

Distribution of Endemic Birds in Protected Forests in Indonesia

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ABSTRACT

The spread and diversity of bird species in an ecosystem is an indicator of the stability of the ecosystem. The high diversity index of birds represents the healthy ecosystem and stable condition so that it can support bird life. The aim of the study was to determine the level of bird diversity on small islands in Maluku, namely Air Louw Hamlet Protected Forest in Ambon Island, bird species abundance and bird response to land cover changes. The study was conducted in April - June 2019 using the Line Transect method on a 100 m long track with a distance between 100 m lane, and the width of the transect band 50 m left and right lane on a plot area of 50,000 m² (5 ha). Observations were carried out at 07.30 - 10.00 WIT and 16.00 - 18.30 WIT. The results of the study found that the number of birds on transect 1 was 81, transects 5 were 46, transects 2 were 37, transects 4 were 32, and transects 3 were 18. The Margalef Richness Index value (R1) ranges from low to moderate at 2.596851 - 2.873082 ($2.5 < R1 > 4$). This condition was caused by the low number of bird species found in the study location, which was only as many as 22 species. The Shannon-Winer Diversity Index (H') was classified as moderate at 1.05 - 1.88 ($1 < H' > 3$). Evenness Index (E) was classified as medium on 4 transects of 0.24 - 0.56. The density of bird populations on each transect was 1 transect (81 tails) with a population density of 147 tails / ha. Transects 2 was 37 tails with a population density of 72 tails /ha. Transects 3 was 18 tails with a population density of 41 /ha. Transect 4 was 32 tails with a population density of 61 tails / ha and transect 5 was 46 tails with a population density of 74 tails /ha. The highest population density was Maluku Perling Bird as many as 157 tails / 5 ha, Walet Sapi as many as 83 tails / 5 ha, Cabai Kelabu as many as 44 tails / 5 ha and Madu Sriganti Bird as many as 42 tails / 5 ha. The results also found 2 species of birds that have conservation values and protected values as well as endemic species of Maluku with very limited distribution properties, namely Sikatan Kelabu (*Myagra galeata*) and Cabai Kelabu (*Dicaeum vulneratum*).

Keywords: Maluku endemic bird, bird diversity, protected forest, small islands

INTRODUCTION

Birds are very important to maintain the balance of many ecosystems by providing a variety of ecological services. Birds are found in various habitat types, play an important role in the structure and function of ecosystems and have ecological benefits, such as seed dispersal, support forest restoration (Wenny et al., 2011), play a role in pollinating plants in the tropics, and help to control pests (Philpott et al., 2009; Sekercioglu, 2012) and mice, which can destroy agricultural products, so that birds are ideal for assessing ecosystem services (Wenny et al., 2011). Less than 1% of bird species in the world prefer agricultural areas as their main habitat and almost one third of all bird species use these habitats (Sekercioglu et al., 2012). Some agroecosystems can support biodiversity in forest areas (Perfecto et al., 1997). Changes in ecosystems have an impact on population density, abundance and distribution of birds in various habitat types (Temple & Wiens

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Table 1. Criteria for Richness Index Value

Index Value	Category
$R < 2.5$	Low type richness
$2.5 > R < 4$	Medium type richness
$R > 4$	High type richness

Table 2. Criteria for Diversity Index Value

Index Value	Category
$H < 1$	Low diversity
$1 > H' < 3$	Medium diversity
$H' > 3$	High diversity

1989). Diversity of bird species is influenced by diversity of habitat types. Vegetation structure and feed availability in habitats are the main factors that influence species diversity in a habitat (Tortosa, 2000), so that habitats with more diverse vegetation variations will have a higher diversity of bird species compared to habitats that have little vegetation. Sirimau Protected Forest has dry land agriculture mixed with shrubs and secondary forests with a variety of human activities around and within the forest area, which greatly disrupts bird life, so the study aimed to determine the level of bird diversity, bird species abundance and bird response to changes in land cover.

RESEARCH METHODS

Research Location

The study was conducted in April - June 2019 in the Protected Forest of Air Louw Hamlet which is part of the Sirimau Protected Forest of Ambon Island, in the Mount Suwa hilly area on the type of secondary forest land use and dry land agriculture mixed with bushes.

