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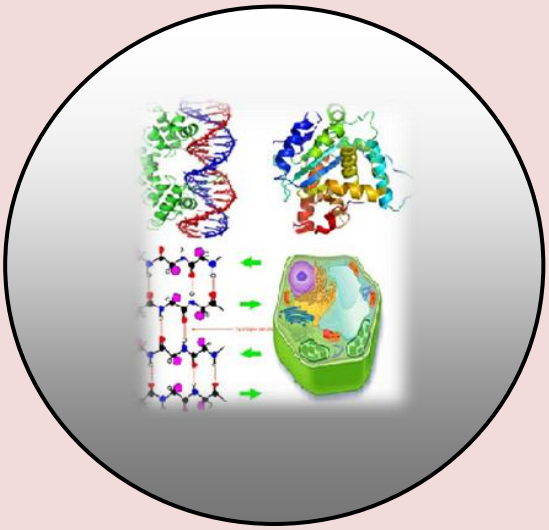

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Bird Diversity as a Tourist Attraction in the Tourism Area of the Taro Gianyar Bali

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ABSTRACT

This study aims to determine the diversity of bird species, the status of the existence of birds and bird activity in the tourist area of Taro. This research will be a consideration for bird watching tourism. Observation of bird diversity was carried out in 3 trekking lane, using the strip transect method. Bird activity in the habitat was observed by the Ad Libitum Sampling method. Bird species diversity was calculated by the Shanon-Wiener diversity index. The results of the study found 37 species of birds, with a diversity index value of 3.21 (high diversity category). The complexity of the vegetation structure in the Taro tourist area strongly supports the high diversity of birds and their activities. There are 24 species of birds included in the category of Least Concern (LC) and Vulnerable (Vu) IUCN Red list, 3 species including protected species and 3 species are Indonesian endemic birds. Thus, the Taro tourist area has a high conservation value for bird conservation. Bird diversity, bird activity, bird conservation status are interesting aspects of avitourism or bird watching tourism. The use of bird diversity for tourism contributes positively to the conservation of biodiversity.
Keywords: Bird Diversity, Bird Conservation Status and Bird watching Tourism.

INTRODUCTION

Taro Village is located at an altitude of 500-1000 m above sea level, Taro Village has an area of 1,289 ha, 247 ha is rice farming land, 950 ha of non-rice agricultural land (consisting of uplands/gardens) and social forest) and 92 ha. is not agricultural land (Tegalalang Subdistrict in Figures, 2018). The people of Taro Village are very enthusiastic to make this region an ecotourism-based tourism village, which is the preservation of the natural/ecological environment, community empowerment, developing community culture and sustainable community economy.

In the tourist area of the village of Taro has developed a tourist attraction White Taro cow park and Mason Elephant Park object. The Taro White Cow Park, which covers 2.5 hectares, was developed by the community (Taro White Cow Foundation, 2014) for ecotourism, spiritual tourism. The attraction of this area is the white Cow Taro, various religious plants, rare plants, fruit plants and flower plants. In the area there are also built temples, which can be used by tourists for spiritual tourism or meditation. Mason Elephant Park is an ex-situ conservation of Sumatran elephant attraction, this attraction plays a role in saving critically-endangered Sumatran elephants that have been threatened in native habitat in Sumatera, because deforestation and poaching has dwindled the native elephant population. Variations of attraction need to be developed, so that the destination of tourists to this region is not only the attractions of the White Cow Taro and the Sumatran Elephant, but also other attractions. One attraction that has the potential to be developed is bird watching tourism or avitourism.

The diversity of birds in this region is supported by a diversity of flora and fauna (insect, reptile). The existence of a forest area that is still sustainable is also a great potential for the interaction of bird diversity with vegetation. The results of a survey by the Damar Pertiwi Foundation (2019), stated that several species of birds can be found in the Taro Village area, both water birds and terrestrial birds.

