Analysis of habitat suitability of birds family Accipitridae in the forest park of Pocut Meurah Intan

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Abstract. Birds are often used as indicators to describe the state of biodiversity, which means areas that are important for birds are also important for other flora and fauna. In addition, the distribution area of birds is well known, so that important regional livelihoods using birds as indicators can be carried out quickly and comprehensively. This research was conducted in February 2021, aiming to observe the habitat conditions of the Accipitridae family birds in Tahura Pocut Meurah Intan, Aceh Province. The method used in this research is an exploratory survey method. Data collection in the field by placing 15 observation points and 3 line transects is combined using the "look down method" and "upward observation". Data analysis using principal component analysis (PCA) method. The results obtained that the area of suitable habitat (suitable) with good categories for bird species of the family Accipitridae of 4306, 106 ha or 69.23% and the medium category, which is available for food and accessible, but there is no reproductive location and has a high level of disturbance of 1727, 294 ha (27.77 %). Birds of the Accipitridae family can carry out activities and find prey in three different forest types, namely primary, secondary and open forests.

1. Introduction
There are 557 bird species with endangered status in Indonesia based on the latest Indonesian legislation, namely the Minister of Environment and Forestry Regulation Number P.106/MENLHK/SETJEN/KUM.1/8/2018 concerning the Second Amendment to the Regulation of the Minister of the Environment. Life and Forestry Number P.20/MENLHK/SETJEN/KUM.1/6/2018 concerning Protected Types of Plants and Animals (here in after referred to as the LHK Ministerial Regulation) [1].

Efforts to conserve bird species with endangered status are to maintain habitats favored by bird species such as the Great Forest Park (Tahura) area. Tahura is a form of nature conservation area for the purpose of collecting natural (native) or artificial plants and animals, which are used for research purposes, to support cultivation, culture, tourism, and recreation. Conservation can be interpreted as an effort to protect, improve, and use natural resources wisely to ensure the continuity of their supply while maintaining and improving the quality of diversity and its value [2]. One of the nature conservation areas
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in Aceh Province which is a habitat for bird species with an endangered status is the Pocut Meurah Intan Forest Park.

Pocut Meurah Intan Forest Park is a form of nature conservation area where there are many nest plants and various other plants that are widely used by various types of animals. With the presence of plants that are very important to maintain a balance parameters of the environment for the species of bird, but the dive a this region are threatened by various activities of exploration by humans. When the parameters of the environment in the region that continues to experience interference impact also on the natural by various species of birds rare, like a bird of prey.

The group of birds of prey in Indonesia there are 69 species were included in the order Accipitriformes, seven families are Accipitridae, Falconidae, Sagittaridae, Cathartidae, Strigidae, Pandionidae and Tytonidae [3]. All kinds of families Accipitridae is a species which is protected [1]. Two types of eagles that Black Eagle (Ictinaetus malayensis Temminck, 1822) and Blyth’s Hawk-Eagle (Nisaetus alboniger Blyth, 1845), included in Appendix II of CITES [4], it means that the species are not in the category are threatened with extinction, but have the opportunity to threatened with extinction if activities of trade is not monitored with strict. Focus on the research of this is determining the boundary area that is appropriate for the family Accipitridae in Taman Hutan Raya Pocut Meurah Intan and surrounding areas. The results of the research it can be used as a reference to the determination of policy in the management of the area as one of the efforts to the preservation of the species endangered in habitat natural (in-situ).

This study aims to determine the physical factors that affect the habitat and determine the habitat area of the birds of the family Accipitridae. One of the obstacles in conservation efforts is the lack of information about the distribution of the Accipitridae family. Therefore, it is important to conduct a research on habitat suitability analysis of the Accipitridae family of birds to produce useful information for conservation efforts of this species.

2. Materials and methods
Research conducted on the month February 2021 in the area of Taman Hutan Raya Pocut Meurah Intan province of Aceh. Observations carried begin at 08.00 - 18.00 wib at 15 point observations on three types of habitat that is 5 points in the jungle primary, 5 points in the jungle secondary and 5 points in the forest open. The research location is shown in Figure 1.