Bird Data Collection

The tools and materials used were GPS, Altimeter, Compass Shunto, Binocular, Digital Camera (Tele Zoom), thematic maps and user guide, Land cover map, Topographic map, Bird animal guide, Parang, Raffia rope, Fabric ribbon and Roll meter. The birds observed were all types of birds found in the research plots, especially those that were sensitive to environmental changes in the rectangular work path using the Line Transect method, which was placed side by side. Bird data was collected in a plot by walking slowly and consistently on the transect, at 7:30 a.m. to 10:00 p.m. and continued at 16:00 - 18:30 Eastern Indonesia Time. Birds observed were identified based on Kennedy (2000) morphology, behavior and types and Fisher and Hicks (2006). Bird conservation status uses data from the International Union for Conservation of Nature (IUCN, 2014) and naming refers to Coates and Bishop (1997).

Data Plot Design

The research plot was rectangular in the shape of 5 transects with a length of 100 m, the distance between transects is 100 m, width is 50 m left and right transect, so the area of the research plot is 50,000 m² (5 ha).

Data Analysis

The parameters seen in this study were species diversity, species abundance and population density. The Diversity Index was used to see the relative abundance of bird species namely Richness index (R1), diversity index (H') and evenness index (E). Richness index (R1), uses the equation from Margalef (Ludwig & Reinold, 1988). Classification of species Richness index values uses criteria as in **Table 1**.

The Diversity Index was intended to find out the individual distribution between species found, assuming that $H' = 0$ if there is only one type in the sample data collected, and $H' = \text{Maximum}$ if there are as many types as possible. The Diversity Index (H'), using the Shanon-Wiener equation (Ludwig & Reinold, 1988).

The classification of the value of the Diversity Index uses the criteria in **Table 2**.

The evenness index calculation (E) uses the Magurran equation (Ludwig & Reynold, 1988). The classification of evenness index values uses the criteria in **Table 3**.

Table 3. Criteria for evenness index values

Index Value	Category
E close to 0	· Individual distribution between types is uneven / not the same · Distribution condition of species abundance is unstable
E close to 1	· Distribution of individuals between types is evenly distributed · Distribution condition of species abundance is stable

Table 4. Abundance Class Lowen et al. (1996), which was modified according to the condition / nature of bird encounters at the research location

Total of Species	Abundance Class Category Based on the number of Species	Abundance Value	Character of Abundance
< 5	Rare	1	Low
6 – 10	Uncommon	2	
11 – 25	Often	3	Medium
26 – 50	Common	4	
51 – 100	Very Common	5	High
>100	Abundant	6	

Table 5. Distribution of Birds in the Air Louw Forest

No. Fm.	Family	No Sp.	Kind of Local name	Kind of Scientific name	Total of Contact	Total Individual
1	ACCIPITRIDAE	1	Alap-alap sapi	<i>Falco moluccensis</i>	1	1
2	COLUMBIDAE	2	Delimukan zamrud	<i>Chalcophaps indica</i>	1	1
		3	Perkutut jawa	<i>Geopelia striata</i>	1	1
		4	Tekukur polos	<i>Streptopelia chinensis</i>	2	2
		5	Pergam mata-putih	<i>Ducula perspicillata</i>	4	6
		6	Walik raja	<i>Ptilinopus superbus</i>	7	9
3	CENTROPODIDAE	7	Bubut alang-alang	<i>Centropus bengalensis</i>	1	1
4	APODIDAE	8	Walet sapi	<i>Collacalia esculenta</i>	12	29
		9	Walet polos	<i>Collacalia vanikorensis</i>	1	2
5	HALCYONIDAE	10	Raja-udang sungai	<i>Halcyon chloris</i>	2	3
6	MEROPIDAE	11	Tiong-lampu polos	<i>Eurystomus orientalis</i>	2	2
	PYCNONOTIDAE	12	Cucak kutilang	<i>Pycnonotus aurigaster</i>	1	2
7	DICRURIDAE	13	Srigunting Lencana	<i>Dicrurus bracteatus</i>	4	8
8	CORVIDAE	14	Gagak hutan	<i>Corvus enca</i>	1	1
9	CISTICOLIDAE	15	Cici merah	<i>Cisticola excillis</i>	1	1
10	MONARCHIDAE	16	Kehicap kaca-mata	<i>Monarcha trivirgatus</i>	1	1
		17	Sikatan kelabu	<i>Myagra galeata</i>	5	6
		18	Kehicap pulau	<i>Monarcha cinerascens</i>	1	1
11	STURNIDAE	19	Perling maluku	<i>Aplonis mysolensis</i>	13	96
12	NECTARINIIDAE	20	Burung-madu hitam	<i>Nectarinia aspasia</i>	6	7
		21	Burung-madu sriganti	<i>Nectarinia jugularis</i>	8	15
13	DICAEIDAE	22	Cabai kelabu	<i>Dicaeum vulneratum</i>	13	19

Abundance class was based on the number of birds found based on the Abundance category from the Abundance Sequence Scale by Lowen et al. (1996) in Zoser et al. (2000).