The combination of bird diversity, bird watching tourism and flora and fauna conservation is a good model in the effort to build sustainable tourism and nature conservation are engaged in a symbiotic relationship. This is in accordance with the concept of ecotourism, namely the use of biodiversity (flora and fauna) while maintaining the biological/ecological function of the ecosystem and there is economic value for local communities (Puhakka *et al.,* 2011; Duangjai *et al.,* 2014; Birdlife International Middle East 2015, Steven *et al.,* 2015; Judge, 2017; Ristić *et al*., 2019**;** Kim *et al.,* 2020). In developing birds as tourist attractions can be in the form of bird diversity, bird activity in habitats, bird interactions with plants and the status of birds.

Considering the potential diversity of birds in the Taro Village area for birdwatching tourism attractions, the focus of this study is to identify bird diversity, the status of bird existence and bird activity in habitats. The status of birds is based on the IUCN red list and the regulation of the Minister of Environment and Forestry of the Republic of Indonesia no. P106, 2018, concerning protected species of animals and flora. The results of this study will be considered for bird watching in the Taro Village tourist attraction.

MATERIALS AND METHODS

Time and location of research

The study was conducted in April-May 2019 around the tourist area of the White Cow Taro Park and Mason Elephant Safari Park, Taro Village Gianyar Bali. Bird surveys were carried out in 3 trekking lines (Figure 1).

Sampling and data collection

Identification of bird species is carried out directly with binoculars. Identification based on morphological characters (including foot shape, feather, feather color, wings, wing color, beak). Identification refers to the Java, Bali and Sumatra bird field guide series (MacKinnon *et al,* 2010). The status of birds is based on the IUCN Red List (2019) on Threatened Birds of Asia.

Observation of bird abundance using the Transect Strip method. 3 transects are determined, each transect is length (L) 700 m and the width on the left and right of the transect line (W) is 10 meters. The parameters observed in each transect were the number of species and number of individual birds (Bibby *et al.,* 2000). Bird activity in the habitat is observed by the Ad Libitum Sampling method, which records all bird activity found in each transect, in the morning and evening. The data recorded is the activity of each species of bird in the habitat.

