CORRIDOR MAPPING OF BIRD AROUND SACRED AREA BASED ON VEGETATION COVER IN WESTERN AREA OF MT. SEMERU USING GEOGRAPHIC INFORMATION SYSTEM (GIS)

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ABSTRACT

Danyangan is A proof traditional conservation created by local wisdom. Knowledge of bioculture provides a facts play a role in understanding the ecological processes that occur and providing an overview local efforts in protecting the environment. The village's. Danyangan has the form of a collection of large trees marked by the presence of sacred fig trees (Ficus sp.). Moreover, the fig tree become a habitat for several species of birds. The canopy's cover reserves water, insects, and fruits as food for birds and creates an interesting relation as a microhabitats.

The location of this study was carried out in the administrative district of Malang district in Tumpang, East Java in the area of the district located in Gubugklakah, Kunci, Drigu, Poncokusomo, Puthuk, Pandansari, Jajang, and Aran-aran. Bird observation is carried out using the point count or IPA method.

The study recorded 636 individuals consisting of 31 species, 21 families and 9 orders. The birds identified were dominated by Passeriformes as many as 11 families. Based on the results, shows all locations in the danyangan area dominated by detailed Swallow (Collocalia linchii). Instead, The value of bird species abundance in all study locations is included in the high category of values ranging >4.

Keyword: Danyangan, Sacred, Bird.

1. INTRODUCTION

Danyangan is proof traditional conservation created by local wisdom. Knowledge of bioculture provides a facts play a role in understanding the ecological processes that occur and providing an overview local efforts in protecting the environment.

Danyang or Pedanyangan is the name of the area considered sacred by the surrounding community. Pedanyangan is the residence of danyang-danyang (village protective spirits). The origin of the word danyang itself comes from the word hyang which means ancestor. Pedanyangan can also be interpreted as an ancestral residence to guard the village. The usual form of tramp from old temples or graves, hidden water sources, large banyan trees (Ficus sp.) Or typical natural landscape areas. In some places, pedanyangan is also called punden.

The village's Danyangan has the form of a collection of large trees such as mountain pine (Casuarina junghuhniana Miq.), and danglu or ki rain (Engelhardia spicata Blume.) Danyangan marked by the presence of sacred fig trees (Ficus sp.). Moreover, the fig tree become a habitat for several species of birds. The canopy's cover reserves water, insects, and fruits as food for birds and creates an interesting relation as amicrohabitats.

The bird community has many potential characteristics to serve as ecological indicators (O'Connell et al. 2000) because the composition of the bird community reflects interspecific dynamics and population trends (Cody 1981). Birds have different responses to landscape modification depending on adaptation in environments with limited resources (Liu and Taylor 2004). If the landscape changes or experiences interference, then the composition of the species that inhabit it will also change soon. The response of birds to the availability of resources varies and depends on the condition of the bird habitat (Adamik 2003). et al. Landscape characteristics influence bird species

distribution and habitat selection (Lee and Carroll 2014).

A spatial review is needed to see the extent and potential of danyangan on the western semeru slopes in an effort to conserve biodiversity, especially birds. As in this study, we investigated the composition, diversity and Geographic Information System of birds in the Danyangan area.

2. METHOD

1.1 Study Area

The location of this study was carried out in the administrative district of Malang district in Tumpang, East Java in the area of the district located in Gubugklakah, Kunci, Drigu, Poncokusomo, Puthuk, Pandansari, Jajang, Aran-aran, Malang regencies. The time of research starts in December 2017 - April 2018.

1.2 Material and Method

The materials used in the study are administrative maps of Malang district. Tally sheet to record the number and name of bird species. For bird watching, binoculars, diameter measuring devices (phi band), GPS (Global Position System), compass, digital cameras and stationery are needed.

Bird observation is carried out using the point count or IPA method. The Point Count or Point Index of Abundannee method is a method of observing birds by taking samples from the bird community to be counted in a certain time and location. Observations were made by standing at a certain point in the habitat studied and then recording encounters with birds within a certain time span (Helvoort, 1981). Observations were carried out in the morning at 06.00-09.00 WIB and in the afternoon at 14.30-17.30 WIB for each observation plot. The time of observation at each point is 20 minutes. Each observation plot will be repeated five times. Observations are made through direct and indirect meetings (votes). While the encounter with the type of bird outside the observation point is not taken into account.

The Geographic information systems are analyzed using the Arcgis and Google Earth programs with the previous GPS data. The data is processed to map the corridors of movement of birds that are around danyangan based on the landscape on the path between danyangan area.

