies listed as near threatened based on IUCN Red List Database

4.1.4. Bird Structure

The bird structure communities at study area can be indicated from the trophic level or bird feeding guild. The bird feeding guild at Bungin Field area is recorded at **Figure 4.11.** Insectivores bird is dominant species observed at whole sample area.

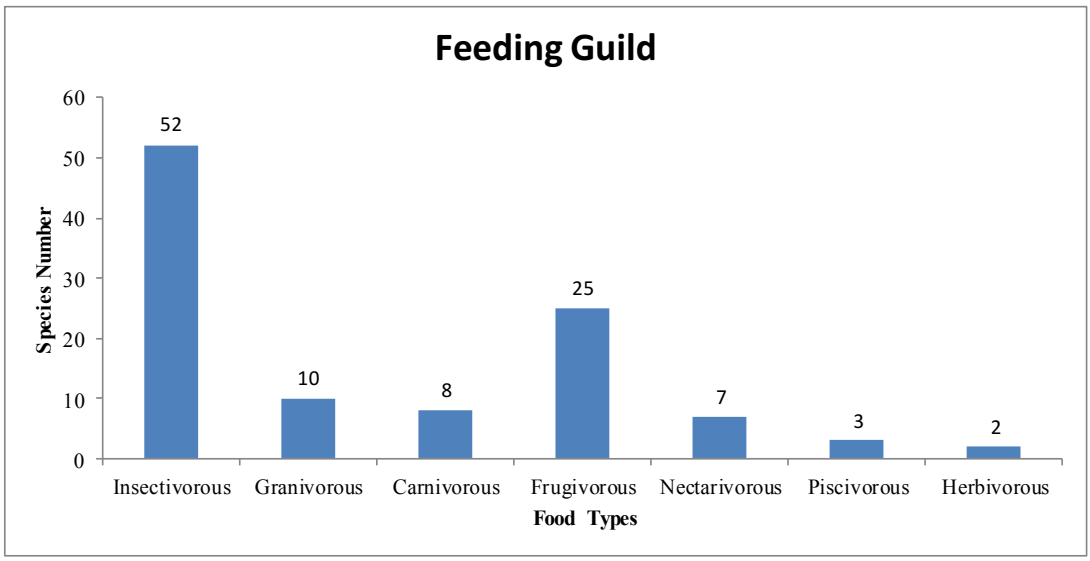

Figure 4.11. Chart of bird feeding guild at Bungin area

Figure 4.12. Pycnonotus aurigaster is one of frequent birds found at the project area.

4.1.5. Bird Dominancy

There are 7 dominant of bird species occurred at the project area such as 1) Scaly breasted munia (*Lonchura punctulata*), 2) Yellow bellied prinia (*Prinia flaviventris*), 3) Bar winged prinia (*Prinia familiaris*), 4) Yellow vented bulbul (*Pycnonotus goiavier*), 5) Ashy tailorbird (*Orthotomus ruficeps*), 6) Pacific swallow (*Hirundo tahitica*), 7) and Sooty headed bulbul (*Pycnonotus aurigaster*). Correlation between importance value index (IVI) of bird species and individual number at the study area is presented at **Figure 4.13**.

4.1.6. Bird Species Diversity

The bird species diversity at the sampling area shown by diversity index varied. The lowest index is observed at shrubs area, and the highest index is at timber estate and pocket of remnant forest (**Table 4.3**). At the shrubs area, the habitat provides less feeding sources, vegetation cover, and shelter, therefore only certain bird species (i.e. birds that prefer open area) are found. Nevertheless, at pocket remnant forest, it is observed that this habitat provides more food resources, cover, shelter and nesting sites that resulted in a higher birds diversity index. Another important factor influencing bird diversity is habitat condition. The diversity of habitat is a main factor to support availability of food resources, cover, shelter, and nesting area for birds. Furthermore, the birds diversity have correlation with natural vegetation (forest) covers at the habitat types.

