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Bird diversity of resort Ranu Darungan, Bromo Tengger Semeru National Park, Indonesia

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ABSTRACT

Bromo Tengger Semeru National Parks is one of four national parks located in East Java Indonesia, which has unique ecosystem. Resort Ranu Darungan, which is part of this are, has potential bird diversity. This research is aimed to identify species of birds, analyze diversity and abundance of birds in Resort Ranu Darungan Bromo Tengger Semeru National Park. This research used birdwatching approach. The sampling of birds used Index Ponctualle de'Abondance (IPA) method. The identification of birds was conducted based on morphological character, meanwhile diversity and abundance analyzed using diversity and abundance index. The research result showed that there were 67 species of birds in Resort Ranu Darungan, the diversity index was 3.23. Five species have the highest abundance. As conservation area, Resort Ranu Darungan can support birds conservation because many species of birds were found in different habitat.

Key words: *Resort Ranu Darungan, Bromo Tengger Semeru National Park, Pernis ptilorhyncus, Accipiter soloensis*

Introduction

Bromo Tengger Semeru National Park is an important site for bird conservation belong to Important Bird Area (International, 2018). There are locations in Bromo Tengger Semeru National Park that have potential bird diversity, they are Resort Coban Trisula, Blok Ireng-Ireng, and Resort Ranu Darungan (Prasetya *et al.*, 2018). Based on previous research, there are 43 species of bird in Resort Coban Trisula with the aggregate spatial distribution and there are 30 species of bird in Blok Ireng-Ireng (Herdiawan *et al.*, 2019; Iqbal *et al.*, 2015). But, there is no publication found about the diversity of birds in Resort Ranu Darungan.

Based on the survey, Resort Ranu Darungan located in elevation 800 masl to 3360 masl. There's some habitat type in Resort Ranu Darungan like the primary forest, secondary forest, and a lake that supports birds life. Resort Ranu Darungan was the habitat for protected and unprotected birds (Prasetya *et al.*, 2018) such as green peafowl that has observed with a population of less than ten (Balen and Prawiradilaga, 1995).

As a conservation area, diversity data of birds in all habitat types was very important for a reference in determining conservation steps to be taken in future. This research is aimed to identify species of birds, analyze diversity and abundance of birds in Resort Ranu Darungan Bromo Tengger Semeru National Park.

Materials and Methods

Study Area

The sampling was located in Resort Ranu Darungan, Bromo Tengger Semeru National Park

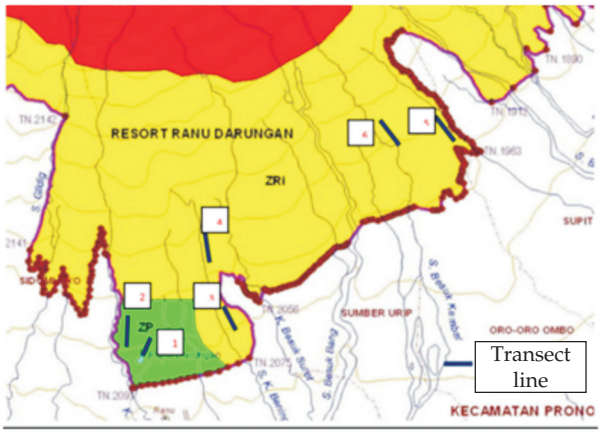

Fig. 1. Map of Resort Ranu Darungan for the research. 1. Ranu transect, 2. Loji transect, 3. Tulungagungan transect, 4. Nepenthes transect, 5. Supiturang1 transect, 6. Supiturang2 transect.

with coordinate $8^0 11'26^0$S – $112^0 55'37^0$E until $8^0 09'38^0$S – $112^0 58'23^0$E. Resort Ranu Darungan has The sampling was conducted in February 2019 until April 2019. Resort Ranu Darungan has altitude between 851 meter a.s.l to 1256 meter a.s.l.. There're six transects as an observation path which as representative of habitat in Resort Ranu Darungan, namely primary forest, secondary forest, and a lake.

Data Collection and Analysis

This research used a birdwatching approach. The sampling was conducted by using Index Ponctualle de'Abundance (IPA) method (Fachrul, 2012; Syafrudin, 2011). The identification of birds was conducted based on morphological characters and used a guide book for birds identification (MacKinnon *et al.*, 2010). The research used equipments, namely binoculars, cameras, observation papers, a GPS, a thermometer, a hygrometer, a clinometer, and a meter

The sampling was done at 6 am until 11 am (Fachrul, 2012). A transect has one km length which divided into five points observation. Distance between points was 200 meters; observation radius was 25 meters adjust the condition of the observation point. The observation was made for twenty minutes at each point that divided into two times, five minutes early was made for normalizing the condition after movement, after that for fifteen minutes observations were made (Bibby *et al.*, 1992). The research was recorded species, the number of species, behavior, and vegetation samples includes trees species and trees height, and environmental factors namely temperature, humidity, altitude, light intensity, and vegetation.