Population Density

Estimation of population density using the King Method which was based on “Radial Distance” which was the distance between observers and animals directly at the time of detection in the field (Lavieren, 1982).

RESULTS AND DISCUSSION

Number of Bird Types

The types of birds found were 22 species, 13 families and were dominated by 5 species of Columbidae family and 3 types of Monarchidae family. Bird observations can be seen in **Table 5**.

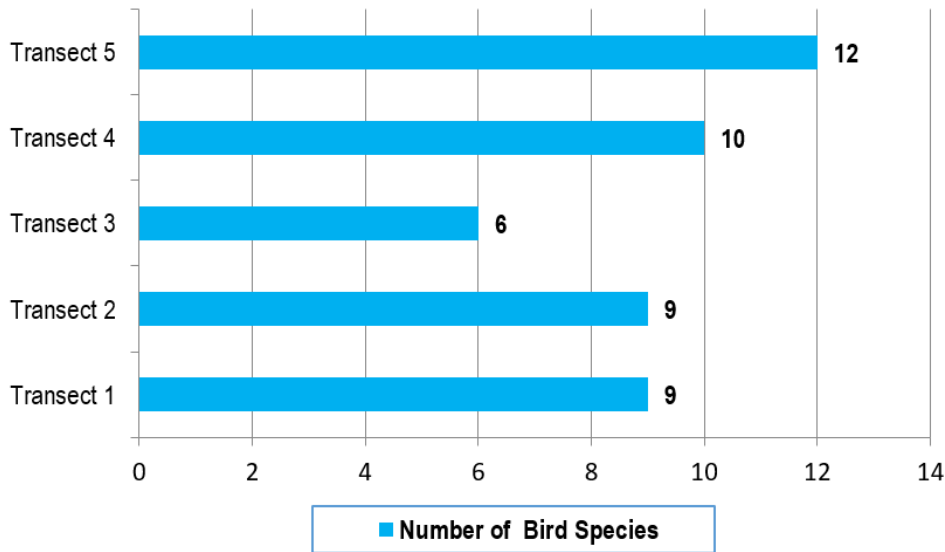


Figure 1. Number of bird species found on each transect

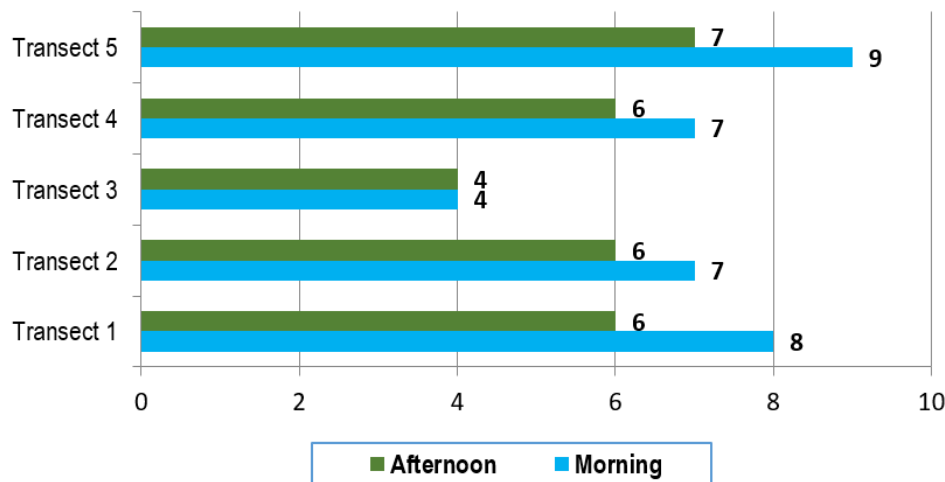


Figure 2. Bird Discovery Based on Time of Observation

The results in the field found 3 species of birds with the highest number of contacts and number of species, namely Perling Malukuas many as 13 times of contacts with 96 species, Walet Sapi as many as 12 times of contacts and 29 species, Cabai Kelabu as many as 13 times of contacts with 19 species, and Madu Sriganti Bird as many as 8 times of contacts with 15 species. Meanwhile, the other species were found with a smaller number of contacts and number of individuals. There were 8 species of birds as many as 1 contact with 1 species. Data on bird species meetings on the 5 transects showed that there were variations in the number of species meetings in each lane where there were 9 types found at transect 1, 9 types found at transect 2, 6 types found at transect 3 transects, 10 types found at transect 4 and 12 types found at transect 5. Transection 3-5 was a secondary forest type and transects 1 – 2 were dry land agriculture mixed with bushes. The 22 species of birds in the research location was a sufficient number of meeting species if it was compared to the sample area of 5 ha with the type of land cover in the form of secondary dry forest mosaics with undergrowth in the form of shrubs and reeds where there are several garden fields nearby. However, due to the presence of several human activities such as timber extraction and natural tourism in protected forests, the number of contacts with bird species was low.

Based on the time of observation, there were differences in each transect as presented in Figure 2.

In Figure 2, there were 35 species found in the morning. It was a high number compared to species found in the afternoons which only 27 species. The results of the observation show that birds tend to rest among

Table 6. Index of Bird Diversity in Each Transect

Transect	Total of Types (S)	Total of Species (N)	Index of Richness Species (R ₁)	Index of Diversity (H)	Index of Evenness (E)
Trans. 1	9	81	1.820478	1.058254	0.240816
