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Species Richness and Birds Conservation Priority in Mount Rinjani Areas, Lombok

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Abstract

Mount Rinjani area on the island of Lombok is unique in bioecology. It provides habitats for many species of birds, especially birds of Wallacea. Several studies on birds in this area have been done, but the conservation priority of these birds has not been determined. Based on this condition, the purpose of this research is to determine the priority of birds conservation in mount Rinjani areas. Exploration about the spesies of birds was started from Senaru Village to Segara Anak Lake. Abundance of each bird species was estimated using point count. Data analysis to determine the conservation priority used indicators that consist of endemicity, population status, species threatened and species management. The results showed that the birds species in mount Rinjani areas are composed of 32 species belonging to 20 families. Bird species that have high abundance were *Amandava amandava* (15.94%), *Zosterops Montanus* (15.70%), and *Parus major* (11.32%), while *Ptilinopus melanospila* and *Anthus novaeseelandiae* were in low abundance (0.23%). Analysis birds conservation priority in mount Rinjani areas indicates that *Otus jolandae* has the highest score (65) and should be the first priority for the conservation, while *Philemon buceroides* and *Gallus varius* with the same score (60) are the second priority.

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INTRODUCTION

Area of mount Rinjani is one of the National Parks on the island of Lombok which has a height 500 m to 3,726 m. Mount Rinjani was declared a national park in 1997 with an area of 40,000 Ha. Prior to that declaration, the Dutch government in 1941 set the region as Wildlife. Some areas of Mount Rinjani National Park is located in North Lombok, West Lombok, East Lombok and Central Lombok (ProFauna, 2011). Meanwhile, the management of Mount Rinjani National Park is conducted by the National Park Authority (Wahyuni & Wildranaya, 2010).

Mount Rinjani National Park area has a variety of ecosystem types and vegetation of tropical lowland forest to tropical rainforest (ProFauna, 2011). In biogeography, mount Rinjani is unique in Bioecology for providing habitat for the species of birds found in Wallacea. Based on Myers and Bishop (2005) record, some ornithologists all over the world have held the observation of birds on Mount Rinjani, such is Lansley (1986), Johnstone et al. (1988), Gibbs (1990), Thomas (1994), Myers (1995) and Garcia (1997). In addition, Van der Laan et al. (2011) conducted a trip specifically to conduct observations of birds in Mount Rinjani. In 2013, Sangster et al. has published a new bird species found only on the island of Lombok is *Otus jolandae* or Celepuk Rinjani (local name).

Beside foreign researchers, some local (indonesian) researchers have conducted observations of birds in mount Rinjani area, such as Kalih (2009), Ikbal (2011), Primary (2011), Sharif (2011), Suana et al. (2012) and Firmansyah (2012). The results of the research conducted by the researchers still focused on the identification and inventory of the bird species. There are 73 birds species in mount Rinjani. However, the determination of priorities of bird conservation has never been done.

Habitat conditions in this region has been a lot of change. This condition can be thretaened species (Burchart et al., 2010) including changes in agricultural practices (Lailolo et al., 2004) and increasing disturbance (Rolando et al., 2007). Based on this condition, the present study aimed to prioritize conservation of birds found in mount Rinjani areas.

The determination of conservation priority will help to develop strategies for the management of the bird species. Such a management with the like this can serve as a model that can be adopted to serve as a referrence management of species of birds found in other regions. This approach can be use to help direct management efforts and allocate limited resources (Chamberlain et al., 2016) and to guide decision making in the implementation of conservation strategy (Czembor et al., 2011).

METHODS

Species richness

Observation of birds species richness using a transect method and determination of the abundance of bird species using a point count method. Observation of birds starts from the Senaru village up to Lake Segara Anak (along transect 6000 m). Transects are grouped into four category. Category I (starts from the office Mount Rinani National Park up to post II), Category II (Starts from post II up to post III), Category III (starts from post III up to Plawangan), and Category IV (starts from Plawangan up to Lake Segara Anak). Observations done every day for 11 hours, starting in the morning 06.30 pm until 17.30 pm.

