

Research Article

Bird Species Diversity in Forest and Plantation Habitat Types in the Patok Picis RPTN area of Bromo Tengger Semeru National Park

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ABSTRACT

Diversity bird is indicator important in evaluate habitat quality and stability ecosystem forests, especially in the area conservation. Research this aim for analyze diversity type birds on two different habitat types, namely forest and plantation habitat types, in the Patok National Park Management Resort (RPTN) area Picis, Bromo Tengger National Park Semeru (TNBTS). Research done for identify influence difference condition structure vegetation and intensity activity man to composition community bird. Data collection using point count method on points specified observations in a way purposive sampling, with analysis covering index Shannon-Wiener diversity (H'), index evenness (E), and index dominance (D). Research results show that in the forest habitat type own diversity type and quantity more individuals tall compared to plantation habitat type, with a total of 40 species and 163 individuals, while in the plantation habitat type only 15 species and 73 individuals were found. The differences the influenced by the availability of higher vegetation strata complex in forest habitat, whereas condition plantation more homogeneous and potential increase dominance species certain. Problems identified ecological that is decline riches types in fragmented landscapes, particularly in edge zones and wetlands cultivation community. Research This recommend the need improvement effort habitat management in the area RPTN Patok support Picis through conservation mosaic vegetation, reduction pressure anthropogenic, as well as strengthening collaboration with society. Overall, research This confirm importance quality of habitat in maintain diversity of avifauna in the area conservation.

Keywords: Birds; Habitat; Forest; Biodiversity; Plantation

1. INTRODUCTION

Forest is one of the ecosystem important role in maintain diversity life, including community birds that have function ecological as pollinator, disperser seeds, and controller organism disturbance. Existence birds also often used as indicator biological For evaluate condition environment because it's sensitivity to change habitat structure and disturbance environment (Ariati et al. 2024). Approach based bioindicators this the more lots used in studies modern ecology because capable reflect condition ecosystem in a way comprehensive (Kim et al. 2024). Change use land and improvement activity man can cause decline quality of bird habitat in various ecosystem mainland (Handoyo et al. 2024). Conditions the Lots happened on the island Java which experienced pressure considerable development and habitat fragmentation tall so that influence composition community birds on a area (Basukriadi et al. 2023). Habitat fragmentation does not only impact on the decline amount species, but also change structure community through improvement domination more species tolerant to disturbance environment (Bhat et al. 2023). In addition that, change use land in scale wide known can influence distribution and patterns diversity bird in a way significant (Amirkhiz et al. 2025).

Patok National Park Management Resort Area (RPTN) Picis in Bromo Tengger National Park Semeru own variation habitat type in the form of forest natural and plantation potential people influence structure community birds. Forest habitat with complexity tall vegetation generally provide niche more ecological diverse so that capable support diversity type more birds tall compared to managed habitats with structure more vegetation homogeneous (Asran et al. 2021). Connection between habitat complexity and diversity birds is also reinforced by research showing that that structure diverse vegetation correlated positive with improvement riches species (Gumede et al. 2022). Structure complex vegetation can increase availability source feed, place nesting, as well as room activity for various type bird so that form more community diverse and stable (Hadinoto 2021). Stability community Birds are also affected by dynamics seasonality and variation condition environment that occurs in a habitat (Wang et al. 2024). In contrast, plantation habitats people generally experience pressure more anthropogenic intense as well as simplification structure vegetation, so that community the bird

that is formed tend dominated by species generalists who have ability adaptation tall to change environment (Arsyan et al. 2024).

Difference characteristics of the habitat show that variation condition environment play a role important in determine composition types, abundance, and structure community birds on a area (Yudha et al. 2022). Information about response community bird to habitat variation is very important in support management area conservation in a way sustainable research show that management vegetation that maintains habitat complexity is capable increase stability community bird as well as guard function ecologically in ecosystem. Based on matter said, research This aim For analyze diversity, composition, and abundance birds in forest and plantation habitats people at RPTN Patok Picis TNBTS, as well as compile recommendation supportive habitat management effort conservation bird.

