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THE DIVERSITY OF BIRD SPECIES IN TERNATE ISLAND

Hoda Abdurahman, Sapsuha Yusri*, Syafie Yunus

Department of Animal Husbandry, Faculty of Agriculture, University of Khairun, Indonesia

*E-mail: yusrisapsuhaunkhair@gmail.com

ABSTRACT

A study has been conducted with the purpose of knowing the type diversity of birds in various habitats (research sites) and to identify which species of bird are dominant in a variety of selected habitat. This research lasted for 3 months from April to June 2015 located in the cluster are of Ternate Island. The sampling and collecting data are taken from five habitat types in the study site: Settlement, Plantation, River Basin, Secondary Forest and Primary Forest. 3 observation points taken randomly are made in each type of habitat, but the determination of the observation point is adjusted to the easily accessible field condition to make the observation so that the total number of points obtained 15 observation points. The data collection of the diversity of bird species is done using TSCs (Time Species Counts) method which is the calculation of bird species by time and free exploration. In this method, the data is recorded in six columns with a time interval of ten minutes with a one-hour count of each survey. To calculate the diversity of bird species by using Shannon-Wiener Diversity Index according to Bibby et al, (2000) with the formula $H' = - \sum P_i \ln P_i$ where: H' : Shannon-Wiener Diversity Index; \ln : Basic logarithm; P_i : n_i/N ; n_i : i number of species; N : Number of all species. From the research result, it is found that 64 bird species, among the bird species that have been found, are relative of paruh bengkok bird such as Kakatua putih (*Cacatua alba*), Kasturi Ternate (*Lorius garrulus*), Nuri kalung ungu (*Eos squamata*), Betet-kelapa paruh-besar (*Tanygnathus megalorhynchus*) and Perkici dagu-merah (*Charmosyna placentis*). In which these birds occupy the height from the sea reaching to the 1000 m above sea level above the sea level and some are kept by the community during the research such as Kakatua putih (*Cacatua alba*), Kasturi Ternate (*Lorius garrulus*) and Nuri kalung ungu (*Eos squamata*).

KEY WORDS

Diversity, birds, Ternate Island, species.

Indonesia is one of seven mega-biodiversity countries in the world with the third largest forest area after Brazil and Zaire. Besides, Indonesia as an archipelagic country with the following characteristics:

- Area \pm 2 million km² of land and \pm 3 million km² of water;
- Consisting of 17.509 large and small islands;
- Having a coastline of \pm 81.000 km
- Spread 5000 km along the equator;
- Located in the cross position between 2 continents and 2 oceans;
- Having tropical forest of \pm 143 million ha;
- Biogeographically divided by the Wallacea Line, into two realms namely Indomalaya and Australasia.

The illustration of biodiversity potential reflected by the richness of flora and fauna, based on the world's percentage is in Indonesia as follows:

- 10% plant flowering;
- 12% mammals;
- 16% reptile and amphibian;
- 17% aves;
- 25% pisces.

Furthermore, the bird species have been acknowledged by the world for its uniqueness and beauty. In addition 3 from 5 (five) bird centers in the world are in Indonesia (Papua, Maluku/North Maluku, and Nusa Tenggara). As a country rich in natural resources, including its uniqueness and diversity, it certainly has a strategic appeal. Various motivations stand behind the pressure inflicted on our tropical forests, which are essentially political and economic in nature. These pressures are given thorough global issues extend to the regions in line with the wishes of regional atomization and affecting the North Maluku Province.

Both biological and non-biological of natural resources found in Maluku Province have an important role for human life in terms of economic, research, education and culture, as well as for the interest of recreation and tourism. Wildlife especially bird (*Aves*) have a significant role in improving the productivity of agriculture, plantation, and forestry.

Ecologically, birds play a significant role in the pollination and seed distribution to various places. The nature of birds is very sensitive to environmental changes hence the existence of species of birds in one area can be regarded as bio-indicator of the environmental condition.

As wildlife that has the ability to live in almost all habitat types, from pole to desert, from coniferous forest to tropical forest, from the river, swamp to the ocean, birds have high mobility and adaptability to a wide variety of habitat types. Besides, the bird is one of the amazing creatures. For centuries, bird becomes one of the sources of inspiration and gives pleasure to the citizen of Indonesia because of its beautiful voice and feathers. Birds are also an excellent indicator of environmental health and other biodiversity values.