Trans. 2	9	37	2.215503	1.884813	0.521976
Trans. 3	6	18	1.729881	1.637529	0.566546
Trans. 4	10	32	2.596851	1.875268	0.541088
Trans. 5	12	46	2.873082	1.843873	0.481600

Table 7. Overall Bird Types Diversity Index

Location	Total of Types (S)	Total of Species (N)	Index of Richness Species (R ₁)	Diversity Index (H')	Evenness Index (E)
Transect 1 to Transect 5	22	214	3.913547	2.03528372	-0.658446

leaves such as perch or silence in the afternoon, so that it is difficult to monitor, especially if the bird does not make his voice. Trees that grow in the Sirimau Protected forest area with a wide canopy and many branches are a convenient place for Tiong lampu polos (*Eurystomus orientalis*) and Srigunting lencana Birds (*Dicurus bracteatus*) where they perch on the branches of the Salawaku Tree all day (*Paraserianthes falcataria*) and Cassowary Trees (*Casuarina junghuiana*).

Bird Diversity

The diversity of bird species in the study locations is presented in **Table 6**.

The diversity index of bird species was classified as moderate with values of 1.05 - 1.88 ($1 < H > 3$). The number of bird species found that were only 12 types as many as 81 species caused this condition. After all data collected on the 5 transects were combined, the Diversity Index value that is classified as moderate can be presented in **Table 7**.

The diversity of bird species is generally different between one habitat with another habitat, where differences in bird diversity can occur due to the presence of differences in the structure of vegetation so that it will cause a variety of feed sources in a habitat. Alikondra (2002) stated that the factors that influence the value of bird species diversity (H') are environmental conditions, number of species and distribution of individuals in each type. The bird diversity index (H') in the Air Louw Protected Forest was in the moderate category. It means that this region has sufficient productivity, balanced ecosystem conditions, and moderate ecological pressure.

Vegetation closure will affect the diversity of bird species, because tree vegetation is a place for birds to carry out activities such as eating, drinking, sheltering and breeding (Hernowo & Prasetyo 1989). According to Fadrikal et al. (2015), the relationship between the diversity of bird species and the area is not as strong as the relationship between the diversity of bird species and the diversity of tree species in an area. Some bird species found in protected forests were only seen perched, and sometimes fly to look for food, so that the discovery of bird species at the research location produces various bird characters.

