Identification and population density of several raptor types in the RPTN Coban Trisula and Jabung Bromo Tengger Semeru National Park

To cite this article: A N Ningtyas *et al* 2021 *IOP Conf. Ser.: Earth Environ. Sci.* **743** 012055

Identification and population density of several raptor types in the RPTN Coban Trisula and Jabung Bromo Tengger Semeru National Park

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Abstract. Raptor or bird of prey is a top predator in the food chain. The important role of raptor as a counterweight and indicator of ecosystem health in forest areas. Bromo Tengger Semeru National Park (TNBTS) is habitat for several types of raptor. The aim of this study to identify the raptor species which is found in RPTN Jabung and RPTN Coban Trisula TNBTS. This research was conducted in September - November 2019. Identifying raptor species and individuals was carried out using the cooperative point count method. Data analysis was performed by calculating population densities and abundance values based on encounters with raptor species. The results of identification raptor in RPTN Jabung is showed 8 types of raptors with 94 individuals and in RPTN Coban Trisula is showed 8 types of raptors with 20 individuals. The highest value of raptor population density in RPTN Jabung is *Tachyspiza soloensis* species with density values 43.18 individual/Ha. Species that often appear is *Nisaetus bartelsi* with an abundance of category 3 (often appear). The highest population density value in RPTN Coban Trisula is *Ictinaetus malayensis* and *Spilornis cheela* with density values 2.85 individual / Ha. The species that often arises is *Ictinaetus malayensis* with an abundance of category 2 (uncommon).

Keywords: raptor, tnbts, density, abundance

1. Introduction

A raptor is a bird of prey that is known for its predatory habits of feeding on other animals. This group of birds possesses several unique anatomical characteristics that allow them to be superior hunters. Raptor has an important role on forest ecosystem especially in food chain [1]. The important role of raptor in ecosystem is as top predator (control of prey population) and keystone species make presence other population depending on the ecosystem they live or migrate [2]. Raptor has been widely carried out as an indicator of species for ecosystem sustainability on global (macro) scale [3]. As a top predator in ecosystems, raptors have characteristics including small populations, sensitive to chemical pollutant contamination, and very sensitive to environmental change [1]. The presence of a raptor isn't inseparable from the presence of food sources or prey, and the elevation also affects the presence of a raptor [3].

There are 30 species of hawks, falcons, and eagles, as well as 18 species of owls breeding in North America. In this large group of birds there are diurnal or daytime species such as hawks, falcons, and

eagles, and nocturnal or nighttime species such as owls. Indonesia has 3 raptor families consisting of Accipitridae family, Falconidae family and Pandionidae family [4]. Bromo Tengger Semeru National Park (TNBTS) is one of the raptors habitats in East Java and conducts integrated surveillance of raptor presence. TNBTS has determined potential areas to used for raptor supervision, namely in the RPTN Coban Trisula and Jabung. Determination of potential areas in the National Park Management Resort (RPTN) Coban Trisula and Jabung because it is still easy and often found several types of raptor at these locations. Identification data of raptor species in RPTN Jabung and RPTN Coban Trisula TNBTS is needed to determine the raptor species in the region. Therefore the purpose of this study is to identify several types of raptor in the RPTN Coban Trisula and Jabung TNBTS. The results of this study are expected to be basic information for appropriate and effective management, thereby ensuring the sustainability of raptor biodiversity in TNBTS.

2. Experimental details

2.1. Time and location

The study had been conducted from September to November 2019 in The Coban Trisula Block of RPTN Coban Trisula and The Bendolawang Block of RPTN Jabung Bromo Tengger Semeru National Park. The description of the research location is presented in the figure 1 :