1.3 Data Analysis

Shannon-Wienner (H ') Diversity Index

The species diversity index serves to compare several communities in selected urban forests as research plots [7]:

$$H' = -\sum_{i=1}^{3} Pi (\ln Pi)$$

H '= Shannon-Wiener Index

Pi = Relative abundance of the i species

 $Pi^2 = (Ni / Nt)^2$

Ni = Number of individual species i

Nt = Total for all individuals

S = Number of species

Criteria for H Index (diversity) are:

: the level of species diversity H '<1.5 is relatively low

: the level of species diversity H'= 1.5-3.5 is classified as moderate

: the level of species diversity H '> 3.5 is high

Evenness index (E)

The evenness index shows the evenness of each species in each observed urban community [7] :

$$E = \frac{H'}{\ln(S)}$$

= Evenness index species

E = Index of species diversity H'

= Number of species S

The Index E criteria (evenness) are:

: the level of species evenness is E < 0.3 relatively low

E = 0.3-0.6: the level of species evenness is classified as moderate

E > 0.3: the level of species evenness is high

Margallef species richness index (R)

$$R = \frac{S-1}{\ln N}$$

Where:

R = Margalef wealth index

S = Number of types

N = Total number of individuals

2. **RESULT AND DISCUSSION**

The study recorded 636 individuals consisting of 31 species, 21 families and 9 orders. The birds identified were dominated by Passeriformes as many as 11 families. In table 9, the lists of the ordos, families, and species of birds found in the study location.

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Table 1. List of Bird Types found in the area of Western Area of Mt. Semerus

Ordo	Famili Genus Latin name		Local name		
		Ictinaetus Ichtinaetus malayens		Elang hitam	
Accipitriformes	Accipitridae	Spilornis	Spilornis cheela	Elang Ular Bido	
Apodiformes	Apodidae	Collocalia	Collocalia linchi	Walet Linci	
Columbiformes	Columbidae	Streptopelia	Streptopelia chinensis	Tekukur biasa	
Coraciiformes	Alcedinidae	Todirhamphus	Todiramphus chloris	Cekakak sungai	
Coraciiformes	Meropidae	Merops	Merops leschenaulti	Kirik-kirik senja	
coraemornies	Halyconidae	Halycon	Halcyon cyanoventris	Cekakak Jawa	
Cuculiformes	Cuculidae	Gacomantis	Cacomathis merulinus	Wiwik kelabu	
Falconiformes	Falconidae	Falco	Falco peregrinus	Alap-alap kawah	
	Aegithinidae	Aegithina	Aegithina tiphia	Cipoh kacat	
	Campephagidae	Hemipus	Hemipus hirundinanceus	Jinjing batu	
		Pericrocotus cinnamomeus		Sepah kecil	
			Lalage sueurii	Kapasan sayap putih	
		Lalage –	Lalage nigra	Kapasan kemiri	
	Cisting 111	Cisticola	Cisticola juncidis	Cici padi	
	Cisticolidae	Prinia	Prinia inornata	Perenjak padi	
			Dicaeum thloroceum	Cabai Jawa	
	Dicaeidae	Dicaeum	Dicaeum sanguinolentum	Cabai gunung	
Passeriformes	Estrildidae	Lonchura	Lonchura leucogastroies	Bondol Jawa	
	Hirundinidae	Cecropsis	Hirundo strolata	Layang-layang loreng	
		Hirundo	Hirundo tahitica	Layang-layang pasifik / batu	
	Nectariniidae	Nectarinia	Cinnyris jungularis	Madu Sriganti	
	Pycnonotidae	Duonoputus -	Pycnonotus aurigaster	Kutilang	
		Fychonatus	Pycnonotus goivaier	Merbah Cerucukan	
	Sylviidae	Orthotomus -	Orthotomus sepium	Cinenen Jawa	
		Officiolitus	Orthotomus sutorius	Cinenen Pisang	
	Timaliidae	Malacocincla	Malacocincla separium	Pelanduk semak	
	Turdidae	Enicurus	Enicurus velatus	Meninting kecil	
	Zosteropidae	Zosterops	Zoosterops palpebrosus	Kacamata biasa	
Disiform	Disidas	Dandra	Dendrocopos analis	Caladi ulam	
richormes	Picidae	Denarocopus –	Picoides mollucensis	Caladi tilik	



Figure 1. Species and Families Summary of Birds found in the area of the Western Area of Mt. Semeru

Based on Figure 1, the locations that have the most number of species of birds are Drigu has 26 species of 13 families, Poncokusomo has 21 species of birds of 10 families, Puthuk has 21 species of birds of 11 families, and Gubugklakah has 20 species of birds. 13 families, Dayangan Kunci has 19 species of birds from 13 families, danyangan Wonosari has 17 species of birds from 12 families, danyangan Jajang has 16 species of birds from 11 families, and danyangan Aran-aran has 13 species of birds from 10 families.