Recorded of he abundance of Birds species using point count method at 20 stations. The stations were between 300 m along transect route. Birds recorded spent 10 min at each station. The coordinates of each point count can be seen in Figure 1. The total time required at all points count in each observation is 200 min. Observation is done on a every week, so that during the observation in May 2015 carried out 2 times with a total observation time of 400 min. Species of birds had been identified and grouped by family, scientific name and Indonesian name by referring to Coates and Bishop (2000).

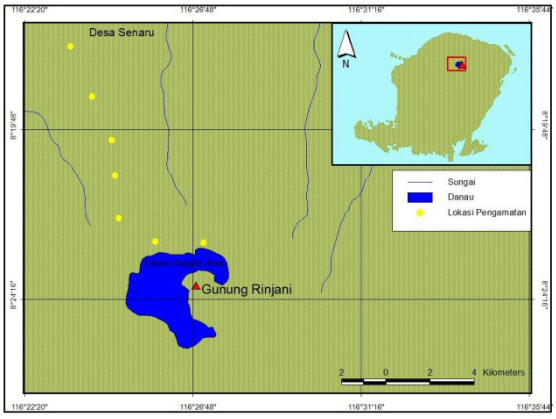

Figure 1. Coordinates point count birds watching in mount Rinjani areas

Birds conservation priority

Birds conservation priority in Mount Rinjani areas is done by using priority species.

Approach priority species is a species that is considered important for conservation efforts when compared to other species. Determination of the priority species of birds found during the study was assessed using criteria that describe the level of importance for conservation. The general criteria used include (1) endemicity, with indicators of the spread coverage of local, regional, national, and non-endemic; (2) the status of the population, with a population size indicator that consists of a small natural population, which declines drasticall, and vulnerable; (3) threatened, with indicator species suffered serious damage due to hunting, trade, culture, and agriculture; and (4) the status of species management, the management indicator is the presence or absence of management activities or management plan for the species. Any species found in the observation will be given a total score base on criteria refer to Annex 1 of Regulation No. P.57/Menhut-II/2008.

RESULT AND DISCUSSION

Species richness of birds

Bird species found in mount Rinjani areas are composed of 32 species belonging to 21 families (Table 1). Family Ploceidae has the highest number of bird species (4 birds). Meanwhile, the family Columbidae, Muscicapidae, and Sylviidae only have 3 species of birds, respectively. Followed by Nectariniidae and Pycnonotidae with 2 species, respectively. And the other family consists only one species. The bird species found in this study are different from the results of research conducted by Kalih (2009). Kalih (2009) found 40 species of birds, whereas in this study, it is found 32 species of birds. The different number of species of birds found in these two studies was 12 species. Some bird species that are not found in the study Kalih (2009) are *Anas superciliosa, Ducula aenea, Macropygia unchall, Cuculus saturatus, Lanius triginus, Merops ornatus, Lonchura Molucca, Pycnonotus aurigaster, Pycnonotus bimaculatus, Otus jolandae, Saxicola caprata,* and *Zosterops wallacei*.

However, some species of the birds found in Kalih (2009) are not found in this study. The 22 species of birds involve *Caridonax fulgidus, Todirhampus chloris, Collocalia Linchi, Pericrocotus flammeus, Cisticola juncidis, Dicrurus Detachment, erythrura hyperythra, Hemiprocne longipennis, Hypothymis azurea, Ficedula dumetoria, Dicaeum maugei, Dicaeum sanguinolentum, Dicaeum trochileum, Gallus gallus, Dendrocopos moluccensis, Lonchura leucogastroides, Trichoglassus haematodus, Pycnonotus goiavier, Zoothera dauma, Zoothera dohertyi, Zoothera interpres,* and *Zosterops chloris*. Thus, if the result of this study is combined with the result of the research conducted by Kalih (2009), there are 55 species of birds. If the bird species found in this study and Kalih (2009) are combined with the result of the other studies on different paths, it provide the composition of bird species found in the area of Mount Rinjani. Other researchers reported that the bird species found in the area of Rinjani varies depending on the path of the observations. Sharif (2011) found 25 species of birds and Firmansyah (2012) found 38 species of birds. Sharif (2011) observed the bird in Sembalun, while Firmansyah (2012) observed the bird in Bawaq Nao. The research data of the birds found at this study is combined with the results of research Kalih (2009), Sharif (2011) and Firmansyah (2012) in the area around Mount Rinjani, there are 73 birds species belonging to 39 families. Myers and Bishop (2005) reported several studies of birds in Rinjani conducted by the other ornithology, such as Gibbs (1990) who found 38 species of birds, Thomas (1994) 37 species of birds, Myers (1995) 76 species of birds. 58 species of birds. A research conducted by Myers (1995). Rinjani area covered Tetebatu, Batu Koq and Pusuk. The different number of birds spesies found in mount rinjani areas caused by different vegetation structure in location of observation. Different vegetation structures affected species richness of birds (Susanto et al., 2016). Based on Table 1, *Otus jolandae* are endemic and threatened species bird in mount Rinjani areas. This bird is a new species of the genus otus found only on Lombok (Sangster et al., 2013).