Richness of Bird Species

Index value of bird species richness in the region ranges from low to moderate. The secondary forest areas (Transects 4 and 5) were in the moderate category with the index value of species richness ranges from 2.59 - 2.87 ($2.5 < R_1 > 4$). The transects 1 - 3 on dryland agricultural areas mixed with shrubs were in the low category with the Richness Index value of 1.72 up to 2.21 ($R_1 < 2.5$). This is because the number of bird species found on all 5 transects was classified as low (6 species up to 12 species, and the total number of species was 22 species with a range of only 5 ha. The type of bird found at the research location is presented in **Figure 3 - Figure 5**.



Figure 3. Perling Maluku (*Aplonis mysolensis*)



Figure 4. Tiong Lampu Polos (*Eurystomus orientalis*)



Figure 5. Srigunting Lencana (*Dicrurus bracteatus*)

The amount of the bird species richness value in the Air Louw Protected Forest area was due to the high distribution of vegetation in protected forest areas. **Table 8** shows the utilization of vegetation by birds in protected areas. The index value of species richness (R) of birds was included in the medium category. It indicates that the Air Louw forest area was a suitable habitat for bird life.

Various types of trees will support the availability of feed for birds so that they will get many choices to choose the type of feed (Tews et al., 2004).

Evenness Type

Evenness Index value (E) ranges from low to moderate of 0.48 - 0.56 where on transect 1 has a low evenness index of 0.240816 approaching the number 0 (uneven evenness condition). Transect 1 has a low evenness index because only one type was found, namely Perling Maluku as many as 51 species. Perling Maluku birds were found in greater numbers because this species was thought to have diverse habitats, namely on plantations, agricultural land, mangrove forests and forest edges. At the time of observation, they were often seen living

Table 8. Utilization of Trees as Bird Habitats in the Sirimau Protected Forest

Bird Types	Tree Types	Form of Utilization	Parts Used
Tiong-lampu polos <i>Eurystomus orientalis</i>	All types of trees that are dead and dry	Very long perch / hours to observe the movement of insects to eat.	Outer branches / twigs and tops.
Srigunting lencana <i>Dicrurus bracteatus</i>	• Cassowary, • Salawaku	Perch to shelter; take refuge from heat and wind	Inner branches / twigs
Perling maluku <i>Aplonis mysolensis</i>	• Cassowary, • Salawaku	Perch in groups to take shelter; take refuge from heat and wind	Inner to outer branches / twigs. In the middle of the crown to the crown top
Cici merah <i>Cisticola excillis</i>	All types of shrubs or shrubs are tall	Perch and whistle	Outer branches / twigs and tops.
Pergam mata-putih <i>Ducula perspicillata</i>	• Salawaku	Perch to shelter; take refuge from heat and wind	Inner to outer branches / twigs. In the middle of the crown to the top of the crown

Table 9. Bird Species Abundance in the Sirimau Protected Forest

Species Local Name–Scientific Name	Total of Individual					Total of Individual Types	Class of Overall Abundance
	T 1	T 2	T 3	T 4	T 5		
Alap-alap sapi (<i>Falco moluccensis</i>)					1	1	Rare
Delimukan zamrud (<i>Chalcophaps indica</i>)					1	1	Rare
Perkutut Jawa (<i>Geopelia striata</i>)	1					1	Rare
Tekukur Polos (<i>Streptopelia chinensis</i>)		1			1	2	Rare
Pergam Mata-Putih (<i>Ducula perspicillata</i>)	2			2	2	6	Uncommon
Walik Raja (<i>Ptilinopus superbus</i>)	6		2	1		9	Uncommon
Bubut Alang-alang (<i>Centropus bengalensis</i>)					1	1	Rare
Walet Sapi(<i>Collacalia esculenta</i>)	8	8	4	7	2	29	Common
Walet Polos (<i>Collacalia vanikorensis</i>)				2		2	Rare
Raja Udang sungai (<i>Halcyon chloris</i>)		2		1		3	Rare
Tiong-lampu polos (<i>Eurystomus orientalis</i>)		2				2	Rare
Cucak kutilang (<i>Pycnonotus aurigaster</i>)					2	2	rare
Srigunting Lencana (<i>Dicrurus bracteatus</i>)			5	3		8	Uncommon
Gagak hutan (<i>Corvus enca</i>)		1				1	Rare
Cici merah (<i>Cisticola excillis</i>)				1		1	Rare
Kehicap kaca-mata (<i>Monarcha trivirgatus</i>)		1				1	Rare
Sikatan kelabu (<i>Myagra galeata</i>)			1		5	6	Uncommon
Kehicap pulau (<i>Monarcha cinerascens</i>)	1					1	Rare
Perling Maluku (<i>Aplonis mysolensis</i>)	51	9	2	12	22	96	Very Common
Burung-madu hitam (<i>Nectarinia aspasia</i>)	1			2	4	7	Uncommon
Burung-madu sriganti (<i>Nectarinia jugularis</i>)	9	5			1	15	Often
Cabai kelabu (<i>Dicaeum vulneratum</i>)	2	8	4	1	4	19	Often