Based on the results, The figure shows all locations in the danyangan area dominated by detailed Swallow (Collocalia linchii). Detailed swallow (Collocalia linchii) in the Gubugklakah region has the highest INP value of 50.63%, in the Key area has an INP value of 33.85%, at danyangan Drigu 48.24%, at danyangan Poncokosumo 38.59%, at danvangan Puthuk 26.79%, at Aran-aran 20.58%. The Swallow (Collocalia linchi) dominates in all research locations because this type has the ability to live in various habitats. Alikodra (2002) says that if a species performs a lot of movement, it means that the species can use more than one habitat type. Hernowo (1989) also said that there was a relationship between the spread of bird species and the level of dominance of bird species. Bird species that have a high spread and dominance will be able to survive environmental changes that occur and will be more often found in various environmental conditions.



Figure 2. INP Values Birds found in the area of western area of mt. semeru

The abundance of detailed swallow species is also related to the behavior and ability of birds to utilize habitat. When viewed from the availability of food sources, swift birds have an abundant source of food at the research site, namely in the form of insects. Open space above the canopy of trees and the movement of flying insects is a condition favored by the type of swallow for prey hunters by grabbing flying insects. According to Beeton (1999) swallows often fly over forest canopies and even fly under forest canopy to catch insects that are flying to eat. Detailed swallow is a species that lives in large groups, often with other sympathetic species with it, and visits fruitful banyan trees (Ficus sp) (Chantller and Driessens, 2010). This species flies even when it rains, where other birds choose to take shelter or avoid water. Rain conditions trigger flying insects from the leaves of Ficus sp and make the Detailed Swallow group more concentrated (Chantler and Driessens, 2010; Mackinnon et al, 2010).

Cucak Kutilang (Pycnototus aurigaster) is a species with the second highest INP in several research areas. In danyangan Gubugklakah has INP value of 36.86%, at danyangan Drigu 31.79%, at danyangan Poncokusomo 20.61%. at danvangan Wonosari 33.31. According Darmawan (2006), the high abundance of bird species was due to the habits of the birds - the birds are doing activities in groups, so it has a value of dominance is high, in addition to the number of individuals of bird species are the most numerous compared with other bird species, and the birds are able to utilize the habitat. This is related to food, daily activities and behavior capable of utilizing all types of land cover.

Index of Diversity, Evenness, and Richness of Bird Species

The level of species diversity in an area can be known by using the Shannon Wiener Index, where the greater the index value, the more diverse species of birds and the more number of individuals in the area. From the eight locations, the location that had the highest diversity index of bird species was Drigu swaying of 2.3, while the smallest diversity index of bird species was found in the wild species, which was 1.7 (Figure 3).

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Index	Gubug klakah	Kunci	Drigu	Sanggar Poncok usomo	Puthuk	Wono sari	Jajang	Aran- aran	
Diversity (H')	1.81	2.2	2.3	2.2	2.1	2.1	2	1.7	
Evenness(E)	0.52	0.65	0.66	0.64	0.61	0.61	0.59	0.50	
Species Abundance (R)	6.80	7.11	6.97	6.90	7.48	6.33	8.55	7.73	

Table 2. Diversity, Evenness and Richness Index of Bird Species

Diversity index (H ') obtained based on observations ranging from 1.7-2.3 for all habitat locations. While the species wealth index values range from 6.33-8.55 and the mapping index (E) is between 0.50-0.66 (table 2). Areas and areas in Drigu have the highest diversity index and evenness index among the eight research locations, with values of H '= 2.3 and E = 0.66. Whereas, the diversity index and evenness index are the lowest in the Aranaran area and that is with the diversity index value 1.7 and evenness index 0.50.

The diversity index of bird species found in the area located in Drigu is included in the medium category (2.3). This value shows that the ecosystem in the area is sufficient in providing support for bird life. The medium value for diversity index shows a balance in the area ecosystem and yang. This is in line with the statement of Kurni et. Al (2005) that diversity is related to the many types and number of individuals in each type as community compilers. Diversity also relates to the balance of species in the ary community when diversity is high, so the balance in the community is also high, and vice versa.

Diverse habitats can affect food sources for birds. This is supported by the statement of Kapisa (2011) that the value of species diversity can indicate the carrying capacity of a habitat for bird life. The higher diversity values indicate good habitat conditions in supporting bird life naturally. The value of bird species diversity is influenced by several factors, such as area size, habitat diversity and general environmental quality (Mulyani and Pakpahan, 1993). A community is composed by many species with relatively the same abundance, so that species diversity will be high (Van Helvort, 1981).

Evenness of bird species in a habitat can be characterized by no dominant types. If each type has the same number of individuals, then the evenness of species in that community has a maximum value, but if the number of individuals in each type differs considerably, it causes evenness of the species to have a minimum value (Santosa, 1995). The evenness value (E) of bird species in the area and area located in Drigu obtained was 0.66 including the high category (> 0.6). This shows that evenness in the region is balanced, with no striking species.