2. RESEARCH METHOD

2.1. Research Design and Location

The study used design survey field for analyze diversity birds on two habitat type, namely forests and plantations in the Patok National Park Management Resort (RPTN) area Picis Bromo Tengger National Park Semeru (TNBTS). Approach comparative used For compare structure community birds in both habitats.

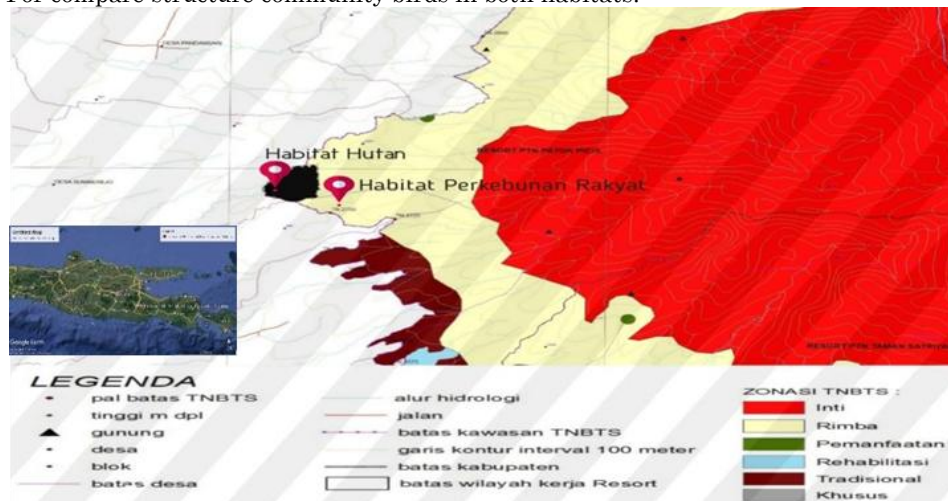


Figure 1. Research Location Map in TNBTS Zoning

2.2. Population and Data Collection Techniques

Population study covers all over type birds found in both habitat type. Data collection was carried out use point count method, which is common used in tropical avifauna studies (Sharma et al. 2021). Observation done in the morning and evening moment activity bird tall. In each habitat is determined a number of point observation with distance between minimum point 100 m for avoid calculation double. Every point observed for 10 minutes with an observation radius of 50 m. All type and quantity individual detected birds both visually and auditory noted. Identification type bird referring to the Birds of the Indonesian Archipelago guided.

2.3. Data Analysis Techniques

Population study covers all over type birds found in both habitat type. Data collection was carried out use point count method, which is common used in tropical avifauna studies (Li et al. 2023). Observation done in the morning and evening moment activity bird tall. In each habitat is determined a number of point observation with distance between minimum point 100 m for avoid calculation double. Every point observed for 10 minutes with an observation radius of 50 m. All type and quantity individual detected birds both visually and auditory noted. Identification type bird referring to the Birds of the Indonesian Archipelago guide. Data were analyzed to calculate the Shannon–Wiener diversity index (H'), evenness index (E), and Simpson dominance index (D). Differences in bird community structure between habitats were analyzed descriptively. H' , E , and D values were interpreted using general criteria for ecological diversity according to (Hosokawa et al. 2021). Diagrams of the number of individuals and the number of bird species were created as visual support for the analysis.

1). Shannon–Wiener Diversity Index (H') formula:

$$H' = -\sum P_i \ln P_i$$

Information :

H' = Species diversity index

P_i = the proportion of abundance of the i -th species of animal \ln = natural logarithm

Diversity Criteria:

$H' > 3.0$ = High diversity H' between 2-3 = Medium diversity $H' < 2$ = Low diversity

2). Equivalence Formula (E):

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

Information:

E = evenness index (value between 0 – 1)

H' = bird species diversity \ln = natural logarithm

S = number of types

Criteria: (Pielou 1977)

E = 0.00 - 0.25 = uneven

E = 0.26 - 0.50 = less even

E = 0.51 - 0.75 = fairly even

E = 0.76 - 0.95 = almost even

E = 0.96 - 1 = even

3). Simpson's Dominance Index Formula (D):

$$D = \sum \left(\frac{n_i}{N} \right)^2$$

Information:

D = Simpson Dominance Index

n_i = Number of individuals of each bird species

N = Number of individuals of all bird species

Dominance Criteria:

$0 < D < 0.5$ = no species dominates

$0.5 < D < 1$ = there is a dominant type

The dominance index value ranges from 0 to 1. If the dominance index approaches 0, it means that almost no individuals dominate. If the dominance index approaches 1, it means that one species dominates (Odum 1993).