in groups and even in creating a nest that made of Tusam leaves, bark and twigs. Perling Maluku always groups up to hundreds of tails. The spread of birds in the Sirimau Protected Forest was close to stability (E value of birds is close to 1). If the value of E approaches 0, it means that evenness among species is low, whereas if the value of E approaches 1, the distribution between species is relatively uniform. Odum (1971). The spread of birds in the Sirimau Protected Forest was quite evenly because the habitat-forming vegetation was diverse and was able to support bird survival. The use of secondary forest land and dry land mixed with bushes were thought to be highly favored by birds for foraging, reproducing, and as a shelter.

Abundance Types

The abundance class on each data transect was based on the number of birds species per species. It can be seen in **Table 9**.

Table 10. Distribution of Insects in the Air Low Protected Forest

No	Types	Total
1	Spider	880
2	Beetle	709
3	Cricket	802
4	Ant	10.022
5	Caterpillar	990
6	Grasshopper	703

The abundance of bird species in the Air Low Protected Forest was assumed as the result of habitat conditions and availability of trees that greatly support birds life. Other sources of food available such as insects were abundant. The results of the study (Latumahina, Musyafa, Sumardi, & Putra, 2014) found a large and abundant insect population in the Air Low protected forest area.

Table 10 shows the number of types and species of insects was very high in protected forests and can be a feed resource for birds that were always available throughout the year. (FS Latumahina et al., 2014). In addition to insects as a source of food, fruit-producing trees such as papaya (*Carica papaya*) which is quite large and ripe in trees, and 40 days banana (*Musa sp*) which grows in protected forest areas were found in protected forests. The study found Tekukur Polos (*Streptopelia chinensis*) and Madu Sriganti Birds (*Nectarinia jugularis*) which were eating bananas and papaya. It was assumed that both types like papaya and banana. Both types of birds appear to have a wider range of cruising than other types to meet their nutritional needs. Other bird characters such as species origin, reproduction, nest, active time, and habitat are dominated by generalist bird species. Observations found Cabai Kelabu (*Dicaeum vulneratum*) and Walet Sapi (*Collacalia esculenta*) were preying on ants and beetles, through a hole in the Mahogany tree (*Swietenia mahagony*). Good habitat conditions and having a variety of tree species make insects' lives sufficient and can breed so that they will be available in abundant quantities as a food source for birds. Availability of feed in the Air Low Protected Forest is one of the main factors for the presence of bird populations. This was also related to the ability of birds to choose habitats in accordance with the availability of resources for their living needs. Wiens (1992) states that the availability of feed in habitat types was one of the main factors for the presence of bird populations.

Population Density

The results of the Population Density Estimation calculation are presented in **Table 11**.

Transect 2 has a lower estimated density because contact with bird species on transect 2 was lower than 4 other transects. This was indicated by the number of population samples recorded. On transect 5, the estimated density was the highest due to contact with the bird species on the transect was higher than the 4 other transects. In addition, the contact distance with bird species on each transect also has a considerable influence. There were 4 species of birds that have a high population density estimate on all transects, namely Perling Maluku, Walet Sapi, Cabai Kelabu, and Madu Sriganti Birds. The type of land cover in the research location in the form of mosaic between secondary forest and dry deciduous forest of secondary leaves with undergrowth in the form of shrubs and reeds was not an ideal form of land cover for bird habitat, so that the discovery with 22 species of birds in the research location was actually enough. Part of the research location, especially on data transects 3, 4 and 5, were secondary standing land which has been repeatedly damaged mainly by fire, this causes the trees to grow low and open with slender canopy trees. The condition of the Air Low Protected Forest land cover is not an ecologically ideal form of land cover, but this condition has formed its own natural conditions for years so that it remains able to play an optimal role for bird life as a bird corridor or as a temporary resting place. The presence of bird species in the research location as far as observations in the field is also influenced by the condition of land cover around the research location, which has better conditions with forest land cover and more lush and cool trees in the narrow hill valleys both at the bottom and the top of the research location. The movement of birds among more dense valleys adds to the record of the number of types and the number of species of birds in the research location. The presence of bird species as recorded on data transects and studies of the results of the analysis produced can be a clue that the environmental conditions at the location of this study can still be residential for various species of birds even though it is not an ideal condition.