The value of bird species richness in all study locations is included in the high category of values ranging> 4 (Jorgensen et al, 2015). This shows the number of species found. The better the wealth value of bird species shows



Figure 3. Possibility Corridor Mapping of sacred area for bird diversity in western area of mt. Semeru

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the level of diversity of habitats in the danyangan area. High wealth values indicate a variety of habitats in a location. According to Dewi et al (2007), the more diverse the habitat structure diversity of plant species and vegetation structure, the greater the diversity of species that occupy an ecosystem.

3. CONCLUSION

- 1. The number of species of birds found was 31 species birds, 21 families, and 9 orders.
- The research location has the highest diversity of bird species is Danyangan Drigu (H '= 2.3) and the lowest is in the Danyangan Aran-aran location (H' = 1.7)

4. **REFERENCES**

- O'NEILL, A.R., BADOLA, H.K. P.P DHYANI, S.K. RANA. 2017. Integrating ethnobiological knowledge into biodiversity conservation in the Eastern Himalayas. Journal of Ethnobiology and Ethnomedicine. 13: 1-14.
- ALVES, R.R.N., R.C.L. LEITE, W.M.S.
 SOUTO, D.M.M. BEZEZZA, A.
 LOURES-RIBERION. 2013. Ethnoornithology and conservation in the semi-arid Caatinga of northeastern Brazil. *Journal of Ethnobiology and Ethnomedicine*.
 9: 1-12
- PURNOMO, P., OKTAVIANI, A. I., & NUGROHO, I. (2018). the Sacred Site: the Conservation Based on the Local People in Tengger Community and Its Potential As Ecotourism Activities. *Journal of Socioeconomics and Development*, 1(1), 7–15. https://doi.org/10.31328/jsed.v1i1.517
- NOBEL, P.S., M. CUI. 1992. Shrinkage of attached roots of opuntia ficus-indica in response to lowered water potentialspredicted consequences for water uptake or loss to soil. *Annals of Botany*. 70: 485-491.
- DARMAYANTI, A.S., A.P. FIQA. 2017. Canopy structure and its impact on hydrological performance of grown in the Purwodadi Botanic Garden. *Journal* of Tropical Life Science. 7: 40-47.
- SREEKAR R., N.T.P. LE, R.D. HARRISON. 2010. Vertebrate assemblage ata fruiting

fig (*Ficus caulocarpa*) in Maliau basin, Malaysia. *Tropical Conservation Science*. 3: 218-227

- ODUM, E.P. 1971. *Fundamental of Ecology*. W.B. Sounders Company, Philadelphia.
- ALIKODRA, H. S. 2002. *Pengelolaan Satwa Liar*. Cetakan pertama. Jilid I. Fakultas Kehutanan IPB: Bogor.
- HERNOWO, J.B. DAN PRASETYO, L.B. 1989. Konsepsi Ruang Terbuka Hijau di Kota sebagai Pendukung Pelestarian Burung. Media Konservasi II (4), Desember 1989: 61-71
- MACKINNON, J., K, PHILIPS AND B. B, VAN. 2010. Burung-burung di Sumatra, Jawa, Bali, dan Kalimantan. Bogor: Pustlitbang Biologi LIPI/Birdlife, Indonesia.
- DEWI, R.S., Y. MULYANI DAN Y. SANTOSA. 2007. Keanekaragaman Jenis Burung di Beberapa Tipe Habitat Taman Nasional Gunung ceremai. Yayasan Penerbit IPB, Bogor.
- VAN HELVOORT, B. 1981. Study of Bird Population in The Rural Ecosystem of West Java. Indonesia а Semi Quantitative Approach. Nature Conservation Dept. Agriculture University Wageningham.The Netherlands.
- DARMAWAN, M. P. 2006. Keanekaragaman Jenis Burung pada Beberapa Tipe Habitat di Hutan Lindung Gunung Lumut Kalimantan Timur. Skripsi. Institut Pertanian Bogor. Bogor. 130
- CHANTLER, PHIL., DRIESSENS, GERALD. 2010. Swifts: A Guide to the Switfs and Treeswifts of the World Second Edition. London: A&C Black Publisher
- KURNIA, I., FADLY, H., KUSDINAR, U., GUNAWAN, W. G., IDAMAN, D. W., DEWI, R. S., YANDHI, D., SARAGIH, G. S., RAMDHAN, G. F., DJUANDA, T. D., RISNAWATI, R., & FIRDAUS, M. 2005. Keanekaragaman Jenis Burung di Taman Nasional Betung
- MULYANI, Y. M., & PAKPAHAN, A.M. 1993. Studi Pendahuluan Tentang Keanekaragaman Burung di Kota Baru Bandar Kemayoran, Jakarta. *Media konservasi*. 4 (2), 59-63