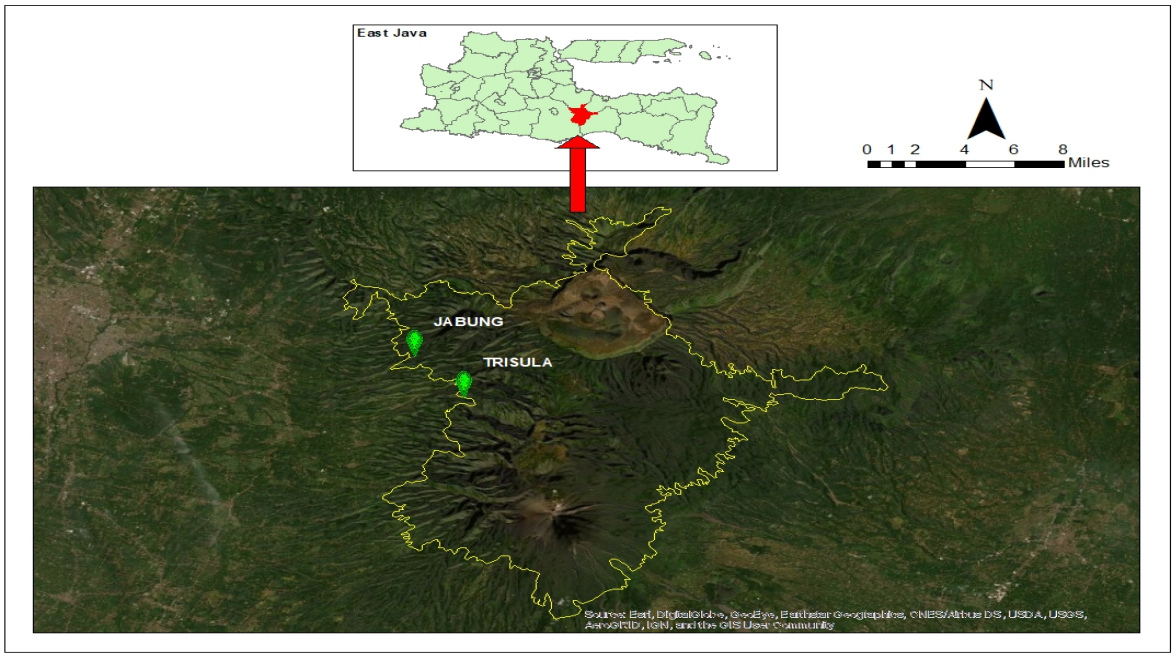

Figure 1. Research locations in the RPTN Jabung and Coban Trisula TNBTS, East Java, which are marked with a green dot.

Block area used as observation study was made using a contour map derived from Indonesia Geospatial Portal which refers to the maximum visibility of the researcher as far as 2 km^2. The contour map is equipped with a grid area of 250 x 250 m^2 to obtain an area of research Bendolawang's Block is 73 Ha from 4512 total area of RPTN and Coban Trisula's Block is 95.58 Ha from 5222 Ha total area of RPTN Coban Trisula. The difference area of the block is due to the condition of the area in Bendolawang's Block bordering Perum Perhutani and agricultural land so that the location of the area is narrower compared then Coban Trisula's Block.

2.2. Data collection

Retrievalof raptor species data by determining the potential location used as raptor habitat. The location was chosen based on information from both officers and ~~from~~ the local community. In RPTN Jabung, the selected data collection locations was in Bendolawang Block (BL), while in RPTN Coban Trisula, the selected observation locations was in Coban Trisula Block (CT). The cooperative point count method in each block is carried out in an open area with a wide viewing distance of a radius of up to 2 km and has a viewing angle of about 180^{o} where the raptor species can identified [4]. Data collection of raptor species starts at 7 am – 2 pm. The data recorded while observing the raptor species in each RPTN included the time of appearance, the activities carried out, the number of individuals and taking pictures of the raptor species. The data that has been collected will be analyzed data to determine the value of population density and abundance of raptor populations in each RPTN.