4). Hutchinson t-test

Differences in Shannon–Wiener diversity index (H') values between forest habitats and smallholder plantations were analyzed using the Hutchinson t-test. This test is used to compare diversity index values in two different communities by considering the variance of each index. The test was conducted at a 95% confidence level ($\alpha = 0.05$) with the calculation procedure following (Li et al. 2023).

3. RESULTS AND DISCUSSION**3.1 Research Location Conditions and Habitat Characteristics****3.1.1 Research Location Conditions**

Study carried out in the Patok National Park Management Resort (RPTN) area Picis, Bromo Tengger National Park Semeru which has characteristics landscape mountains with cover vegetation forests and land cultivation community. This area own topography hilly with condition relative environment cool and humid. Forest habitat at the site study own structure vegetation layered with relative canopy meeting as well as existence vegetation enough bottom dominant. Complexity structure vegetation the play a role important in provide niche ecological for various species bird (Wulandari et al. 2022). Vegetation forests also provide source feed experience like insects, fruit, and nectar that support existence various bird guilds (Annisa et al. 2023). On the other hand, plantation habitat people own structure more vegetation open with stratification limited vertical activity. man like management plants and mobility society is also sufficient tall so that can increase level disturbance on bird habitats (Junaedi et al. 2023). Habitat conditions that experience change structure vegetation tend influence composition community the birds in it (Wahyuni et al. 2021).

3.1.2 Forest Habitat

Forest habitat in RPTN Patok Picis own structure vegetation layered with canopy meeting and presence enough bushes dominant. Penetration light relatively low so that create condition cool and moist microhabitat. Vegetation forest dominated by trees mountains tropical which provides source feed experience in the form of insects, fruit, and nectar. Complex habitat conditions like this generally support existence community more birds diverse because provide niche more ecological lots (Nasihin et al. 2023).

3.1.3 People's Plantation Habitat

Plantation habitat people is land cultivation owned by public with structure more vegetation open and stratified vertical

limited. Vegetation dominated by plants managed fruits and shrubs in a way periodic. Intensity light and temperature relatively more-tall compared to forest habitats. Activities man like management plants and mobility public Enough intense so that level disturbance to animals relatively more tall (Sonia et al. 2023).

3.2 Composition Type Birds on Two Habitat Type

3.2.1 Composition Types of Forest Habitat

Research result recorded 40 types birds in forest habitat in the Patok RPTN area Picis. Community bird dominated by insectivores, frugivores, and nectarivores like Luntur Putri, Ciung Air Jawa, and Cica Sun. Dominance group the show that structure vegetation complex forest provide availability food and niche ecologically stable for bird forest mountains (Fajri 2022). Habitat with stratification layered vegetation is also known capable increase riches type bird Because provide various source feed and place take shelter (Dzikri et al. 2025).