Bird species in the Resort Ranu Darungan area identified using a guide book for identification birds (MacKinnon *et al.*, 2010). Diversity birds analyze using Shannon-Winner diversity index (1) (Magurran, 2004), abundance birds analyze using the index of abundance (2) (Syafrudin, 2011). The diversity and abundance of birds analyze strengthened by other indexes namely index of evenness (3) (Magurran, 2004) and index of similarity (4) (Fachrul, 2012).

$$H' = - \Sigma pi \ ln \ pi \quad (1)$$

$$Di = ni/N \times 100\% \quad (2)$$

$$E = H'/ln \ S \quad (3)$$

$$SI = C/(a+b+c) \quad (4)$$

Results and Discussion

Birds of Resort Ranu Darungan, Bromo Tengger Semeru National Park

Based on observation, we found 67 species of birds, divided into 34 families and 14 orders in Resort Ranu Darungan. Passeriformes was order which has most families, the number is 20 families. Meanwhile, the family which has most species was Muscipidae, the number is 14 species. Birds that observed in this research cover one-third species of birds found in all of Bromo Tengger Semeru National Park area (Prasetya *et al.*, 2018).

There were 14 species from 10 families that are protected by law in accordance with the Peraturan Menteri Lingkungan Hidup dan Kehutanan No.106/MENLHK/SETJEN/Kum.1/2018 in Resort Ranu Darungan. Meanwhile in Resort Coban Trisula and Blok Ireng-Ireng Bromo Tengger Semeru National Park, there were 16 species birds that have been protected by law (Herdiawan *et al.*, 2019). Based on that, Resort Ranu Darungan has important value for protected birds.

There was a new species record for Bromo Tengger Semeru National Park. It was *Rhipidura javanica*. *Rhipidura javanica* found in 960 m a.s.l., habitat type was open forest and close to the edge of the national park area. *Rhipidura javanica* was known to be found in range 0 m a.s.l. to 1500 m a.s.l. (MacKinnon *et al.*, 2010). In general, *Rhipidura javanica* lives in low lands (Harmoko and Dewantara, 2018; Rusmendro *et al.*, 2009; Sukara *et al.*, 2014; Sulistyadi, 2017).

Table 1. Birds of Resort Ranu Darungan

No	Common Names	Ordo	Family	Scientific Name	Abundance (%)
1	Chinese sparrowhawk	Accipitriformes	Accipitridae	*Accipiter soloensis*	12.85
2	Black Eagle			*Ictinaetus malayensis*	1.65
3	Crested serpent eagle			*Spilornis cheela*	1.15
4	Oriental honey-buzzard			*Pernis ptilorhyncus*	20.43
5	Banded kingfisher	Coraciiformes	Alcedinidae	*Lacedo pulchella*	0.16
6	Javan kingfisher			*Halcyon cyanoventris*	0.66
7	Blue-eared kingfisher			*Alcedo meninting*	0.66
8	Cave swiftlet	Apodiformes	Apodidae	*Collocalia linchi*	6.43
9	Pied triller	Passeriformes	Campephagidae	*Lalage nigra*	0.16
10	Sunda minivet			*Pericrorotus miniatus*	2.64
11	Scarlet minivet			*Pericocotus flammeus*	3.95
12	Javan leafbird	Passeriformes	Chloropsidae	*Chloropsis cochinchinensis*	0.33
13	Olive-backed tailorbird	Passeriformes	Cisticolidae	*Orthotomus sepium*	1.98
14	Plain prinia		Cisticolidae	*Prinia inornata*	0.33
15	Little Cuckoo-dove	Columbiformes	Columbidae	*Macropygia ruficeps*	1.65
16	Black-naped fruit-dove			*Ptilinopus melanospilus*	0.16
17	Grey-capped emerald dove			*Chalcophaps indica*	0.16
18	Slender-billed crow	Passeriformes	Corvidae	*Corvus enca*	1.81
19	Greater coucal	Cuculiformes	Cuculidae	*Centropus sinensis*	0.16
20	Chestnut-breasted malhoka			*Phaenicophaeus curvirostris*	0.33
21	Red-billed malhoka			*Phaenicophaeus javanicus*	0.16
22	Blood-breasted flowerpecker	Passeriformes	Dicaediae	*Dicaeum sanguinolentum*	0.66
23	Scarlet-headed flowerpecker			*Dicaeum trochileum*	0.49
24	Crimson-breasted flowerpecker			*Prionochilus percussus*	0.49
25	Greater racquet-tailed drongo	Passeriformes	Dicruridae	*Dicrurus paradiseus*	0.16
26	Black drongo			*Dicrurus macrocercus*	0.33
27	Ashy drongo			*Dicrurus leucophaeus*	3.79
28	White-headed munia	Passeriformes	Estrildidae	*Lonchura maja*	0.16
29	Black-thighed falconet	Falconiformes	Falconidae	*Microhierax fringillarius*	1.48
30	Yellow-eared barbet	Piciformes	Megalaimidae	*Psilopogon australis*	0.82
31	Black-banded barbet			*Psilopogon javensis*	1.15
32	White-crowned forktail	Passeriformes	Muscicapidae	*Enicurus leschenaulti*	0.16
33	Blue-and-white flycatcher			*Cyanoptila cyanomelana*	0.33
34	Snowy-browed flycatcher			*Ficedula hyperythra*	0.16
35	Yellow-rumped flycatcher			*Ficedula zanthopygia*	0.16
36	Narcissus flycatcher			*Ficedula narcissina*	0.16
37	Indigo flycatcher			*Eumyias indigo*	0.82
38	Blue whistling-thrush			*Myophonus caeruleus*	0.16
39	White-flanked sunbird	Passeriformes	Nectariniidae	*Aethopyga eximia*	0.16
40	Javan sunbird			*Aethopyga mystacalis*	1.32
41	Olive-backed sunbird			*Cinnyris jugularis*	0.49
42	Streaky-breasted spiderhunter			*Arachnothera affinis*	0.82
43	Golden whistler	Passeriformes	Pachycephalidae	*Pachycephala pectoralis*	2.64
44	Horsfiled's Babbler	Passeriformes	Pellorneidae	*Malacocincla sepiaria*	5.27
45	Green junglefowl	Galliformes	Phasianidae	*Gallus varius*	0.33
46	Mountain warbler	Passeriformes	Phylloscopidae	*Phylloscopus trivirgatus*	0.16
47	Fulvous-breasted woodpecker	Piciformes	Picidae	*Dendrocopos macei*	0.16
48	Crimson-winged woodpecker			*Picus puniceus*	0.16
49	Javan banded pitta	Passeriformes	Pittidae	*Hydrornis guajanus*	0.16
50	Yellow-throated hanging-parrot	Psittaciformes	Psittacidae	*Loriculus pusillus*	1.81
51	Javan bulbul	Passeriformes	Pycnonotidae	*Ixos virescens*	1.15
52	Black-headed bulbul			*Pycnonotus atriceps*	0.16