2.3. Data analysis

2.3.1. Population density of raptor (D). Analysis of population density data is calculated by combining the population density formula [5] :

$$D = \frac{The\ Number\ of\ Individual\ Raptor\ Species}{Total\ Area} \quad (1)$$

Note:

D = Density (Individual / ha)
Area = Region used as the research sample

2.3.2. Abundance of Raptor (ET). To get the value of species abundance in an area can be done by approaching the calculation of the level of meeting [5] :

$$ET = \frac{Total\ Meeting\ with\ Individuals\ Raptor\ Spesies}{Total\ Observation} \quad (2)$$

Calculating the abundance of raptors species in an area requires another parameter approach in terms of dividers in the calculation of meeting levels. Dividers in the calculation of meeting levels can be replaced by the number of meetings on habitat type or altitude. This is due to the very difficult and rare level of encounter of raptors species with very limited observation time (limited time of raptors activity). The categories of species abundance presented in the table are as follows:

Table 1. Abundance category value [5]

Abundance category	Value	Sequence scale
< 0,1	1	Rare
0,1 – 2,0	2	Not Common
2,1 – 10,0	3	Often
10,1 – 40,0	4	General
> 40,0	5	Overflow

3. Results and Discussion

The condition of the BL Block of RPTN Jabung and CT Block of RPTN Coban Trisula is hills with steep valleys at an altitude between 1400 mdpl - 1500 mdpl. The location of the block is a natural forest bordering the production forest and agricultural land. The location is determined as a potential location that is used as a habitat for several species of raptor by TNBTS. The description of the blocks that serve as the location of the study is presented in Figure 2.

(a) (b)

Figure 2. The figure of research location. (a) Bendolawang's Block in RPTN Jabung and (b) Coban Trisula's Block in RPTN Coban Trisula.

Based on observations in the field, both BL and CT blocks there is a special time that the raptor uses to appear at 08.00 - 11.00 am. The time is used by the raptor to heat the body by flying soaring to save energy [6]. When doing soaring air flow on the raptor wings will increase and remain restrained in a fairly strong air flow [2], [6]. Therefore, the potential for a raptor to appear during sunny weather is very high [2]. Results of raptor identification in BL RPTN Jabung found 8 raptor species with 94 individuals. In the CT Block found 8 raptor species with 20 individuals. The details of the raptor species found at Coban Trisula and Bendolawang Block are presented in the table 2:

Table 2. Raptor Identification in the Coban Trisula Block and Bendolawang Block

No	Common Name	Scientific Name	Number of Individuals		Number of Meetings	
			CT	BL	CT	BL
1.	Javan-Hawk Eagle	*Nisaetus bartelsi*	4	6	11	28
2.	Crested Serpent Eagle	*Spilornis cheela*	5	6	10	16
3.	Black Eagle	*Ictinaetus malayensis*	5	6	12	15
4.	Oriental Honey-buzzard	*Pernis ptilorhyncus*	1	12	2	5
5.	Chinese Sparrowhawk	*Tachyspiza soloensis*	2	51	1	8
6.	Japanese Sparrowhawk	*Tachyspiza gularis*	1	11	0	3
7.	Peregrine Falcon	*Falco peregrinus ernesti*	0	1	0	1
8.	Black-thighed Falconet	*Microhierax fringillarius*	0	1	0	2
9.	Changeable Hawk-eagle	*Nisaetus cirrhatus*	1	0	1	0
10.	Spotted Kestrel	*Falco moluccensis*	1	0	1	0
Total			20	94	38	78

BL Block is a potential area for raptor, this is evidenced by the number individual of raptor found in BL Block more than in CT Block. One factor that can influence the presence of raptor is biotic factor which includes vegetation and feed. The high diversity of vegetation both in number and species in BL Block and CT Block causes the raptor to be able to survive in the area. Raptor likes tree-level vegetation to carry out activities such as eating, perching for resting and observing enemies and being used for nesting [7]. In each of the dominant vegetation blocks and raptor often used for activities including teritih (*Ficus sp),* anggrung (*Trema orientalis)*, mesusi *(Maesopsis eminii), Dadap (Erythrina variegata)* and pasang *(Quercus sundaica).*

Not only vegetation but also the number of prey animals can affect the existence of raptors. Prey animals are influences the presence of raptor. Prey animals are used as a (limiting factor) because it affects the growth and development, as well as the welfare of the animal population [8]. The availability of food in a habitat both in quantity and sufficient quality, will positively influence the development and growth of animal populations [9]. The potential of prey animlas is classified into several groups namely small mammals, reptiles and birds [9]. At the time of observation is observed that the species *Falco peregrinus ernesti* perch and carrying prey who allegedly is species *Tachyspiza*

gularis (Figure 3a), and also *Microhierax fringillarius* perched and carried prey *Chiroptera sp* (Figure 3b).