Table 11. Estimated Density of Bird Populations in the Air Louw Protected Forest

Species LocalName–Scientific Name	Tr. 1 (1 ha)	Tr. 2 (1 ha)	Tr. 3 (1 ha)	Tr. 4 (1 ha)	Tr. 5 (1 ha)	Total Density Species(5 ha)
Alap-alap sapi <i>Falco moluccensis</i>					1	1
Delimukan zamrud <i>Chalcophaps indica</i>					3	3
Perkutut jawa <i>Geopelia striata</i>	1					1
Tekukur polos <i>Streptopelia chinensis</i>		1			1	2
Pergam mata-putih <i>Ducula perspicillata</i>	2			2	2	6
Walik raja <i>Ptilinopus superbus</i>			2	2		4
Bubut alang-alang <i>Centropus bengalensis</i>					1	1
Walet sapi <i>Collacalia esculenta</i>	24	14	13	25	7	83
Walet polos <i>Collacalia vanikorensis</i>				3		3
Raja-udang sungai <i>Halcyon chloris</i>		7		1		8
Tiong-lampu polos <i>Eurystomus orientalis</i>		2				2
Cucak kutilang <i>Pycnonotus aurigaster</i>					2	2
Srigunting lencana <i>Dicrurus bracteatus</i>			10	3		13
Gagak hutan <i>Corvus enca</i>		1				1
Cici merah <i>Cisticola excillis</i>				2		2
Kehicap kaca-mata <i>Monarcha trivirgatus</i>		1				1
Sikatan kelabu <i>Myagra galeata</i>			1		6	7
Kehicap pulau <i>Monarcha cinerascens</i>	1					1
Perling maluku <i>Aplonis mysolensis</i>	87	15	4	21	30	157
Burung-madu hitam <i>Nectarinia aspasia</i>	3			1	8	12
Burung-madu sriganti <i>Nectarinia jugularis</i>	18	11	11		2	42
Cabai kelabu <i>Dicaeum vulneratum</i>	11	20		2	11	44
Total Estimated Density per Transect	147	72	41	62	74	
Number of Population Samples	81	37	18	32	46	

Table 12. Types of birds that have conservation values and protected values

Types	Legal Basis of Protection	Estimated Population Type Density					Total 5 ha
		Tr.1 1 ha	Tr.2 1 ha	Tr.3 1 ha	Tr.4 1 ha	Tr.5 1 ha	
Sikatan kelabu <i>Myagra galeata</i>				1		6	7
Cabai kelabu <i>Dicaeum vulneratum</i>		11	20		2	11	44
Alap-alap sapi <i>Falco moluccensis</i>	•Government Regulation No.7 of 1999 •environment and forestry minister regulation no. 20 of 2018					1	1
Raja-udang sungai <i>Halcyon Chloris</i>	•Government Regulation No.7 of 1999		7		1		8
Burung-madu hitam <i>Nectarinia aspasia</i>	•Government Regulation No.7 of 1999	3			1	8	12
Burung-madu sriganti <i>Nectarinia jugularis</i>	•Government Regulation No.7 of 1999	18	11	11		2	42

Maluku Endemic Bird

The results of the field findings found 6 species of birds that have conservation values and protected values. The two types of them are Maluku endemic species, namely: Sikatan Kelabu *Myagra galeata* and Cabai Kelabu *Dicaeum vulneratum*. These two endemic bird species are very limited in nature, and 4 other species of birds found were protected by the state based on Ministerial Decrees and Government Regulations, the types of birds as presented in **Table 12**.