No	Common Names	Ordo	Family	Scientific Name	Abundance (%)
53	Sooty-headed bulbul			*Pycnonotus aurigaster*	2.97
54	Yellow-vented ulbul			*Pycnonotus goiavier*	5.27
55	White-breasted waterhen	Gruiformes	Rallidae	*Amaurornis phoenicurus*	0.16
56	Sunda Pied Fantail	Passeriformes	Rhipiduridae	*Rhipidura javanica*	0.33
57	White-belied fantail			*Rhipidura euryura*	0.99
58	Brown wood owl	Strigiformes	Strigidae	*Strix leptogrammica*	0.16
59	Asian glossy starling	Passeriformes	Sturnidae	*Aplonis panayensis*	0.33
60	Grey-cheeked tit-babbler	Passeriformes	Timaliidae	*Mixornis flavicollis*	0.82
61	Chestnut-capped babbler			*Timalia pileata*	0.66
62	Crescent-chested babbler			*Cyanoderma melanothorax*	0.66
63	Orange-breasted trogon	Trogoniformes	Trogonidae	*Harpactes oreskios*	0.33
64	Barred buttonquail	Charadriiformes	Turnicidae	*Turnix suscitator*	0.16
65	Black-winged flycatcher-shrike	Passeriformes	Vangidae	*Hemipus hirundinaceus*	1.32
66	Pied shrike-babbler	Passeriformes	Vireonidae	*Pteruthius flaviscapis*	0.16
67	Javan grey-throated white-eye	Passeriformes	Zosteropidae	*Heleia javanica*	1.48

Bird Diversity and Abundance in Resort Ranu Darungan Bromo Tengger Semeru National Park

Based on observation and calculation, Birds of Resort Ranu Darungan has index diversity 3.23 which interpretative as not high diversity. Based on the index diversity value, diversity in every transect was different.

The highest diversity index was Loji transect (2.95). (Fig. 2), Ranu transect observed highest number of species 45 species. Based on diversity index, the diversity index of birds in Resort Ranu Darungan smaller than Gunung Ciremai National Park that has similar habitat (Dewi *et al.*, 2007).

There were some factors that have influence on diversity index, namely number of species and abundance (McNaughton and Wolf, 1992). If there were not balance between number of species and abundance, it can make different index diversity (Magurran, 2004). Ranu transect has highest number of species due to various habitat namely primary forest, secondary forest, and a lake (Krebs, 1989). Supiturang 2 transect has lowest number of species due to habitat condition which not stable after fire two years ago (Krebs, 1989).