The bird is a part of biodiversity that must be preserved from extinction and decreased of its species diversity. Birds have a lot of benefits and functions for human, either directly or indirectly. In general, the benefit and function of bird can be classified into the cultural, aesthetic, ecological, scientific, and economic value Yuda (1995). Alikodra (2002) and Ontario et al. (1990) suggest that bird has a significant role in terms of research, education, and for the interest of recreation and tourism.

The benefit and function of bird are so great for human life, thus encouraging the effort to preserve its sustainability and diversity. However, lately, the life of birds is urged due to the human activities that destroy and change the function of birds' habitat. These activities include land conversion for settlement, livestock, plantation, industry, mining, and others. These activities require quite a wide land, thus the habitat of bird decreases with the increase of activities done by the human to fulfill their needs. These activities may lead to extinction that goes beyond its rate of return.

According to Howes et al (2003), the presence of a particular bird species is generally adapted to its preference for a particular habitat. In general, bird's habitat can be distinguished from terrestrial, freshwater, and ocean habitat, and can be subdivided according to the plant such as dense forest, shrub, and grass (Rusmendro, 2004). According to Jati (1998), the current population of birds tends to decline. This condition is a direct effect of anthropogenic impact, such as forest and grassland fires, shifting cultivation, birds hunting and trade. According to Shannaz et al (1995), the decreasing quality, modification, and habitat loss are a significant threat to bird species. Currently, there are around 50% birds in the world that are under the extinction threat due to the declining quality and habitat loss.

So far, bird conservation in Indonesia is still concentrated in the conservation areas designated by the government such as in the sanctuary, wildlife reserve, and national park. However, there are birds that live outside of the conservation area such as forest plantation, plantation, settlement, rice field area and others. From this factor, the function of forest plantation on bird conservation should be reviewed especially the ability to accommodate the diversity of bird species. The attention to the conservation of birds is not only aimed at natural habitat since species reduction will not only occur within natural habitat but also outside of their natural habitat such as plantation.

In the future, it is estimated that the area of plantation forest will increase and the conversion of the natural forest will increase so that the natural forest will suffer damage and declining area. Therefore, the management of plantation should get more attention to maintain the bird's conservation. The change and decline of the bird species ultimately lead

to local extinction of various species of birds. Therefore, forest plantation is expected to be able to accommodate the species diversity of birds. Although the level of birds' diversity in plantation is lower than in natural forest (Fraser 1995).

The adaptability of birds to plantations will be affected by some landscape factors. The heterogeneity of the landscape will decrease the diversity of interior species and will increase the diversity of the edge species (Forman & Godron 1986). It is estimated that patch, patch area, land use around plantation forest and plantation distance to the natural forest can affect the diversity of bird species present in the forest. The effect of these landscape factors can be determined by using Geographic Information System (GIS).

The purposes of this study are as follows:

- Knowing the number of species (wealth of species) of birds in the Ternate Island;
- Knowing the diversity species of birds in various habitats (research sites) and making a comparison between the observed habitats;
- Knowing which bird species are dominant in the various selected habitats;
- Knowing the distribution and composition of bird species at each research site.

The benefits of this study are as follows:

- Providing basic information and data in any bird species in the Ternate Island;
- Providing recommendation for the development in the Ternate Island, especially for the management of urban space or planning of the settlement and green open space (City Park);
- Providing information for the community, especially on biodiversity, ecology and environmental issues.

LITERATURE REVIEW

Bird Ecology. Habitat is special location or type of environment where creatures usually grow and live naturally (Rifai, 2002). All of the creatures have a place called habitat. Habitat to some extent corresponds to the living condition of the creatures that inhabit it. The lower limit of life requirement is called minimum point and the upper limit is called maximum, and the optimum point is in between the two ranges. If the habitat properties change beyond the minimum or maximum point, the creatures will either die or have to move elsewhere. If the change is slow, the creatures are generally able to adjust to the new condition beyond its original limit (Soemarwoto, 2004).