Figure 1. Map of Research Locations in Pocut Meurah Intan Forest Park, Aceh Province [5].

The methods used to observe the activity of the family Accipitridae is Ad-Libithum Sampling Method [3], [6], which is to record as much as possible the activity of three types (species) of birds of prey which found that the activity of fly, perch and hunt. The method is combined with the method of "observations to the bottom" (look down method ) and "observation to the top" [7].

Habitat use by birds of the Accipitridae family is determined based on the frequency of presence/encounters of eagle species in each habitat type with habitat preference parameters including the presence of Accipitridae family bird species, availability of nesting trees, presence of coverage area (canopy cover), level of anthropogenic disturbance, distance forest to road and the number of prey
observed in each observation station in the Pocut Meurah Intan Forest Park Area [8]–[10]. Relations preference habitat that is based on the activity of the birds eagle in every type of habitat do the analysis of multivariate using techniques PCA (Principal Component Analysis) [3], [8].

3. Results and discussion

During the research has been done 15 times observation of the birds Family Accipitridae. This study only focuses on birds of the Accipitridae family and ignores encounters with other bird species. Species of bird predators are found when the observation in the morning (6:00 a.m. to 09:00) and evening (15.00-18.00). Data encounter of the bird family Accipitridae in the area of Taman Hutan Raya Pocut Meurah Intan shown in Table 1

| No | Region Name | Scientific Name        | Family     | Coordinate Point        | Forest Type |
|----|-------------|------------------------|------------|-------------------------|-------------|
| 1  | Black Eagle | Ictinaetus malayensis  | Accipitridae | N 05°26’54.09” E 095°45’22.81” | secondary forest |
|    |             |                        |            | N 05°26’53.80” E 095°45’22.81” | secondary forest |
| 2  | Blyth’s Hawk-Eagle | Nisaetus alboniger       | Accipitridae | E 095°45’20.91” N 05°26’57.71” | open forest |

The condition of the forest is still good with primary forest habitat type supported by high plant diversity and dominated by tall tree vegetation, it is very possible for the availability of prey animals so that birds of the Accipitridae family often visit the area to hunt, roost and monitor prey. Birds of prey habit often visit forest edges or open area borders to hunt prey [11]. The Accipitridae family prefers trees that are open and tallest at the edge of the forest for perching [12].

The results of a principal component analysis are carried out differently for variables (types/species) and individuals (sample units/plots). The variable coordinate for each axis is the same as the correlation between the variable and the axis. The stronger the correlation (negative or positive), the closer the variable is to the axis. The proximity (proximity) between plots shows the similarity of plot characteristics to species, while the angle formed between the axes of species shows a relationship (correlation). The formation of an angle of about 90-180 degrees shows that the two have no relationship in their distribution in the sample [3].

Habitat suitability is a habitat condition that is chosen or preferred by animals to carry out various daily activities and can accommodate a viable population size because in the habitat unit there is a need for resources and space with high accessibility [13], [14]. Habitat suitability can be predicted by combining and mapping various suitable habitat variables. Availability of food, water and limiting factors that function to determine resource accessibility and habitat preferences that produce a habitat quality index [14], [15].

The suitability of the bird habitat of the Accipitridae family in the Pocut Meurah Intan Forest Park ecosystem area is illustrated in the PCA (Principal Component Analysis) diagram shown in Figure 2.
Note: Sbl: Species of bird family Accipitridae; Kps: Availability of nest trees; Kca: Availability of coverage area; Tga: Anthropogenic disturbance rate; Jhj: Forest to road distance; Jm: Number of prey

Figure 2. Diagram of the conformity analysis of the suitability of bird habitats of the Accipitridae family in the Pocut Meurah Intan Forest Park ecosystem area

This analysis model is based on the parameters of the frequency of encounters on the type of habitat where birds of the Accipitridae family are found. PCA analysis of habitat suitability of the Accipitridae family in various habitat types showed an eigenvalue of 3.5699 for the first component and 1.2509 for the second component of the total variance of 100%. Furthermore, PCA analysis according to Figure 2 shows that there are quadrants that have the same characteristic tendency because they are located in the same component.