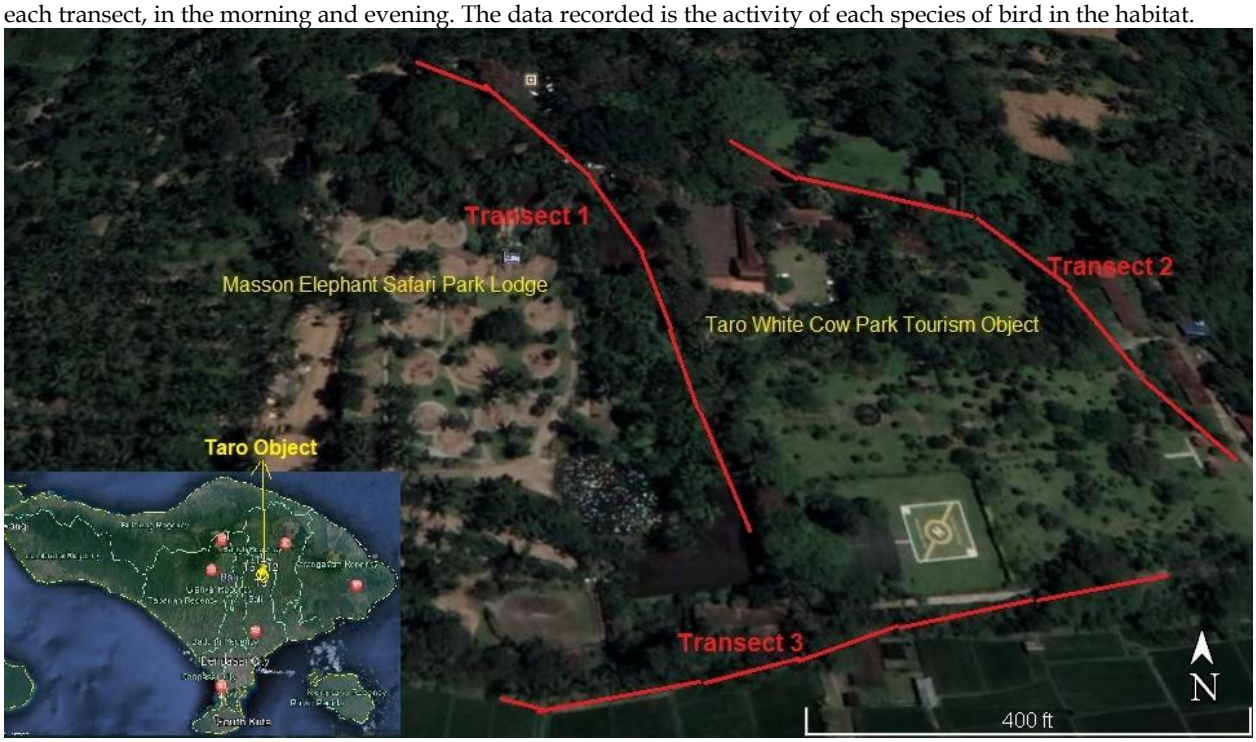


Figure 1. Map of research location (Map source: Google earth, @2020 google)

Data analysis

The abundance of each species of bird (Di) is calculated by the formula Di = di/ 2LW, and the relative abundance of each species is calculated by the formula Dr= (Di/ ∑Di) x 100. Bird species diversity is calculated by the Shanon-Wiener diversity index (H), which is H = -∑ [ni/N x Ln ni/N), which is ni = the importance value of the i-th species and N = the total importance of all species. Important values are determined from the sum of the parameters of relative density and relative frequency.

RESULTS AND DISCUSSION

Bird diversity

The results of studies in the Taro Tourism Object area found 37 species of birds, including 21 families. From all bird species observed, several spesies of population are quite abundant, including Glossy swiftlet (*Collocalia esculenta*), Cave swiftlet (*Collocalia linchi*), Olive-backed Tailorbird (*Orthotomus sepium*), Olive-backed sunbird (*Nectarinia jugularis*), Spotted dove (*Streptopelia chinensis*), Pink-necked Green pigeon (*Treron vernans*), Asian starling (*Aplonis* sp.), and Yellow-vented Bulbul (*Pycnonotus goiaver*). Some birds are quite rare (low population), including Oriental White-eye (*Zosterops palpebrosus*), Flame-fronted barbet (*Psilopogon armillaris*), Lineated barbet (*Psilopogon lineata*), Red Junglefowl (*Gallus gallus*), Plaintive Cuckoo (*Cacomantis merulinus*) and *Lesser coucal* (*Centropus bengalensis*). Birds with low populations are generally found solitary.

The overall bird diversity index is 3.21. From the magnitude of the index, the diversity of bird species in the Taro Tourism Object area is included in the high category. The high diversity of species is influenced by the complexity of habitat structure (Tanalgo *et al.,* 2015; Muttaqien *et al.,* 2015; Casas *et al.,* 2016). Taro tourist area is supported by a fairly complex habitat structure. The habitat structure in this area consists of forests, bushes, grass areas, watershed forests, gardens, rice fields. This diversity of habitat structure affects the high availability of food, shelter and accommodation for bird species.

Of the 21 bird families found, the Apodidae family (swiflet family) showed the highest abundance of individuals, 48.43%. Some predominant abundance families are the Columbidae family (dove family) of 13.3%, the Sturnidae family (starling family) 7.7%, the Sylvidae family (tailorbird family) 5.19% and 17 other families each less than 5% each. Detailed data on the diversity of birds in the Taro tourist area are presented in Table 1.

Status of birds

In the Taro Tourism Object Area, there are 24 bird species listed as a rare category of the IUCN red list in the LC (Least Concern) and Vu (Vulnerable) categories. 11 species of which are included in the decreasing population trend globally. These species include Red Jungle fowl (*Gallus gallus*), Orange-headed thrush (*Geokichla citrine*), Javan Kingfisher (*Halcyon cyanoventris*), Black-nape Oriole (*Oriolus chinensis*) and giant weaver (*Ploceus grandis*) and 1 species included in the category of Vulnerable that's decreasing population trend in nature, namely Javan myna (*Acridotheres javanicus*). Based on the Minister of Environment and Forestry Regulation no. 106 of 2018, there are 3 species of birds including protected status, namely Flame-fronted barbet (*Psilopogon armillaris*), Lineated barbet (*Psilopogon lineatus*) and Sunda Pied Fantail (*Rhipidura javanica*). In the Study area also found 3 species which are Indonesian endemic birds namely Javan Kingfisher (*Halcyon cyanoventris*), Scarlet-headed Flower pecker (*Dicaeum trichileum*) and Javan-munia (*Lonchura leucogastroides*) (Table 1). Based on the presence of many birds which are rare and endemic species, the Taro tourist area has a high conservation value for bird conservation.