Heddy & Kurniati (1994) suggests that habitat is where organism lives or the place where human can find the organism. Habitat can also mean a place where the community lives. In this case, habitat includes not only the abiotic environment but also biotic environment. While niche can be interpreted as the profession of the creature in the habitat. An ecological niche is an organism that depends on not only the living organism but also on what the organism does (how the organism alters energy, behaves, reacts, and alters the physical and biological environment) and how the organism is inhibited by other species.

The habitat of the living creatures can be more than one, for example, habitat to collect food in a place and habitat to lay eggs elsewhere. It also happens in bird species such as Gosong Maluku (*Eulipoa wallacea*). This species choose forest as the habitat for foraging and mating, and beach for laying eggs (Waters, 1997).

Coates and Bishop, (2000) identify 18 habitats as bird-life sites in the Wallacea region (Sulawesi, Maluku and Nusa Tenggara). These habitats are: (1) oceans, (2) inland waters, (3) offshore islands, (4) beaches, (5) mangroves (6) tidal affected forests, (7) coconut plantations, (8) swamp forests, (9) swamp forests, (10) field area, (11) grasslands, (12) shrubs, (13) savanna, (14) monsoon forest, (15) secondary forest and forest edge, (16) pamah forest, (17) mountain forest, (18) alpine grassland.

Nurwatha et al (2000) states that the understanding of the relationship between habitat and bird species is very basic if we want to know the status of the conservation. This habitat review approach is beneficial to gain the understanding of the nature of the relationship between birds and their habitat and predict the possibilities of the land use in the future.

Distribution of Birds. Distribution is a place for the species of living creatures or organism that can be found either in large or small quantity. This can also be found in the fauna group such as birds (Nurwatha et al, 2000). According to Coates and Bishop (2000), most of the islands covered by Wallacea Region (Sulawesi, Maluku and Nusa Tenggara) has variations in climate, topography, geography, and geomorphology. However, there is one similarity among these areas: the birds in the Wallacea Region depend on forests or vegetation.

Global analysis on the distribution of birds shows that northern Maluku is one of 218 Endemic Bird Areas (EBA) in the world. Endemic Bird Area is a concentration place of limited-bird species distribution, namely a place where it is found two or more limited-bird species distribution that cannot be found in other places. With 43 limited-bird species distribution, Endemic Bird Areas of northern Maluku (EBA 171 - Halmahera, Bacan, Morotai, Obi, and surrounding areas) including Ternate Islands, are ranked in the top ten globally (from 218 EBA), taking into account the total of limited-bird species distribution (Stattersfield, et al, 1998 in Poulsen, M.K, et al, 1999).

Bird Diversity. The species wealth and the structure of bird community are different from one region to another. The diversity of species in a region is determined by various factors. The diversity of a species has a number of components that can respond differently to the geographic, developmental and physical factors. Small species diversity exists in area community with extreme environments such as dry area, poor solid, former fires area or volcanic eruption, whereas high diversity is usually present in the optimum environment (Odum, 1994).

The diversity of bird species in a region is influenced by the following factors:

- The habitat size. The wider the habitat, the higher the diversity of bird species;
- Area with high diversity plant species usually has high diversity of animal species including the bird species, because each species of animal life depends on a particular group of plant species (Ewusie, 1990);
- The more complex the habitat, the higher the diversity of bird species (Gonzales, 1993);
- The diversity of bird species tends to be low in the physically controlled ecosystem and tends to be high in the biologically regulated ecosystems (Odum, 1994).

The diversity of animal species including bird is affected by the level of food availability. The higher diversity of species shows higher food chain and more cases of symbiosis (mutualism, parasitism, and commensalism), thereby reducing the food chain to be more stable (Heddy & Kurniati, 1994). Generally, the habitat can experience changes in seasonal condition in food structure and availability. The concept of succession can describe the response of the animal to habitat changes that is every level of succession is related to the composition of wildlife that occupies it (Alikodra, 1990). Based on this aspect, the diversity of birds becomes one of the significant terms in the ecology. Indonesia, which has most of the world's biodiversity (ranked in second) is known as one of the countries with the title "megadiversity" in the world (Mittermeir, 1988 in Monk et al, 2000). The Halmahera group (Halmahera, Bacan, Morotai, Obi, and small islands extending from the north-south of the western part of Halmahera Island) are biologically less studied than the other islands of Maluku such as Seram. Although the biological data in the island is relatively small, there is strong evidence to suggest that Halmahera is essential for biodiversity at global and regional levels (Poulsen, M.K, et al, 1999).