Table 1. List of Types Birds in Forest Habitat

No	Name Type	Name Scientific	Amount	Status Conservation
1	Fade Daughter	Harpactes duvaucelii	5	Protected
2	Speeding Blue Old	Cinclidium Diana	4	Protected
3	Ciung Air Jawa	Macronus flavicolis	3	Protected
4	Cabai Gunung	Dicaeum sanguinoletum	5	Protected
5	Cica Matahari	Crotophaga albonotatus	6	Protected
6	Sikatan Belang	Ficedula westermanni	3	Protected
7	Turtle Dove	Spilopelia chinensis	4	No protected
8	Serindit Java	Loriculus pusillus	4	Protected
9	Parrot Head Beak Big	Tanygnathus megalorhynchus	5	Protected
10	It is a sin. Malay	Loriculus little one	6	Protected
11	Cica Down Kiss	Chlorophytum they wereringing	3	Protected
12	Madu Mountain	Arthropya exceptional	5	Protected
13	Kutilang	Pycnonotus arugastes	5	Not protected
14	Stone Kite	Hirundo thaitica	4	Not protected
15	Sepah Mt.	Pericrocotus flames	4	Not protected
16	Sepah Forest	Pericrocotus Miniatus	4	Protected
17	Cabal Javanese	Dicaeidae trochileum	4	Protected
18	Cinena Javanese	We stand up. spy	4	No protected
19	Drink Javanese	Centerpiece black and red	6	Protected
20	Sikatan Belang	Small tree Westerners	3	Protected
21	Chuckle Java	Hedyme cyanocentris	5	Protected
22	Serindit Java	Loriculus pusillus	3	Protected
23	Kekeb Pig	Artamus leucorhynchus	3	Protected
24	Falcon Dragonfly	Microhierax fringillarius	3	Protected
25	Sriginting Kelabu	Dicrurus leucophaeus	4	Protected
26	Wallet Lynx	Collocalism lynx	4	No protected
27	Walik Head Ungu	Ptilinopus porphyreus	3	Protected
28	Takur Tohtor	Megalaima armillaris	3	Protected
29	Mouse Deer Bush	Malaconcinia lonely	3	Protected
30	Lathe Alang- Alang	Centropus bengalensis	6	No protected
31	Uncal Court	Macropygia ruticeps	3	Protected
32	Keladi Tilik	Dendrocopos molucensis	3	Protected
33	Dederuk Jawa	Streptopelia bitoroquata	5	Protected
34	Bondol Beijing	Lonchura punctulate	5	Protected
35	Decu Belang	Saxicola caprate	5	Protected
36	Cekakak China	Halcyon pilot	3	Protected
37	Cabbage Bunga Api	Dicaeum trigonostigma	3	Protected
38	Sikatan Bodo	Ficedula hyperythra	4	Protected
39	were scared Transport	Megalaima hemocephalus	4	Protected
40	lathe LARGE	Cuculidae Chinese	4	Protected



Sikatan Belang



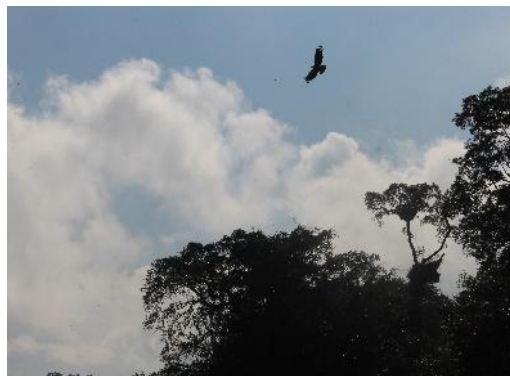
Cekakak Jawa

3.2.2. Composition Types of People's Plantation Habitat

In plantation habitat people recorded 15 types birds, a large number more-low compared to forest habitat. Composition type dominated by species generalist and opportunistic like Cucak Java sparrow, Merbak Corok-corok, and Merbak Cerucuk. Structure more vegetation homogeneous as well as intensity activity tall man cause limitations niche ecological so that bird specialist forest seldom found (Fadila et al. 2023). Semi- natural habitat conditions generally more Lots inhabited by species birds that have ability adaptation tall to change environment (Diandra 2023).

Table 2. List of Types Birds in Plantation Habitats

No	Name Type	Name Scientific	Amount	Status Conservation
1	Merbak Corok–Corok	<i>Pycnonotus simplex</i>	5	No protected
2	Sweep Jungle Chest Chocolate	<i>Cyornis aviaceus</i>	6	No protected
3	Cucak finch	<i>Pycnonotidae aurisgaster</i>	8	No protected
4	Anis Forest	<i>Zoothera andromedae</i>	10	Protected
5	Cat Buffalo	<i>Motacillia eschutschesnsis</i>	4	Protected
6	Sweep Ninon	<i>Eumyias indigo</i>	3	Protected
7	Merbak Cerucuk	<i>Pycnonotus goiavier</i>	5	Protected
8	Sikata Side Dark	<i>Muscicapa Siberian</i>	3	Protected
9	Hawk Black	<i>Ictinetus malaensis</i>	4	Protected
10	Hawk Java	<i>Nisaetus bartelsi</i>	3	Protected
11	Paok Five colors	<i>Hydrornis guajana</i>	6	Protected
12	Chuckle River	<i>Todiramphus chloris</i>	4	Protected
13	Serindit Java	<i>Loriculus pusillus</i>	3	Protected
14	Chilli Mountain	<i>Dicaeum sanguinopathy</i>	5	Protected
15	Cica Sun	<i>Crociias albonotatus</i>	4	Protected