The results in Table 2 shows the bird species with different abundance. The difference in the abundance of species of birds have implications on the dominance of a few species of birds found in the area of Mount Rinjani. Dominant bird species (abundance ≥5%) consists of *Amandava amandava* (15.72%), *Zosterops montanus* (15.49%), *Parus major* (11.16%), *Pycnonotus bimaculatus* (9.57%), *Linchmera lombokia* (7.97%), and *Lonchura molucca* (5.24%). Other bird species with the abundance of 2 to <5% are categorized as sub dominant composed of *Cettia vulcania* (4.78%), *Phylloscopus trivirgatus* (3.64%), *Saxicola caprata* (3.19%), *Cuculus saturatus* (2.73%), *Pycnonotus aurigaster* and *Zosterops wallacei* each with a relative abundance 2.28%. Meanwhile, other bird species with the abundance of <2% are categorized as non dominant bird.

Birds found in the area of mount Rinjani can be classified based on the distribution of the coordinates of the discovery of the birds at the sites. Based on this category, the distribution of

Table 1. Birds species in mount Rinjani areas

No	Family	No	Scientific Name	Indonesian Name
1	Accipitridae	1	*Haliastur indus*	Elang Bondol
2	Anatidae	2	*Anas superciliosa*	Itik Gunung
3	Campephagidae	3	*Lalage sueurii*	Kapasan Sayap Putih
4	Columbidae	4	*Ducula aenea*	Pergam Hijau
		5	*Macopygia Unchall*	Uncal Loreng
		6	*Ptilinopus melanospila*	Walik Kembang
5	Cuculidae	7	*Cuculus saturatus*	Kangkong Ranting
6	Dicrudae	8	*Dicrurus leucophaeus*	Srigunting Kelabu
7	Laniidae	9	*Lanius triginus*	Bentet Loreng
8	Meliphagidae	10	*Philemon buceroides*	Cikukua Tanduk
9	Meropidae	11	*Merops ornatus*	Kirik-kirik Australia
10	Motacillidae	12	*Anthus novaeseelandiae*	Apung Tanah
11	Muscicapidae	13	*Ficedula hyperythra*	Sikatan Bodoh
		14	*Ficedula westermanni*	Sikatan Belang
12	Nectariniidae	15	*Linchmera lombokia*	Isap Madu Topi Sisik
		16	*Cinnyris jugularis*	Isap Madu Sriganti
13	Paridae	17	*Parus major*	Gelatik Batu
14	Phasianidae	18	*Gallus varius*	Ayam Hutan Hijau
15	Ploceidae	19	*Amandava amandava*	Pipit Benggala
		20	*Lonchura molucca*	Bondol Taruk
		21	*Lonchura pallida*	Bondol Kepala Pucat
		22	*Lonchura punctulata*	Bondol Peking
16	Pycnonotidae	23	*Pycnonotus aurigaster*	Kutilang
		24	*Pycnonotus bimaculatus*	Cucak Gunung
17	Strigidae	25	*Otus jolandae*	Celepuk Rinjani
18	Sturnidae	26	*Aplonis minor*	Perling Kecil
19	Sylviidae	27	*Cettia vulcania*	Ceret Gunung
		28	*Orthotomus sepium*	Cinenen Jawa
		29	*Phylloscopus trivirgatus*	Cikrak Daun
20	Turdidae	30	*Saxicola caprata*	Decu Belang
21	Zosteropidae	31	*Zosterops montanus*	Kacamata Gunung
		32	*Zosterops wallacei*	Kacamata Wallacea

the bird species in the area of Mount Rinjani as grouped into 4 categories. Category I is a bird species found in the central office Mount Rinjani National Park up to post II. Category II consists of bird species found after post II up to post III. Category III consists of bird species found after post III up to Plawangan. Category IV is composed of bird species found in Plawangan up to Segara Anak Lake. Based on the classification, the distribution of birds found in category IV is a location that has the highest number of bird species (16 species), followed by category II (14 species), location with category III (13 species), and the location of the category I (8 species).