In addition, according to Poulsen, M.K, et al (1999) the parameters of biodiversity include wealth, uniqueness, and scarcity. These parameters indicate the high value of these different habitats comparing to each other. The review results of BirdLife International-Indonesia Program and PHKA of the Ministry of Forestry from 1994 to 1996 show that 216 birds species were recorded spread in the Halmahera Island (Poulsen, 1999). White and Bruce (1986) state that 140 bird species, 21 of limited-bird species distribution including 13 endemic species are found in the Ternate Island of the northern part of North Maluku.

According to Persulesy (2004) limited-bird species distribution is all flightless bird that in its history has a wide spread of breeding less than 50.000 km², including endemic birds

(Endemic, a species or taxa that are considered endemic if a species or taxa naturally found in a region or habitat in the world), are considered as the indicator of environmental quality of a habitat, due to its sensitivity and limited distribution to preferred habitats in the vegetation type. With this step, a quality of one habitat type with another type of habitats is calculated, analyzed, and compared faster.

ICBP (1992, in Sujatnika, 1995) state that a group of fauna (birds) has a high sensitivity to the environmental changes. In addition, taxonomy and distribution are understood well. For the next bird species with the status of limited-bird species distribution, endemic Kep Halmahera in this research is referred to as "indicator bird species".

Bird Classification. A classification is usually subjective and often a distinction between the frequent animal group of some kind of transitional form and the various stages of kinship relations. The most important this is that an animal has a place in the bird classification system, which is divided into orders and its division started from the bird that is considered to be the most primitive, then reached to the highest level of development (Hoeve, 1996). It is found 20 orders from 24 orders in the world, 96 families, 512 genus and 1598 species of birds (Sukmantoro, 2007).

Based on the largest number of species in each order, birds are generally classified into 2 major groups (Anonymous, 2001):

1. Passerine: A bird classified into the Passerine group means that the bird in Order of Passeriformes, characterized by a foot structure commonly known as "bird with the ability to alight", which includes singing birds such as crows, chirping birds such as remetuk and cikrak, gelatik-batu birds, and anis bird and sparrows;
2. Non-Passerine: all of the birds that are not included in the Passerine group. Example of non-Passerine birds are furrows, hornbills, raja-udang birds, woodpeckers.

METHODS OF RESEARCH

This research was conducted for one month starting from April to June 2015 located in the Cluster Area of Ternate Island.

The tool used in this research is binocular, GPS, birds manual book, data sheet and stationery, while the material used in this research is raffia rope.

The method used in this research is the descriptive method with field observation technique. Field observation was conducted directly by viewing and recording each species of bird encountered at each observation point.

The variables observed are:

- Diurnal birds species located in Ternate Island;
- Type of habitat and type of vegetation;
- Geographical (altitude) and weather conditions.

Prior to the observation, a preliminary survey is conducted to determine the point of observation and to collect information on the location of the research obtained through the interview with local guides.

Sampling and data collection are taken from five types in the research sites namely Settlement, Plantation, River Basin, Secondary Forest and Primary Forest. In each habitat type, 3 observation points are taken randomly, but the determination of the observation point is adjusted to the easily accessible field condition to do the observation. Thus, the total number of points obtained 15 observation points. Sampling and data collection of diurnal bird species diversity is done with the help of some equipment such as:

1. Geographic Positioning System (GPS) to determine the coordinates at each observation point.
2. Binocular is used to observe each species of bird found so that it can be seen clearly.
3. Field Guide Books of Birds include:
 - Panduan Bird of Indonesia
 - Burung di kawasan Wallacea (Coates and Bishop, 1997)
 - Burung di Sulawesi (Holmes and Philipps, 1989)

- Burung di Papua (Beehler *et al.* 1986)
4. Data sheets and stationery are used to record the types of birds observed with their habitats.