Elang hitam



Cekakak Sungai

3.3 Abundance Individual Birds in Forest and Plantation Habitat Types

3.3.1. Total Abundance Individual

Amount individual recorded birds show clear differences between both habitats. Forest habitat recorded 163 individuals while the plantation habitat people only 73 individuals. In forest habitats, abundance relatively tall shown by Cica Sun,

Lathe Javanese and Serindit Malay that reflects stability source food and habitat structures that support it. Forest habitat with vegetation layered tend own abundance more individuals tall Because capable provide source feed and place more shelter diverse (Yusan et al. 2025). In contrast to plantation habitats people, abundance individual dominated by several species adaptive such as the Forest Anis, Cucak Java Sparrow, and Brown-breasted Jungle Flycatcher. Dominance this show that only species certain capable adapt to better habitat conditions open and disturbed (Dama et al. 2025).

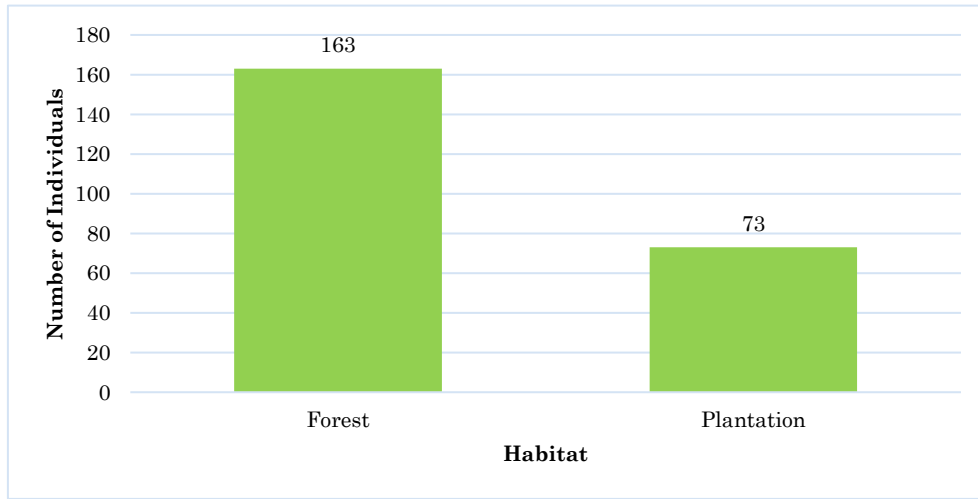


Figure 2. Map of Forest and Plantation Habitat Observation Areas

3.3.2. Interpretation Ecological Abundance

Difference abundance individual related close with condition ecological habitat. Forest habitat with complexity vegetation tall provide food, protection, and location more nesting stable for various bird guilds (Maulahila et al. 2023). On the other hand, the structure vegetation more plantations open as well as height disturbance man limit existence bird so that only species adaptive capable endure (Ambarwati 2025).

3.4 Index Diversity (H'), Evenness (E), and Dominance (D)

3.4.1. Indexing Diversity and Equality Type Bird (H' dam E)

Shannon–Wiener index (H') and index equality Pielou (E) is used For describe structure community birds on both habitat type. The H' value reflects riches types and proportions abundance, while E indicates level equality individual interspecies.