The presence of rare birds (LC and Vu categories), especially those with decreasing population trends globally and endemic species, are priorities in conservation (Hadiprayitno *et al.,* 2016; Henri *et al.,* 2017). Conservation can be through habitat protection, vegetation, preventing poaching and avoiding habitat destruction.

Table 1. Bird diversity in Taro Tourism Object.

No	Species (Family)	Common name	Density (ind/ha)	Important value	Observed activity	Status	Feeding guild
1	*Acridotheres javanicus* (Sturnidae)	Javan myna	3.57	7.06	Insect foraging on the ground	Decrea sing-Vu	Omnivore
2	*Aegithina tiphia* (Aegithinidae)	Common iora	2.62	6.23	Perched on a tree branch	LC	Insectivore
3	*Amaurornis phoenicurus* (Rallidae)	white-breasted waterhen	0.24	1.52	Walking, foraging on the grass and on the ground	LC	Carnivore
4	*Anthreptes melacensis* (Nectariniidae)	Brown-throated Sunbird	0.24	1.52	Perched on a coconut flower stalk		Nectarivore

5	*Aplonis penayensis* (Sturnidae)	Asian Glossy Starling	0.48	1.73	fly between vegetation		Frugivore
6	*Aplonis* sp. (Sturnidae)	Asian Starling	4.76	6.78	Fly to the vegetation branches		Frugivore
7	*Arachnothera* sp. (Nectariniidae)	Spiderhunter	0.71	3.25	Fly on top canopy		Nectarivore
8	*Ardeola speciosa* (Ardeidae)	Javan Pond-heron	0.71	3.25	Foraging in a moat around rice fields	LC	Carnivore
9	*Bulbulcus ibis* (Ardeidae)	Catle egret	4.05	7.47	Fly on vegetation branches, foraging on rice fields		Insectivore
10	*Cacomantis merulinus* (Cuculidae)	Plaintive Cuckoo	0.24	1.52	Fly on top canopy	Stable-LC	Insectivore
11	*Centropus bengalensis* (Cuculidae)	Lesser coucal	0.24	1.52	Fly to the bush, Perched	Increasing-LC	Carnivore
12	*Collocalia esculenta* (Apodidae)	Glossy swiftlet	43.57	41.91	Flocking in groups, Insect fly catching	Stable-LC	Insectivore
13	*Collocalia linchi* (Apodidae)	Cave swiftlet	11.90	11.69	Insect fly catching	Decreasing-LC	Insectivore
14	*Dicaeum tricheleum* (Dicaidae)	Scarlet-headed Flowerpecker	1.43	5.19	Perched on a tree branch, looking for insects in the tree	Indonesia Endemic	Omnivore
15	*Gallus gallus* (Phasianidae)	Red Junglefowl	0.48	3.05	walk and forage in the bush	Decreasing-LC	Omnivore
16	*Gallus gallus domesticus* (Phasianidae)	Chickens	0.95	3.46	Walk and forage on the ground		Omnivore
17	*Geokichla citrine* (Turdidae)	Orange-headed thrush	0.48	1.73	Perched on a tree branch	Decreasing-LC	Omnivore
18	*Halcyon capensis* (Alcedinidae)	Stork-billed Kingfisher	0.48	3.05	Fly to the vegetation branches, perched on a tree and made a loud noise		Carnivore
19	*Halcyon chloris* (Alcedinidae)	Collared Kingfisher	0.48	3.05	Flying around the river, perched on a tree and made a loud noise	Decreasing-LC	Carnivore
20	*Halcyon cyanoventris* (Alcedinidae)	Javan Kingfisher	0.24	1.52	Fly to the vegetation branches	Decreasing-LC, Indonesia endemic	Carnivore
21	*Lonchura leucogastroides* (Estrildidae)	Javan-munia	2.38	6.02	Perched on a tree branch , Fly to the vegetation branches	Stable-LC, Indonesia endemic	Granivore