Data Collection and Identification. The data collection of bird species diversity is done by TSCs (Time Species Counts) method which is the calculation of the bird species by time and free exploration. In this method, the data is recorded in the six columns with a time interval of ten minutes with a one-hour count at each survey. The observation is performed slowly (approximately 1-2 km/h) at the observed location for an hour after which it is followed by a free exploration of the area.

The first ten minutes of each visible type are recorded in the first column but only the name of the type, without the total of its individual. The second ten minutes period, the undocumented species is written in the second column. Species recorded in the first ten minutes period is recorded in the appropriate column so that every species recorded for an hour is only written once in the appropriate column where the species is first seen. Meanwhile, the total of the individual is recorded after finishing one-hour observation. This method is used on 15 observation points determined in each island. The observation is done in the morning at 07.00-10.00 WIT and in the afternoon at 15.00-18.00 WIT at each observation point. Data collection at each observation point from five habitat types is done three times in which the observation conducted through randomization that calculation is done twice to all of the points for 6 hours (3 hours in the morning and 3 hours in the evening). The observation is done to all of the variables in the 15 observation points in each Island. The identification includes the sound of the birds that is heard and the morphological features such as the color of feathers, beaks, nails and etc. that are directly seen or using binoculars and to facilitate names of the bird species that have been identified during the observation to be recorded using the local name (Hattam). The bird species are matched to the shape and characteristics of the bird manual used.

Variable Observations. Observation of the diversity of bird species located on each island is done to the habitat type and geographical condition and climate. The habitat types consist of primary forest, secondary forest, riverbank, plantation, and settlement. These habitat types are represented at each observation point. GPS is used to determine the coordinates of observation location. In addition to the coordinate points, general geographical conditions at research sites and microclimate including temperature and humidity are observed.

Data Analysis. The data obtained are analyzed descriptively then displayed in the form of table and drawing. In analyzing the bird species and their abundance, data result of TSCs of each type are given score according to the period of the species discovery. The bird species in the first column (the first ten minutes) is given score 6, the species in the second column (the second ten minutes) is given score five and so on, finally the species recorded in the last ten minutes is given score 1. After that, each species is calculated its total and average score. The rank of the birds' abundance can be seen based on the average score that can also be used to know its species diversity. Based on the result of inventory, curve picture of species discovery can be made.

Quantitative data (number of individuals) obtained from 15 observation points are used to calculate bird species diversity using the Shannon-Wiener Diversity Index according to Bibby *et al.* (2000) with the formula:

$$H' = - \sum Pi. \ln.Pi$$

Where: H': Shannon- Wiener Diversity Index; ln: Basic logarithm; Pi: ni/N; ni: i of the number of species; N: Number of all types.

RESULTS AND DISCUSSION

Ternate Island. Ternate is one of the cities in North Maluku Province with municipal status based on law number 11 of 1999 dated 27 April 1999. The total area of Ternate is

5,681,30 km² consists of 5,457,55 km² and 133.74 km², which covers eight islands of Ternate (92.12 km²), Hiri Island (7.31 km²), Moti Island (17.72 km²), Mayau Island (8.5 km²), Maka Island (0.5 km²), Mano Island (0.05 km²), and Gutida Island (0.55 km²), these last three islands called Gura Mangofa or small island and uninhabited.

The agricultural sector cultivated by the community and superior in Ternate is the plantation of coconut, cloves, and nutmeg and has been known since long ago. Although it does not have rice field area, other potential main staple crops such as cassava and corn are relatively large in this region.

Bird Species of Ternate Island. The result of the observations that has been done at 5 observation points ranging from the coordinate point 00o50.269' LU and 127o18.296' BT Tolire area, 00o48.285' LU and 127o21.525' BT Moya Village. 00o48.189' LU and 127o21.032' BT Air Balanda, 00o48.740' LU and 127o22.062' BT Kadato Ici/Buku Bendera, 00o48.769' LU and 127o2.476' BT The Fatcei village, most of the observation areas are forest plantations habitat such as cloves, nutmeg, sengan, durian and coconut. The observation has found 64 bird species, among the bird species that have been found, are relative of paruh bengkok bird such as Kakatua putih (*Cacatua alba*), Kasturi Ternate (*Lorius garrulus*), Nuri kalung ungu (*Eos squamata*), Betet-kelapa paruh-besar (*Tanygnathus megalorhynchus*) and Perkici dagu-merah (*Charmosyna placentis*). In which these birds occupy the height from the sea reaching to the 1000 m above the sea level and some are kept by the community during the research such as Kakatua putih (*Cacatua alba*), Kasturi Ternate (*Lorius garrulus*) and Nuri kalung ungu (*Eos squamata*).