Birds conservation priority

Bird species in Table 1 which have conservation status show some differences. Some birds species are categorized as endemic, protected, and threatened. Other birds species are classified as endemic birds *Lalage sueurii* (endemic Nusa Tenggara), *Linchmera lombokia* (endemic NTB),

Table 2. Abundance species of birds in mount Rinjani areas

Scientific name	Office - Post II	Post II - Post III	Post III - Plawangan	Plawangan - Lake	N (%)
Haliastur indus	0	0	0	3	0.69
Anas superciliosa	0	0	0	4	0.92
Lalage sueurii	0	1	0	0	0.23
Ducula aenea	0	0	2	0	0.46
Macopygia Unchall	0	0	0	2	0.46
Ptilinopus melanospila	0	1	0	0	0.23
Cuculus saturatus	7	5	0	0	2.77
Dicrurus leucophaeus	3	0	0	0	0.69
Lanius triginus	0	0	2	0	0.46
Philemon buceroides	3	3	0	0	1.39
Merops ornatus	0	0	0	2	0.46
Anthus novaeseelandiae	0	0	1	0	0.23
Ficedula hyperythra	0	7	0	0	1.62
Ficedula westermanni	0	1	0	2	0.69
Linchmera lombokia	4	9	14	8	8.08
Cinnyris jugularis	5	3	0	0	1.85
Parus major	0	8	28	13	11.32
Gallus varius	2	1	0	3	1.39
Amandava amandava	0	0	26	43	15.94
Lonchura molucca	0	0	0	23	5.31
Lonchura pallida	0	0	2	0	0.46
Lonchura punctulata	0	0	2	0	0.46
Pycnonotus aurigaster	0	0	10	0	2.31
Pycnonotus bimaculatus	0	5	25	12	9.70
Otus jolandae	0	2	0	0	0.46
Aplonis minor	3	0	0	0	0.69
Cettia vulcania	4	7	1	9	4.85
Orthotomus sepium	0	4	0	0	0.92
Phylloscopus trivirgatus	0	13	0	3	3.70
Saxicola caprata	0	0	7	7	3.23
Zosterops montanus	4	9	30	25	15.70
Zosterops wallacei	0	0	0	10	2.31

and *Otus jolandae* (endemic Lombok). *Otus jolandae* through categorized as endemic, based on the criteria of IUCN, it belongs to the species of threatened birds. Meanwhile, the bird species protected by law consists of *Cinnyris jugularis* (Figure 1D).

The discovery of various bird species that exist in the area of mount Rinjani and some bird species including the importance of conservation efforts are required to maintain the existence of the bird species. There is a tendency that the number of bird species found over the years the decreases. Based on the research described in the Minister of Forestry No. P.57/Menhut II/2008, the fauna (including birds) are protected and conservation status increased the number. Because it is necessary to select species that can be used as a priority species for its management activity. Determination of priority species make it easy to overcome various obstacles, to improve the management of biodiversity in conditions of limited resources (Dono, 2013).

Based on Table 3, *Otus jolandae* has the highest score of 65, while *Gallus varius* and *Philemon buceroides* have the same score 60. Meanwhile, other species of birds have a score below 60. Referring to the results of the analysis, a priority species for conservation of birds found in Rinjani Mountain area consists of *Otus jolandae* (Figure 2A), *Gallus varius* (Figure 2B) and *Philemon buceroides* (Figure 2C). This result can be an other alternative approach to develop conservation strategy such as biological importance and levels of threat (Brooks et al., 2006), biodiversity hotspots (Myers et al., 2000) and key biodiversity (Eken et al., 2004).