22	*Lonchura punctulata* (Estrildidae)	Scaly-breasted Munia	0.71	1.94	Perched on a tree branch, fly between vegetation,	Stable-LC	Granivore
23	*Psilopogon lineatus* (Capitonidae)	Lineated barbet	0.95	4.78	Perched on a tree branch	Stable-LC, L	Frugivore
24	*Psilopogon armillaris* (Capitonidae)	Flame-fronted barbet	0.48	3.05	Perched on a tree branch	Stable-LC,L	Frugivore
25	*Nectarinia jugularis* (Nectariniidae)	Olive-backed sunbird	2.38	6.02	Perched on a tree branch	Stable-LC,	Nectarivore
26	*Oriolus chinensis* (Oriolidae)	Black-nape Oriole	0.24	1.52	Perched on a tree branch	Decreasing-LC,	Frugivore
27	*Orthotomus sepium* (Sylvidae)	Olive-backed Tailorbird	5.95	9.13	Perched on a tree branch	Stable-LC	insectivore
28	*Picinae* sp. (Picidae)	Woodpecker	0.24	1.52	Perched on a tree trunk while pecking the trunk		Carnivore
29	*Ploceus grandis* (Placeotidae)	giant weaver	0.48	3.05	Flying above vegetation	Decreasing-LC	Frugivore
30	*Ptilinopus melanospilus* (Columbidae)	Black-naped Fruit-dove	0.24	1.52	Perched on a tree branch		Frugivore
31	*Pycnonotus goiaver* (Pycnonotidae)	Yellow-vented Bulbul	4.52	7.89	Flying above vegetation, perched tree branches		Frugivore
32	*Rhipidura javanica* (Rhipiduridae)	Sunda Pied Fantail	1.67	5.40	Fly on vegetation branches	Stable-LC, L	insectivore
33	*Streptopelia bitorquata* (Columbidae)	Sunda-collared Dove	0.95	3.46	Fly on vegetation branches	Decreasing-LC	Granivore
34	*Streptopelia chinensis* (Columbidae)	Spotted Dove	5.95	9.13	Foraging on grass, walk on ground, Fly to the vegetation branches, perched on a tree and made a sound		Granivore
35	*Surniculus lugubris* (Cuculidae)	Square-tailed Drongo-Cuckoo	0.48	3.05	Perched on a tree branch	Decreasing-LC	insectivore
36	*Treron vernans* (Columbidae)	Pink-necked gree pigeon	8.10	11.00	Perched on a tree branch, was eating fruit ficus	Stable-LC	Frugivore
37	*Zosterops palpebrosus* (Zosteropidae)	Oriental White-eye	0.95	3.46	Perched on a tree branch,	Decreasing-LC	Insectivore
Shannon-Wiener Index : 3.21							

Note: LC: Least Concern and Vu: Vulnerable are actually based on the IUCN red list. L: protected status based on the regulation of the Minister of Environment and Forestry of the Republic of Indonesia no. P106 2018.

Bird activity

Bird activity is closely related to food types (feeding guilds) and their interactions with vegetation. In the study area there were 6 feeding guilds, the most dominant insectivore group was 63.37%, followed by frugivore 17.69%. Other feeding guilds are 8.72% granivore, 6.01% omnivore, nectarivore 2.91% and carnivore 2.3%.

Insectivore birds show many activities to catch insects while flying, catching insects that interact with vegetation. The height of birds from insectivore feeding guilds is related to the high diversity of insects that interact with vegetation in the tourist area of Taro. Damar Pertiwi Foundation (2019), noted that in the Taro tourist area there were found 35 species of insect, mainly of the Lepidoptera, Odonata and Orthoptera groups.