On the other hand, there are 8 (eight) species of birds encountered in this study categorized as endemic birds they are Walik kepala kelabu (*Ptilinopus hyogaster*), Walik topi-biru (*Ptilinopus monach*), Kakatua putih (*Cacatua alba*), Kasturi Ternate (*Lorius garrulus*), Cekakak biru-putih (*Halcyon diops*), Kapasan halmahera (*Lalage aurea*), Walik dada-merah (*Ptilinopus bernsteinii*), Pergam boke (*Ducula basilica*). Among endemic bird species, Walik topi-biru (*Ptilinopus monach*) and Walik kepala-kelabu (*Ptilinopus hyogaster*) are most commonly found. But the species of Kasturi ternate (*Lorius garrulus*) is limited in the area of Air Belanda at an altitude of 913 m above sea level. This condition indicates the need for habitat management in the area above 900 m altitude so that some species of endemic birds and birds of low mobility are not ignored. The number of individuals from the total species of birds at the observation points recorded 386 individuals, common birds found during the study: *Walet maluku* (*Collocalia infuscata*), *Walet sapi* (*Collocalia esculenta*), *Kipasan kebun* (*Rhipidura leucophrys*) and *Burung madu sriganti* (*Nectarinia jugularis*), *Bubut alang-alang* (*Centropus bengalensis*) and the largest number of species are Swallow Maluku (*Collocalia infuscata*), *Perling ungu* (*Aplonis metalicca*) and *Perkici dagu merah* (*Charmosyna placentis*). While, the least number of species are *Walik dada-merah* (*Ptilinopus bernsteinii*) and *Pergam boke* (*Ducula basilica*).

The value of diversity index or diversity of bird species in Ternate island can be seen in Table 1.

The Calculation Result of Diversity Index in Table 1 above shows that Ternate Island still has a high diversity index ($H' = 3,331$), this is because the observed area is still fully supported by the ecological condition around it. Starting from the activity of other living things that co-exist, the presence of a predator, the availability of feed, until the availability of a safe and comfortable place to live for the birds to be able to breed.

According to Alikodra (1990, in Rasmendro, et al, 2009), factors that affect the value of H' (diversity) are environmental conditions, number of species, and individual distributions of each species. Communities with high diversity index values have inter-component relationships within the complex community.

Vegetation is dominated by nutmeg, cloves, coconut, and cocoa. While wild plants occupy the valley of a rocky steep and around the peak of Gunung Gamalama. Although the forest vegetation is dominated by plantation crops such as nutmeg, cloves, cocoa, and coconut. Types of the tree that are commonly found among others *Syzygium aromaticum*, *Myristica fragrans*, *Theobroma cacao*, few species of *Ficus* spp, *Canarium indicum*, *Citrus* spp. (Orange suaggi, lime), *Leucosyke capitellata*, *Syzygium cumini* (Jambula), *Mallotus*,

Gnetum gnemon. Common low plant species include Ipomoea pescapre, Andrographis paniculata, Lantana camara, Callicarpa longifolia, and Synedrella nodiflora.

Table 1 – The diversity of bird species in Ternate Island at 4 points of observation