The results of the study found 2 species of birds that have conservation values and protected values as well as a species of Malayan Endemic species with very limited characteristics, namely Sikatan Kelabu (*Myagra galeata*) and Cabai Kelabu (*Dicaeum vulneratum*). Sikatan Kelabu (*Myagra galeata*) were found as many as 6 and Cabai Kelabu (*Dicaeum vulneratum*) or Ashy flowerpecker were found as many as 19. Both bird species are endemic to Maluku, which are often found on Seram Island, and their distribution is limited and does not



Figure 6. Cabai Kelabu (*Dicaeum vulneratum*)

live outside Indonesia. Ashy Woodpecker Cabai Kelabu (*Dicaeum vulneratum*) comes from the family Dicaeidae. Its natural habitat is subtropical or tropical moist lowland forests and subtropical or tropical humid mountain forests (Latumahina, 2019).

Cabai kelabu, which was found in blackish gray was seen to cover the lower part of the limbs starting from the throat, chest, stomach, until the ridge. Dull black color appears on the top of his body, which includes the crown of the head, sides of the face, neck, back, wings, and tail. The red color is in the middle of the chest and behind the back. Medium-sized brownish-black eyes with not too sharp highlight, medium-sized black beak and look rather thick, black tail with a fairly short size consisting only of a few broad hairs and medium-sized black legs with sharp claws. This type was small since it was only about 9 cm long and was found in the morning at 09.00 - 09.30 Eastern Indonesian Time, with a very loud voice and chatter in the protected forest area. This type was reported to have also been found in several places in Maluku including Seram Island, Ambon Island, Saparua Island, Gorong Island, Seram Sea, and Buano Island. (Sahusilawane, 2017).

Dicaeum vulneratum found at an altitude of around 700 - 850 m above sea level in the Air Louw protected forest. This type likes areas that are rarely visited by humans, usually located quite far from community settlements, among others, in primary forests, secondary forests, the edge of forests and plantations. Field observations found that the chirping of the Cabai Kelabu was melodious, loud, and slightly shrill in the ears. The chirping volume was not too high with a slow tempo. The chirping sound that tends to be rather seductive in the form of a rather long thin whistle, which is repeated continuously and includes quite sharply. This type is known as a nimble and agile little bird. The movement is fast, swiftly moving from one branch to another branch to find small fruits of his favorite. This species is very fond of Kersen or Talok (*Muntingia calabura L.*) fruit, which was found quite a lot in transects 1, 2 and 5, where it was found eating Kersen fruits throughout the day, thought to be a favorite food. Based on population density estimation of 6 species of birds that have conservation value and protected values as shown in **Table 12**, the 2 species have a quite high estimated population density. It consisted of: Cabai Kelabu as many as 44 birds/ 5 ha, Madu Sriganti as many as 42 birds / 5 ha, Madu Hitam Birds as many as 12 birds / 5ha, Raja Udang Sungai as many as many as 8 birds / 5ha, Sikatan Kelabu as many as 7 birds/ 5ha and Alap-alap Sapi with only 1 bird / 5ha.

The findings on transects 3 and 5 were Sikatan Kelabu birds (**Figure 6**) in blackish gray. A little black gray is seen covering the head from the crest, cheeks, nape, throat, to the chest, black color appears on the wings and under the tail that resembles horizontal straight lines. Feathers on their head seem smoother than other part of body. It will stand upright when wind exposed it or when they will sing. Field observations at 9:00 a.m. - 10:30 p.m. found that this species was very agile and active by flying from one tree to another to hunt for food including small grasshoppers and dragonflies. Sikatan Kelabu (*Myagra galeata*) from the Order of the Passeriformes with the main characteristics of small to medium size. It has a medium-sized foot and anisodactyl type that is used to perch. In addition, the beak type varies depending on food, small head size, short neck, elongated round wings, and long tail (Sujatnika, et al., 1995). Welty and Baptista (1988) said that the spread and population of birds in a habitat is influenced by physical / environmental factors such as soil, water, temperature, sunlight and biological factors including vegetation and other animals. The relative abundance of bird species in the Air Louw protected forest was assumed to be strongly influenced by the number of individuals of each species of bird encountered during the observation. Some bird species with relatively high abundance are birds that like to group in foraging and like secondary forests (Mackinnon, 2000). Some species of birds with relative abundance index values and low frequency of encounters were

caused by tight habitat conditions and ecological behavior of birds that prefer to move individually or not in groups. Susanto (2016) states that habitats that are in good condition and far from human disturbances as well as inside contain various sources of feed, allow many species of birds to live. The Sirimau Protected Forest with good vegetation cover greatly supports bird life, so its conservation value is very high.

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Disclosure statement

No potential conflict of interest was reported by the authors.

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