(a) (b)

Figure 3. Raptor that carries prey. (a) *Falco peregrinus ernesti* perch and carrying prey who allegedly is species *Tachyspiza gularis* and (b) *Microhierax fringillarius* perched and carried prey *Chiroptera sp.*

Potential prey animals for raptor in Block BL and CT are jungle Fowl *(Gallus sp),* Lizards *(Eutropis multifasciata),* Javan langur *(Trachypithecus auratus),* Squirrel coconut *(Callosciurus notatus),* Sooty-headed Bulbul *(Pycnonotus aurigaster,* Yellow-vented Bulbul *(Pycnonotus goiavier)* and Pink-headed Fruit Dove (*Ptilinopus porphyreus).* In addition to biotic factors, the presence of raptor is also influenced by abiotic factors which include temperature, altitude, slope, land cover and rainfall [10].

Raptors from Indonesia are found 3 families Pandionidae, Accipitridae and Falconidae [4]. The highest number of raptor species comes from the Accipitridae family which are 34 species, Falconidae family are 8 species and the Pandionidae family is only 1 species [4]. An important animal in forest ecosystems, each raptor species is protected from Government Regulations / Ministerial Regulations of Republic Indonesia, CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) and IUCN (International Union for Conservation of Nature and Natural Resources). This is to protect raptor species from being endangered by the goverment [11]. In Table 3 raptor family identificatified conservation status in each RPTN.

Table 3. Family raptor identification and raptor conservation status by Ministerial Regulations (MR) No 20, 2018, IUCN and CITES.

No	Common Name	Scientific Name	Family	Conservation Status		
				MR	IUCN	CITES
1.	Javan-Hawk Eagle	*Nisaetus bartelsi*	Accipitridae	D	EN	II
2.	Crested Serpent Eagle	*Spilornis cheela*	Accipitridae	D	LC	II
3.	Black Eagle	*Ictinaetus malayensis*	Accipitridae	D	LC	II
4.	Oriental Honey-buzzard	*Pernis ptilorhyncus*	Accipitridae	D	LC	II
5.	Chinese Sparrowhawk	*Tachyspiza soloensis*	Accipitridae	D	LC	II
6.	Japanese Sparrowhawk	*Tachyspiza gularis*	Accipitridae	D	LC	II
7.	Peregrine Falcon	*Falco peregrinus ernesti*	Falconidae	D	LC	I
8.	Black-thighed Falconet	*Microhierax fringillarius*	Falconidae	D	LC	II
9.	Changeable Hawk-eagle	*Nisaetus cirrhatus*	Accipitridae	D	LC	II
10.	Spotted Kestrel	*Falco moluccensis*	Falconidae	D	LC	II

In RPTN Jabung and Coban Trisula 10 raptor species in 7 species of the Accipitridae family and 3 species of the Falconidae family. At the same time were found migrant species namely *Pernis ptilorhyncus, Tachyspiza soloensis* and *Tachyspiza striped species.* The observation time is the time of migration raptor, which is auntum (September - November). Migration is adaptation of raptor behavior to breed and to avoid food scarcity [12]. During migration raptor has three main objectives breeding site, stopover, and temporary residence when the habitat wintering site, therefore the raptor migrates to a warmer location [12].