No	Indonesian Name	Latin Name	Total	Pi	ln(pi)	Pi[ln(pi)]
1	Kipasan kebun	<i>Rhipidura Leucophrys</i>	11	-0.028497409	-3.557942097	0.101392132
2	Perling ungu	<i>Aplonis metallica</i>	28	-0.07253886	-2.623632859	0.190315337
3	Gagak kampung	<i>Corvus orru</i>	21	-0.054404145	-2.911314932	0.1583876
4	Burung madu-sriganti	<i>Nectarinia jugularis</i>	15	-0.038860104	-3.247787168	0.126209346
5	Burung madu-hitam	<i>Nectarinia Aspasia</i>	8	-0.020725389	-3.876395828	0.08033981
6	Kirik-kirok Australia	<i>Merops ornatus</i>	12	-0.031088083	-3.47093072	0.107904582
7	Titihan telaga	<i>Tachybaptus ruficollis</i>	16	-0.041450777	-3.183248647	0.13194813
8	Tekukur biasa	<i>Streptopilia chinensis</i>	6	-0.015544041	-4.1640779	0.064726599
9	Walet sapi	<i>Collocalia infusate</i>	23	-0.059585492	-2.820343154	0.168051535
10	Walet Maluku	<i>Collocaia esculenta</i>	46	-0.119170984	-2.127195973	0.253500038
11	Cekakak suci	<i>Halcyon sancta</i>	5	-0.012953368	-4.346399457	0.056300511
12	Walik kepala kelabu	<i>Ptilinopus hyogaster</i>	10	-0.025906736	-3.653252276	0.094643841
13	Walik topi biru	<i>Ptilinopus monacha</i>	14	-0.03626943	-3.31678004	0.120297722
14	Betet-kelapa paruh-besar	<i>Tanygnathus megalorynchus</i>	5	-0.012953368	-4.346399457	0.056300511
15	Kakua putih	<i>Cacatua alba</i>	10	-0.025906736	-3.653252276	0.094643841
16	Elang-alap kelabu	<i>Accipiter novaehollandiae</i>	3	-0.007772021	-4.857225081	0.037750454
17	Bubut alang-alang	<i>Centropus bengalensis</i>	11	-0.028497409	-3.557942097	0.101392132
18	Gosong kelam	<i>Megapodius freycinet</i>	6	-0.015544041	-4.1640779	0.064726599
19	Rajawali kus-kus	<i>Aquila gurneyi</i>	2	-0.005181347	-5.262690189	0.027267825
20	Nuri kalung-ungu	<i>Eos squamata</i>	6	-0.015544041	-4.1640779	0.064726599
21	Tiong lampu-biasa	<i>Eurystomus orientalis</i>	2	-0.005181347	-5.262690189	0.027267825
22	Alap-alap sapi	<i>Falco mollucensis</i>	2	-0.005181347	-5.262690189	0.027267825
23	Sikatan kilap	<i>Piezorhynchus alecto</i>	3	-0.007772021	-4.857225081	0.037750454
24	Kancilan pulau	<i>Pachycephala phaionotus</i>	3	-0.007772021	-4.857225081	0.037750454
25	Kareo zaitun	<i>Amaurornis olivaceus</i>	2	-0.005181347	-5.262690189	0.027267825
26	Wiwik rimba	<i>Cacomantis variolosus</i>	3	-0.007772021	-4.857225081	0.037750454
27	Kangkong ranting	<i>Cuculus saturatus</i>	2	-0.005181347	-5.262690189	0.027267825
28	Elang-alap meyer	<i>Accipiter meyerianus</i>	1	-0.002590674	-5.955837369	0.01542963
29	Cekakak biru-putih	<i>Halcyon diops</i>	4	-0.010362694	-4.569543008	0.047352777
30	Uncal ambon	<i>Macropygia amboinensis</i>	4	-0.010362694	-4.569543008	0.047352777
31	Pergam mata-putih	<i>Ducula perspicillata</i>	2	-0.005181347	-5.262690189	0.027267825
32	Karakelo Australia	<i>Scythrops novaehollandiae</i>	3	-0.007772021	-4.857225081	0.037750454
33	Kapasan Halmahera	<i>Lalage aurea</i>	4	-0.010362694	-4.569543008	0.047352777
34	Julang irian	<i>Rhityceros plicatus</i>	3	-0.007772021	-4.857225081	0.037750454
35	Sikatan burik	<i>Muscicapa griseisticta</i>	3	-0.007772021	-4.857225081	0.037750454
36	Sikatan kelabu	<i>Myiagra galeata</i>	3	-0.007772021	-4.857225081	0.037750454
37	Punggok Maluku	<i>Ninox squamipila</i>	2	-0.005181347	-5.262690189	0.027267825
38	Celepuk Maluku	<i>Otus magicus</i>	2	-0.005181347	-5.262690189	0.027267825