Table 4.3. Birds diversity index at habitat types observed in Bungin Field area

No.	Tansect & Habitat Types	Species Number	H'	E
1	Tie-in (Rubber Mixture Plantation & Oil Palm Plantation	28	3.15	0.95
2	Sumpal HTI BPP (Timber Estate Plantation Plantation & Pocket Remnant Forest)	33	3.28	0.94
3	Pakerin HTI (Timber Estate plantation)	12	2.41	0.97
4	Bayat Riparian (Riparian, Secondary Growth, Shrubs)	16	2.70	0.97
5	Shrubs Area, oil palm plantation Kubangan Village	10	1.37	0.60
6	Proposed gas plan (Pocket Remnant Forest Degraded, Shrubs)	13	2.35	0.92
7	Log over Forest & Lalan Riparian	29	3.26	0.97
8	Proposed gas plan (oil palm plantation, shrubs)	12	2.32	0.93
9	Trunkline (oil palm plantation & shrubs)	20	2.95	0.98

legend: H' = diversity index E = equitabilty index

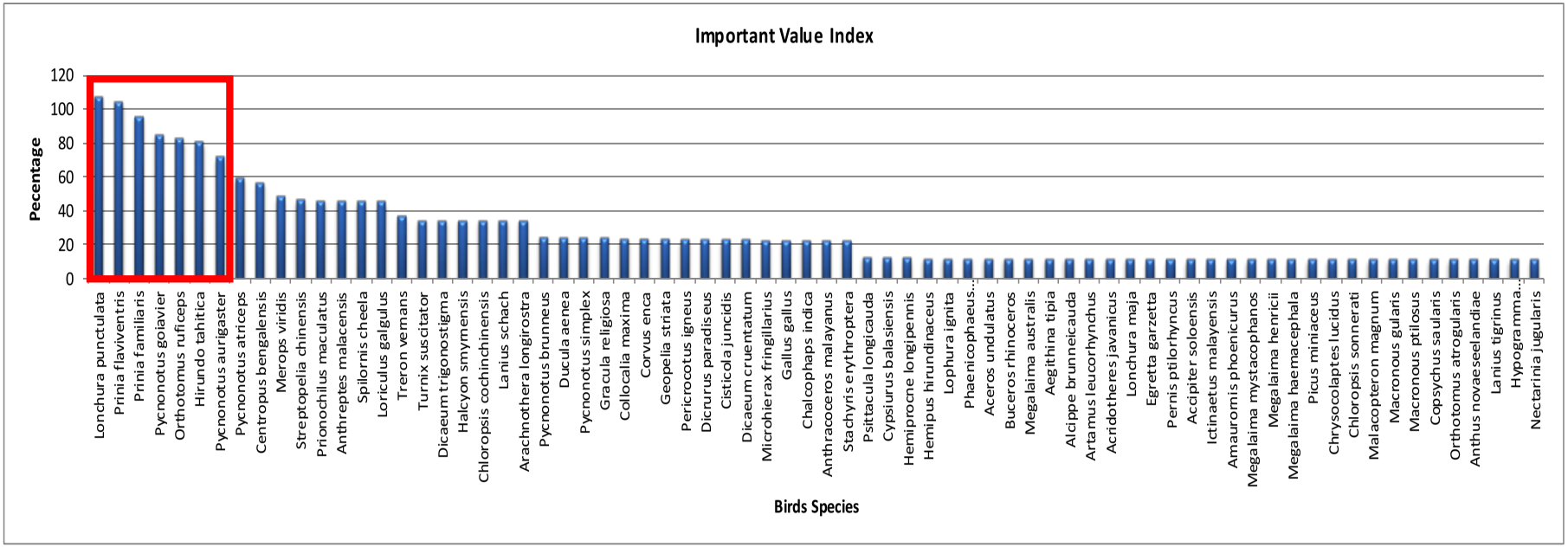

Figure 4.13. Correlation between importance value index of bird species and individual number at the project area

4.1.7. Similarity of Bird Community

The similarity of birds community at sample area determined in Bungin Field area is presented at F**igure 4.14**. Birds community clustering at sample area is divided into 7 cluster as follows:

1. C**luster 1** is TE-P–RBR (similarity around 80.5 %)
2. **Cluster 2** is OPPSA– TL – GP2 (similarity approximately 75.56 %),
3. C**luster 3** is cluster 1 linkage to cluster 2 (similarity around 70.37%)
4. C**luster 4** is cluster 3 linkage to TE-BPP (similarity approximately 69.30%)
5 **Cluster 5** is cluster 4 linkage to PDRF similarity around 68.50%),
6. **Cluster** 6 is cluster 5 linkage to TI (similarity approximately 67.00%) than
7. **Cluster 7** is cluster 6 linkage to FOL (similarity around 55.56 %).

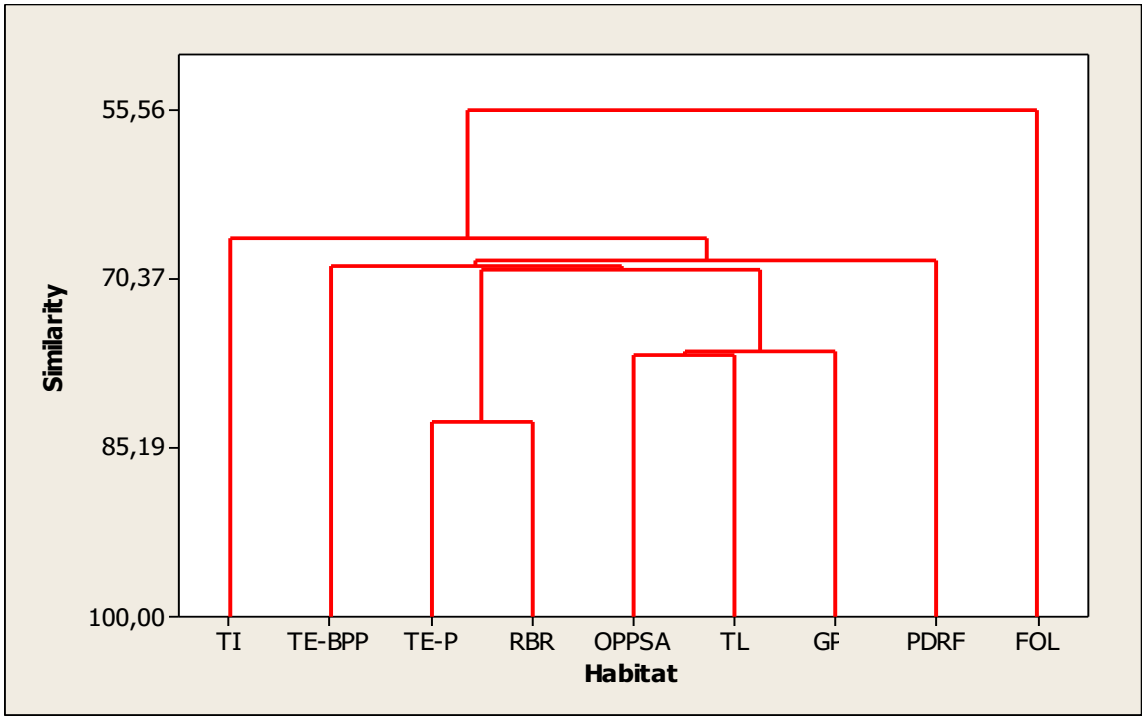

Figure 4.14. Dendrogram bird community at sample area at Bungin area

TI: Tie-In (VW1); TE-BPP: Timber Estate of Bumi Persada Permai (HTI BPP) Sumpal; TE-P: Timber Estate of Pakerin (HTI Pakerin Pangkalan Bayat); RBR: Riparian of Bayat River; OPPSA: Oil Palm Plantation and Shrubs Area; PDRF: Pocket of Degraded Remnant Forest and Shrubs; FOL: Forest Log Over Area and Riparian of Lalan River and Gas Plan Area; GP: Oil Palm Plantation and Shrubs Area of proposed gas plan; TL: Oil Palm and Shrubs Area of Trunkline.