First component is a variable that consists of the availability of coverage area, within the forest to the road and the availability of a tree nest. It is meant family Accipitridae have a correlation that is strong with the type of habitat jungle primary. Second component is a variable that consists of a number of prey, the level of interference of anthropogenic and species of birds rare. Based on the diagram in Figure 2, it is known that the birds of the Accipitridae family are very fond of or depend on the habitat types of primary forest, secondary forest and open forest.

3.1. Species of bird family Accipitridae
The results of the study in the Pocut Meurah Intan Forest Park area, it was found that there were two species of birds from the Accipitridae family, namely the Black Eagle (*Ictinaetus malayensis* Temminck, 1822) and Blyth’s Hawk-Eagle (*Nisaetus alboniger* Blyth, 1845). Several species of birds of the family accipitridae are found when the observation in the morning (06.00 - 09:00) and evening (15.00-18.00). Among the bird species found during the research can be seen in Figure 3.
3.2 Availability of nest trees
At the location of the observation of forest, secondary and open forests, seen some trees pine that has dried up. However on trees that contained a nest bird family Accipitridae in general. Bird of prey species will fly from the nest to the area of the forest is open to hunting prey such as rats, snakes, chickens and squirrels as well as in the area of forest secondary hunt various types of prey such as the type of bird herbivore.

3.3 Availability of coverage area
Habitat use by birds varies. Birds use the habitat in the area of Taman Hutan Raya Pocut Meurah Intan to seek eat, rest, shelter, place a stop or play as well as a place for nesting. It is because the region Taman Hutan Raya is still providing all the space and provide a source of food that is needed by the birds. The condition of forests primer is habitat jungle nature with the closing of vegetation which is fairly dense (>88%). Forests secondary is one of the forest that is favored by many species of birds, one of which is a bird predators. Forests Secondary generally have stands of trees were large and rather sparse. Animals birds like the place is mainly on during the day, often fly under the canopy of trees.

Another habitat for birds is open forest such as yards/abandoned land which is still overgrown with various kinds of fruting plants. Although the canopy is more open than the forests primary and forests secondary. However, the presence of various types of birds in open forest areas is also important for the birds of the Accipitridae family, because the birds of the Accipitridae family spend more time doing activities in more open areas. The closure of the canopy are favored by bird family Accipitridae is the range of 51% - 75%, due to the activity of hunting prey species of birds have more a lot done in the area of forests secondary and open forest.

3.4 Anthropogenic disturbance rate
The threat of the most substantial more for the life of the birds in Taman Hutan Raya Pocut Meurah Diamond is poaching and trade, namely the capture of birds Eagles are used for pets as birds decoration or sold by a variety of reasons. Disruption of habitat pressure due to human activities changing the natural environment (primary, secondary) into agricultural and plantation land, is an activity that can lead to reduced or even loss of habitat for birds of the Accipitridae family. Expansion of Regional Parks Hutan Raya Pocut Meurah diamonds into the land of plantation society in around can increase the pressure on the lives of wildlife and ecosystems naturally. The emergence of this pressure is also closely related to the level of poverty, the use of resources and land, as well as the excessive development of agriculture and plantations. Development of the agricultural sector with the use of fire in the open field, because the use of fire is considered more cost-effective excessive costs and is more practical and faster.