39	Kuntul perak	<i>Egretta intermedia</i>	2	-0.005181347	-5.262690189	0.027267825
40	Elang bondol	<i>Haliaeetus Indus</i>	4	-0.010362694	-4.569543008	0.047352777
41	Cangak Australia	<i>Egretta novaehollandiae</i>	1	-0.002590674	-5.955837369	0.01542963
42	Kekep babi	<i>Artamus leucorhynchus</i>	9	-0.023316062	-3.758612792	0.08763605
43	Kokokan laut	<i>Butorides striatus</i>	1	-0.002590674	-5.955837369	0.01542963
44	Elang tiram	<i>Pandion Haliaeetus</i>	2	-0.005181347	-5.262690189	0.027267825
45	Kutuil kecil	<i>Egretta garzetta</i>	2	-0.005181347	-5.262690189	0.027267825
46	Pergam laut	<i>Ducula bicolor</i>	3	-0.007772021	-4.857225081	0.037750454
47	Perkici dagu-merah	<i>Chamosyna placentis</i>	22	-0.056994819	-2.864794916	0.163278467
48	Kowak malam merah	<i>Nycticorax caledonicus</i>	1	-0.002590674	-5.955837369	0.01542963
49	Cekakak pantai	<i>Halcyon sourophaga</i>	1	-0.002590674	-5.955837369	0.01542963
50	Elang laut perut putih	<i>Haliaeetus leucogaster</i>	1	-0.002590674	-5.955837369	0.01542963
51	Kicuit kerbau	<i>Motacilla plava</i>	3	-0.007772021	-4.857225081	0.037750454
52	Elang-alap Maluku	<i>Accipiter erythrauchen</i>	2	-0.005181347	-5.262690189	0.027267825
53	Murai batu arung	<i>Monticola solitaries</i>	1	-0.002590674	-5.955837369	0.01542963
54	Kancilan emas	<i>Pachycephala pectoralis</i>	2	-0.005181347	-5.262690189	0.027267825
55	Kehicap kacamata	<i>Monarcha trivirgatus</i>	1	-0.002590674	-5.955837369	0.01542963
56	Perling Maluku	<i>Aplonis mysolensis</i>	2	-0.005181347	-5.262690189	0.027267825
57	Layang-layang api	<i>Hirundo rustica</i>	8	-0.020725389	-3.876395828	0.08033981
58	Walik raja	<i>Ptilinopus superbus</i>	2	-0.005181347	-5.262690189	0.027267825
59	Kipasan dada-hitam	<i>Rhipidura rufifrons</i>	1	-0.002590674	-5.955837369	0.01542963
60	Paok mopo	<i>Pitta erythrogaster</i>	1	-0.002590674	-5.955837369	0.01542963
61	Walik dada-merah	<i>Ptilinopus bersteinii</i>	1	-0.002590674	-5.955837369	0.01542963
62	Pergam boke	<i>Ducula basilica</i>	1	-0.002590674	-5.955837369	0.01542963
63	Kasturi ternate	<i>Lorius garrulous</i>	2	-0.005181347	-5.262690189	0.027267825
64	Kacamata gunung	<i>Zosterops montanus</i>	4	-0.010362694	-4.569543008	0.047352777
Source: Processed Data, 2015.			386	-0.943005181	-252.7205526	3.3315558

The Swallow Maluku (*Collocaia esculenta*) is the most common bird species found in this area of observation because it has a wide range of adaptability, the lowest bird species found in the area of observation are peragam boke (*Ducula basilica*), Walik Darah Merah (*Ptilinopus bersteinii*), Kipasan Dada Hitam (*Rhipidura rufifrons*), Paok Mopo (*Pitta erythrogaster*).

CONCLUSION

From the research result, it is found that 64 bird species, among the bird species that have been found, are relative of paruh bengkok bird such as Kakatua putih (*Cacatua alba*), Kasturi Ternate (*Lorius garrulus*), Nuri kalung ungu (*Eos squamata*), Betet-kelapa paruh-besar (*Tanygnathus megalorynchos*) and Perkici dagu-merah (*Charmosyna placentis*). In which these birds occupy the height from the sea reaching to the 1000 m above the sea level and some are kept by the community during the research such as Kakatua putih (*Cacatua alba*), Kasturi Ternate (*Lorius garrulus*) and Nuri kalung ungu (*Eos squamata*).

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