Javan pon heron (*Ardeola speciosa*)

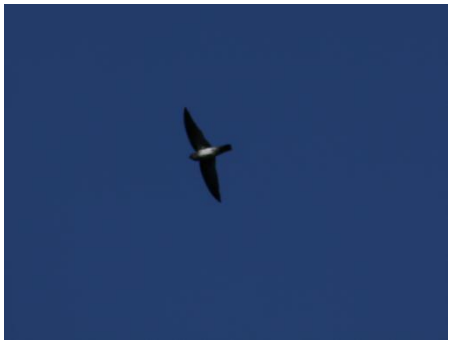
Brown-throated Sunbird (*Anthereptes melacensis)*

Olive-backed Tailorbird (*Orthotomus*

Pink neked green pegeon *(Treron*

Spotted dove (*Streptopelia chinensis*)

Scaly-breasted Munia (*Lonchura punctulata*)



Glossy swiftlet (*Collocalia esculenta*)

Common iora ***(****Aegithinna tiphia*)

Figure 2. Some bird activities were observed on the Taro tourist trekking trail.

Glossy swiftlet and Cave swiftlet are often found flying over open land. The activity of these birds can be observed in the morning and evening. Green pigeon often found perched on large trees in the coconut tree, ficus tree. Spotted dove and yellow vented bulbul are often found perched on coconut trees, walking on the grass while looking for food. The diversity of vegetation in the region provides resources for a variety of birds.

Figure 2, shows some bird activities observed in the birdwatching track of the Taro attraction. Some of these species are Javan pon heron flying between vegetation, Brown-throated Sunbird perched on coconut flower stalks, Olive-backed Tailorbird perched while looking for insects, Pink neked green pigeon groups perched on palm-leaf stalks, Spotted dove walking on grass while foraging, Scaly-breasted Munia perched on a banana leaf stalk, Glossy swiftlet was flying while catching insects in the air and Common iora perched on a tree branch.

In the context of vegetation resources for bird life, vegetation provides 3 main functions, namely (1) providing settlement, perching, nesting for birds (accommodation); (2) providing food either directly or indirectly, directly namely fruit, seeds, flowers and leaves, is food for frugivore/nectarivore/granivore birds and indirectly, namely that plants provide food for carnivore birds, in the form of insects, small reptiles, spiders that interact with plants; (3) become a shelter from environmental stress conditions (rain, heat).

Birds diversity and tourism

The use of bird species diversity for tourism purposes is a sustainable conservation strategy. Birdwatching tourism or avitourism positively contributes to the conservation of bird diversity and its habitat (Shelar, 2016; Hakim, 2017; Kim *et al.,* 2020). In this case referring to the concept of ecotourism, namely the existences of biodiversity of flora and fauna (especially birds), local communities have a positive role and impact from tourism activities and there is a sustainable economic value. The economic value obtained is partly reused for the restoration of the object area.

The presence of birds including the abundance of each species, bird activity in the habitat or interaction of birds with vegetation and their conservation status on the tourist trail are interesting attractions for birdwatching toursm. Information about the species found, whether protected or not, rare or general, is important information in birdwatching tourism activities. So, in addition to tourists enjoying the beauty of the existence of birds and birds activity, they also get knowledge about the aspects of bird conservation.

Birdwatching tour guides should have good competence (knowledge, expertise, and behavior) about birds and habitat or vegetation in the area, so that they are able to interpret and explain overall about the existence of birds well. To help tour guides in observing fauna so that they can interpret properly, a handbook on the presence of birds in the Taro tourist area should be prepared. The presence of birds is also an excellent indicator of environmental quality, ecosystem stability and biodiversity. The abundance of bird populations and the richness of bird species can be utilized as a measure of sustainability of development activities and the utilization of natural resources (Tamalene, 2014; Hennry *et al.,* 2017). Birdwatching tours can also be in the form of photo-based activities for natural-based paintings and those that provide income for the photographer and guide. Birdwatching tours can be educational tours, where tourists get knowledge and insights about the role of birds in habitats. Thus, tourists are aware of the importance of conserving the diversity of fauna, flora and ecology. Birdwatching tourism or avitourism has recently become a travel trend, because it is a nature-based tourism sub-sector (Steven *et al.,* 2015, Birdlife International Middle East, 2015).

CONCLUSION

The diversity of bird species in the Taro tourist area is relatively high (diversity index 3.21). Found 37 species of birds included in 27 families. There are 24 species of birds included in the category of Least Concern (LC) and Vulnerable (Vu) IUCN Redlist, 3 species including protected species and 3 species are Indonesian endemic birds. Bird diversity, bird activity, bird conservation status are interesting aspects of birdwatching tourism or avitourism.

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