4.2. Discussion

4.2.1. Habitat Types and Diversity

Bungin project area have varied habitat types. There are 8 habitat types observed during the survey. The habitat types have significant difference on species number of bird, thus,

based on the analysis, it can be divided into two groups; habitat types possessing low species number of birds and habitat types possessing medium number of birds species.

The bird habitat types that have low number of birds species are shrubs area, riparian area, secondary growth and pocket degraded remnant forest. These habitats types have around 10-13 number of bird species. Meanwhile, habitat types such as oil palm plantation, mixed rubber plantation, timber estate plantation, and pocket remnant forest and logged over area are classified as types that posses medium number of bird species with total species number found around 23 – 33 species. This phenomenon is similar to birds diversity, which also has close correlation with habitat types condition. The highest bird diversity is observed in mixture habitat types. It seems that occurred forested area significantly influenced species abundance.The birds diversity will increase if the habitat type composed with forest vegetation

4.2.2. Conservation Status

The number of protected bird species observed at Bungin Field area are quite high (around 19.4 % of total bird species found at the project area). Among birds species found at Bungin Field area, 14 species are classified as protected speciesby GOI regulation (PP 7/1999). From those birds species identified (72 species), they are also categorized as Near Threatened (NT) base don Red List Database of IUCN (2009) such as Black hornbill (*Anthacoceros malayanus*), Rhinoceros hornbill (*Buceros rhinoceros*). Furthermore, some species are also listed in Appendix II CITES such as Oriental honey-buzzard (*Pernis ptilorhynchus*), Crested serpent eagle (*Spilornis cheela*), Chinese goshawk (*Accipiter soloensis*), Black eagle (*Ictinaetus malayensis*), Black tighed falconet (*Microhierax fringilarius*).

The migratory birds, Oriental honey-buzzard and Chinese goshawk, are observed at the study area that only fly over Bungin Field area. Anyhow, Tiger shrike is identified to stop over at the mixed rubber plantation. Based on the survey result, it is observed that there is no endemic bird found at the Bungin Field area.

4.2.3. Feeding Guild and Dominancy

Most of the bird species observed at Bungin Field area are categorized as insectivores bird (approximately 72.20 %) and frugivores bird (around 34.72 %). The dominant bird species found at Bungin Field area are Scaly breasted munia (*Lonchura punctulata*), Yellow bellied prinia (*Prinia flaviventris*), Bar winged prinia (*Prinia familiaris*), Yellow vented bulbul (*Pycnonotus goiavier*), Ashy tailorbird (*Orthotomus ruficeps*), Pacific swallow (*Hirundo tahitica*), and sooty headed bulbul (*Pycnonotus aurigaster*). In addition, most birds observed live in groups or pairs.

4.2.4. Similarity Communities

From dendrogam analysis, it shows that bird community at Bungin Field area have 7 clusters based on similarity index to bird habitat types. The birds community of cluster1, cluster 2, and cluster 3 have similarity of > 70 %, it seems that communities quite similar in species. Because of species bird at that cluster mostly non forest dependent birds It is also concluded that bird community is composed by birds that adapts to non forest. In the

future bird communities at Bungin development project will change to non forest dependent birds.

CHAPTER V
CONCLUSION AND RECOMENDATION

1. The total bird species found at the Bungin project area are 72 species. Among them, 14 birds species are classified as protectedby Government of Indonesia (GOI) regulation; 10 species are listed as near threatened based on the Red List Database of IUCN; and 10 species are listed in Appendix II by CITES.

2. The bird diversity observed is varied that has correlation with habitat types. In general the birds diversity is influenced by the occupancy of forested areas at the Bungin Field area.

3. based on feeding guild analysis, the dominant bird at project area is insectivores bird. In addition, the most of bird species observed at the study area is categorized non forest dependent bird.

4. In order to develop Bungin Field area, the data and information of bird diversity can be used as baseline data to be considered for maintaining environmental condition at the project area.

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