All of raptor species are identified in the category of protected animals based on the Regulation of the Minister of Environment and Forestry Republic of Indonesia Number P.106/ MENLHK/ SETJEN/ KUM.1/6/2018 [13]. IUCN raptor identified into the LC category (Least concern) and EN (Endangered). The species included in the EN category is *Nisaetus bartelsi* because this species is very small in number and only found in certain regions [14]. Raptor species identified in CITES are into 2 categories : Appendix I and II. Raptor species are categorized as Appendix I because this species will be threatened with extinction if illegal trade is not stopped, so species included in this category are prohibited from being traded nationally or internationally. *Paregrine falcon* is a species that is included in the Appendix I category, this is evident in the field that the number of species is very small and difficult to find. Appendix II is used to list species that are not threatened with extinction, but may be endangered if trade continues without regulation [11].

Table 4. Density and abundance value of raptor Coban Trisula Block and Bendolawang Block

No	Common Name	Scientific Name	D (Individual /Ha)		ET	
			CT	BL	CT	BL
1.	Javan-Hawk Eagle	*Nisaetus bartelsi*	2.28	5.08	0.78	2.00
2.	Crested Serpent Eagle	*Spilornis cheela*	2.85	5.08	0.71	1.14
3.	Black Eagle	*Ictinaetus malayensis*	2.85	5.08	0.85	1.07
4.	Oriental Honey-buzzard	*Pernis ptilorhyncus*	0.57	10.1	0.14	0.35
5.	Chinese Sparrowhawk	*Tachyspiza soloensis*	1.14	43.18	0.07	0.57
6.	Japanese Sparrowhawk	*Tachyspiza gularis*	0.57	9.31	0.00	0.21
7.	Peregrine Falcon	*Falco peregrinus ernesti*	0.00	0.84	0.00	0.07
8.	Black-thighed Falconet	*Microhierax fringillarius*	0.00	0.84	0.00	0.14
9.	Changeable Hawk-eagle	*Nisaetus cirrhatus*	0.57	0.00	0.07	0.00
10.	Spotted Kestrel	*Falco moluccensis*	0.57	0.00	0.07	0.00

The results of identification of the number of individuals and raptor encounters in table 4 are used to determine the value of the density and abundance of raptor in each study area. The calculation resulted in BL Block RPTN Jabung the highest value of raptor species density is *Tachyspiza soloensis* with a value of 43.18 Individual/Ha. The number of individuals *Tachyspiza soloensis* are 51 individuals, the number is very large when compared with other species in BL Block. This happens because at the time of observation is the peak time of raptor migration, so the number of raptor is very much. When the migration season of *Tachyspiza soloensis* and during monitoring that it was found in several areas East and West Java, most recorded in January, February, March and November [15]. On the CT Block RPTN Coban Trisula the highest population density of raptor species is in *Spilornis cheela* and *Ictinaetus malayensis* that is equal to 2.85 Individual/Ha with the number of individuals each is 5. The results of the calculation of the highest abundance of raptor species in BL Block are on the species *Nisaetus bartelsi* with ET 2.00. CT Block the species with the highest abundance value is *Ictinaetus malayensis* with ET value of 0.85. Factors that can affect population density and abundance of a wildlife are the area and type of habitat, climatic conditions, adaptability of a species of wildlife and interactions between individuals and between types [7] .

4. Conclusion

There are 8 species of raptor identified in the each RPTN (Jabung and Coban Trisula). The highest population density of raptor in the Jabung RPTN are Tachyspiza soloensis (43.18) and RPTN Coban Trisula are *Spilornis cheela* and *Ictinaetus malayensis* (2.85). The highest abundance (ET) of raptor in RPTN Jabung are *Nisaetus bartelsi* (2) and in RPTN Coban Trisula are *Ictinaetus malayensis* (0.85)

Acknowledgments

Thank you to the Forestry Wildlife Study Club (KSSL) of the University of Muhammadiyah Malang has helped a lot in identifying and collecting raptor data in the field. And thanks to the Great Bromo Tengger Semeru National Park for gived permission and research opportunities so we can identified several raptor species in the RPTN Jabung and Coban Trisula TNBTS.

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