Based on the observation, there were species birds that have dominant abundance. They were *Pernis ptilorhyncus* (20.42%), *Accipiter soloensis* (12.85%), *Collocalia linchi* (6.43%), *Turdinus sepiarius* (5.27%), and *Pycnonotus goiavier* (5.27%). Meanwhile, the index of evenness area was 0.5. It can be interpreted that there was unevenness on abundance of birds' species in Resort Ranu Darungan. If explained about the index of evenness in research transect, Ranu transect was lowest (0.42) and Tulungagungan transect was highest (0.88) (Fig 3).

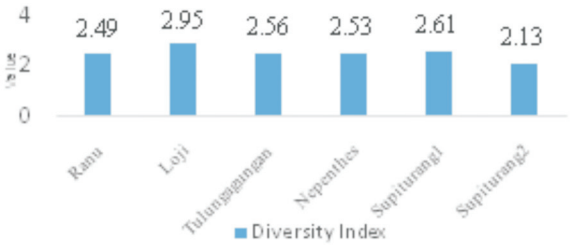

Fig 2. The diversity index of each transect

Ranu transect has the lowest index of evenness due to there were some species that have highest abundance, meanwhile Tulungagungan transect have highest index of evenness as all of observed species have similarity abundance. *Pernis ptilorhyncus* and *Accipiter soloensis* were species that have highest abundance in Ranu Transect. *Pernis ptilorhyncus* and *Accipiter soloensis* have highest abundance due to migration in large quantities. Bromo Tengger Semeru National Park is on the migrant raptor trajectory (Prasetya *et al.*, 2018). In addition, research time coincides with reverse flow of migrant birds (Nijman, 2001). The presence of migratory birds in Resort Ranu Darungan strengthened this area was important for birds conservation (Herdiawan *et al.*, 2019).

Checklist of birds observed in each transect has similarity. Based on analyzing, Index of similarity highest number was Nepenthes transect-Supiturang 1 transect (0.37037) meanwhile the lowest number was Ranu transect-Loji transect (0.076923) (Table 2).

Table 2. Index of similarity each transect

Transect		Total			SI
		a	b	c	
Ranu	Loji	40	20	5	0.076923**
Ranu	Tulungagungan	38	15	7	0.116667
Ranu	Nepenthes	36	7	9	0.173077
Ranu	Supiturang1	32	8	13	0.245283
Ranu	Supiturang2	34	0	11	0.244444
Loji	Tulungagungan	18	15	7	0.175
Loji	Nepenthes	18	9	7	0.205882
Loji	Supiturang1	20	16	5	0.121951
Loji	Supiturang2	20	6	5	0.16129
Tulungagungan	Nepenthes	16	10	6	0.1875
Tulungagungan	Supiturang1	13	12	9	0.264706
Tulungagungan	Supiturang2	17	6	5	0.178571
Nepenthes	Supiturang1	6	11	10	0.37037*
Nepenthes	Supiturang2	11	6	5	0.227273
Supiturang1	Supiturang2	16	6	5	0.185185

a = the number of species found only at transect a
b = the number of species found only at transect b
c = the number of species found in both transect a – b
* = highest value
** = lowest value

A comparison will have full similarity if index of similarity value equals one. There were different values of index similarity due to different habitat types in each transect, other than that bird cruising rate and adaptability influence to birds encounter in each transect (Soendjoto *et al.*, 2015; Adelina *et al.*, 2016; Wulandari and Kuntjoro, 2019).

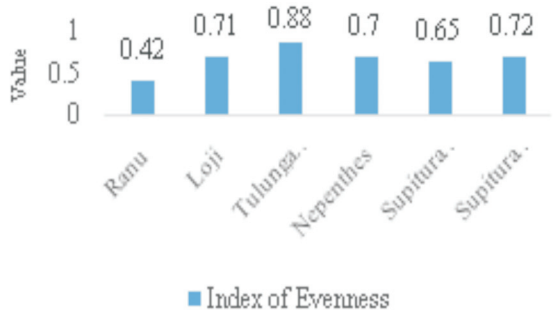

Fig 3. Index evenness of each transect

Conclusion

Based on research diversity of birds in Resort Ranu Darungan Bromo Tengger Semeru National Park, it can be concluded that there were 67 species of birds belong to 34 families and 14 orders in Resort Ranu Darungan Bromo Tengger Semeru National Park, Indonesia. Bird diversity in Resort Ranu Darungan based on Shanon-Wienner index diversity relatively not high (3.23). Some species of birds have a high abundance (>5%), they were *Pernis ptilorhyncus* (20.42%), *Accipiter soloensis* (12.85%), *Collocalia linchi* (6.43%), *Turdinus sepiarius* (5.27%), and *Pycnonotus goiavier* (5.27%).

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