One way to do is to give a place to nest and hunt these birds, because the live animals should be able to provide a sense of security and availability of feed for that animals. Animals will move to other habitats if the habitat they live in is deemed not to provide a sense of security and cannot meet their needs.
3.5 Forest to road distance

The habitat factor of the forest distance to the road is one of the important habitat factors in its use by birds of the Accipitridae family. Bird family Accipitridae avoid the minimum possible area that threatens the security of the species, because the species that carry out activities of rest and evolving breed in the jungle primary and forests secondary also to take refuge from all the distractions in the form of hunting. Birds of the family Accipitridae are found at distances from the road between 300-500 m in primary forest areas. Region Forest Secondary discovered species of bird family Accipitridae at a distance of 30-100 m from the road. While the area of open forest type species of bird family Accipitridae found at a distance of 10-25m.

3.6 Number of prey

The Eagle as a top predator occupies a strategic position as a controller of the prey population below it, so that the eagle has an important role in maintaining the balance of the ecosystem [3], [16]. In the ecosystem, eagles have characteristics of low density and small population and are very sensitive to environmental changes [11]. The condition of the forest is still good with primary forest habitat type with high plant diversity and dominated by tall tree vegetation, it is very possible for prey animals to be available so that birds of prey often visit the area to hunt, roost and monitor prey.

The types of bird prey of the Accipitridae family found in the observation area, not all of them are included in the type of eagle feed. Therefore it is necessary to determine the types of animals found. The types of bird feed family Accipitridae note of the observations are shown in Table 2.

Table 2. Types of bird feed of the Accipitridae family in Pocut Meurah Intan Forest Park.

| Region Name       | Scientific Name                  | Quantity | Habitat                      |
|-------------------|----------------------------------|----------|------------------------------|
| Forest Rat        | Rattus sp.                        | 48       | primary, secondary, open forest |
| Common Treeshrew  | Tupai a glis                      | 60       | primary, secondary, open forest |
| Black Giant Squirrel | Ratufa bicolor                  | 14       | primary                      |
| Riopa Bowringii   | Lygosoma bowringii               | 13       | primary, secondary, open forest |
| Many-striped Skink | Mabuya multifasciata             | 18       | primary, secondary, open forest |
| Tokay Gecko       | Gekko gecko                      | 3        | primary, secondary, open forest |
| Large flying fox  | Pteropus vampirius               | 25       | primary, secondary, open forest |
| Sooty-headed bulbul | Pycnonotus aurigaster           | 25       | secondary, open forest        |
| Yellow-vented bulbul | Pycnonotus goiavier             | 24       | secondary, open forest        |
| Black-capped bulbul | Pycnonotus melanicterus         | 9        | secondary, open forest        |
| Zebra dove        | Geopelia striata                 | 13       | secondary, open forest        |

3.7 Most influential environmental factors for birds of the Accipitridae family

Based on the analysis of components of primary (PCA) obtained the results of the factor environment of the most influential of the suitability of habitat for the bird family Accipitridae in Central Park Forest Kingdom Pocut Meurah Diamond is within the forest to the road and the availability of a tree nest [17]. The existence of forests primary well be a factor essential to the existence of the bird family Accipitridae. Bird family Accipitridae only perform the activities of reproduction in the area of forest primer whereas for activities seeking eat and rest over a lot done in the area of forests secondary and forests open, then obtained the habitat of birds that appropriate (suitable) only in habitats with quality good. In the habitat of this bird family Accipitridae can life be worthy of available space and a source of power sufficient to perform all the activities to be able to survive living in the habitat.
A suitable habitat unit for birds of prey to carry out their daily activities. Habitat with good bird category used for breeding and used as nesting location, good category for birds of prey, covering primary, secondary and open forest areas. The location of the nests of birds of prey is in primary forest, while prey hunting activities are mostly in secondary forest and open forest, this is because prey in primary forest can take shelter under dense canopy cover.

4. Conclusions
The study shows that habitat factors greatly influence the development of the Accipitridae bird species population. Efforts to protect suitable habitats in primary forest areas must also be carried out in various other forest type habitats. The existence of the forest area is an important parameter that must continue to be carried out by various forest protection efforts from activities that can damage and reduce the quality of the habitat of the Accipitridae family birds in the Pocut Meurah Intan Forest Park.

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