Otus jolandae is the first priority because it is an endemic bird species on the island of Lombok and is not found elsewhere. *Otus jolandae* was identified in Lombok since 2003, but the since 2013, the species is defined different from other species of birds. Since then, *Otus jolandae* is categorised as a new species of the genus Otus found is only on Lombok (Sangster et al., 2013). How-

Table 3. The analysis of determination birds conservation priority in mount Rinjani areas

Scientific name	Endemicity	Population status	Habitat condition	Threatened	Management status	Score
Haliastur indus	5	15	10	5	10	45
Anas superciliosa	5	15	5	15	10	50
Lalage sueurii	5	10	5	5	10	35
Ducula aenea	5	10	5	5	10	35
Macopygia Unchall	5	10	5	5	10	35
Ptilinopus melanospila	5	10	5	5	10	35
Cuculus saturatus	5	10	5	5	10	35
Dicrurus leucophaeus	5	10	5	5	10	35
Lanius triginus	5	10	5	5	10	35
Philemon buceroides	15	15	10	10	10	60
Merops ornatus	5	10	5	5	10	35
Anthus novaeseelandiae	5	10	5	5	10	35
Ficedula hyperythra	5	10	5	5	10	35
Ficedula westermanni	5	10	5	5	10	35
Linchmera lombokia	25	10	5	0	10	50
Cinnyris jugularis	5	10	5	5	10	35
Parus major	5	10	5	5	10	35
Gallus varius	15	15	5	15	10	60
Amandava amandava	5	10	5	5	10	35
Lonchura molucca	5	10	5	5	10	35
Lonchura pallida	5	10	5	5	10	35
Lonchura punctulata	5	10	5	5	10	35
Pycnonotus aurigaster	5	10	5	5	10	35
Pycnonotus bimaculatus	5	10	5	5	10	35
Otus jolandae	25	15	10	5	10	65
Aplonis minor	5	10	5	5	10	35
Cettia vulcania	5	10	5	5	10	35
Orthotomus sepium	5	10	5	5	10	35
Phylloscopus trivirgatus	5	10	5	5	10	35
Saxicola caprata	5	10	5	5	10	35
Zosterops montanus	5	10	5	5	10	35
Zosterops wallacei	25	10	5	0	10	50

ever, intensive research is still needed to ensure their conservation status. Some aspects of *Otus jolandae* to be explored further include is mapping the distribution, population density and habitat characteristics. The second priority is *Gallus varius* and *Philemon buceroides* caused by the capture or trade. The decline in the population of both species while also caused by the habitat decrease, economically sale value of both species can provide promised benefits for wildlife traders. In addition, until now there has been no serious effort to manage to increase population of both species.

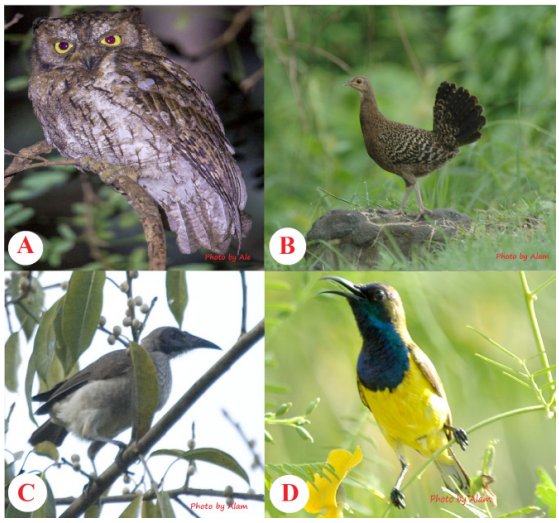

Figure 2. (A) *Otus jolandae*, (B) *Gallus varius*, (C) *Philemon buceroides*, (D) *Cinnyris jugularis*

CONCLUSION

Birds species found in mount Rinjani areas are composed 32 species belonging to 21 families. Bird species that have high abundance were *Amandava amandava* (15.94%), *Zosterops Montanus* (15.70%), and *Parus major* (11.32%), while *Ptilinopus melanospila* and *Anthus novaeseelandiae* are low abundance (0.23%). Analysis birds conservation priority in mount Rinjani areas indicate that *Otus jolandae* has the highest score (65) and should be the first priority for the conservation, while *Philemon buceroides* and *Gallus varius* with the same score (60) are the second priority.

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