Table 3. Diversity (H') and Evenness (E) Values of Birds in Forest and Plantation Habitat Types

No	Habitat	H'	E
1	Forest	3,651	0.71
2	Plantation	2,228	0.51

Index value Shannon-Wiener diversity in forest habitats (3,651) including category high, while on plantations people (2,228) are classified as moderate. Difference This show that the forest habitat with structure more vegetation complex provide niche ecological and resource more feed diverse so that support diversity more birds tall (Fathani et al. 2025). This result in line with research that states that complexity structure forest own connection positive with riches species bird Because provide more niche variations wide (Weeks et al. 2025). Simplification structure vegetation on land cultivation can reduce existence a number of species bird certain (Muhamad Atho' et al. 2022). Another study shows that intensification agriculture and habitat change significant lower diversity birds, especially in species sensitive specialist to disturbance environment (Fontúrbel et al. 2022). Evenness value of forest habitat (0.71) is also higher tall compared to plantation people (0.51) which shows distribution individual between species more evenly distributed in forest habitats (Arsyan et al. 2024). Conditions This indicates that habitat with level disturbance low tend own structure more community stable and even compared to habitats that experience pressure anthropogenic tall (Martínez et al. 2023).

3.4.2 Index Dominance Type Bird (D')

Index dominance Simpson (D') used for evaluate level mastery One or a number of species to community bird on something habitat. Grade D Which approach zero show dominance low and reflect community Which more stable, whereas increasing value big show trend dominance by species certain.

Table 4. Index Simpson's Dominance of Birds on Two Habitat Type

Habitat	Amount Type	Amount Individual	Index Dominance (D)	Category Dominance
Forest	40	163	0.0486	Dominance low
People's plantations	15	73	0.13	Dominance low

Index value Simpson's dominance in forest habitats of 0.0486, while in plantation habitats people of 0.13. Second mark the show level relative dominance low, but greater value high in plantation habitats indicates existence trend domination by a number of species certain conditions This reflect that the habitat is experiencing simplification structure tend dominated by species adaptive which has tolerance tall to change environment (Fitriana 2025). Findings This in line with study ecology community that shows that habitat disturbance and change use land contribute to increasing dominance species generalist, who ultimately pressing existence species specialist in something community (Leveau 2021). More further, simple habitat structure as well as height intensity activity humans on land plantation people play a role in limit heterogeneity niche available ecologically, so that only species with ability adaptation capable height survive and dominate community (Ayine et al. 2025). Phenomenon this is also related with the homogenization process biotic, where the community birds in fragmented habitats or degraded tend show uniform composition consequence domination species certain (Holm et al. 2022). With Thus, the difference mark dominance between both habitats are not only reflect variation amount individual, but also shows existence difference level stability community and habitat quality in general ecological.

3.4.3 Hutchinson Test (Difference Diversity Inter- Habitat)

Hutchinson test is used for know whether mark index diversity (H') in two habitat type has significant difference in a way statistics. Testing done with compare H' value and its variance from each habitat so can show whether difference diversity obtained truly different or only happen consequence variation sample.

Table 6. Comparison Diversity Type on Two Habitat Based on Test Hutchinson

No	Habitat	H'	Var H'	T.count	Df	T.table
1	Forest	3,651	0.07	T= 4,3121	1,457	2,00575
2	Plantation	2,228	0.04			

Information: Index Diversity (H'), Variants (Var H'), Degrees Freedom (Df)

Based on results analysis, t - value by 4.3121 more big compared to t-table value at the level significance of 0.05 is 2.005, so show that diversity birds in forest and plantation habitats people own significant difference in a way statistics. Differences This show that habitat conditions have influence important to structure community birds, especially through complexity vegetation, availability source feed, as well as condition supportive environment life various species bird (Annisa et al. 2023). Besides that, variation structure vegetation and habitat characteristics are also known can influence composition and distribution species bird in something ecosystem (Doctorina et al. 2024), Findings This in line with research that shows that structure landscape and habitat heterogeneity play a role important in form community bird (Ding et al. 2022). Difference the reflect influence condition ecological habitat to structure community birds. Forest habitat generally own structure more vegetation complex and stable, so provide various niche ecological for bird For do activity like nesting, sheltering, and searching eating. Complexity tall vegetation known capable increase amount species bird Because provide source feed as well as place a better life diverse (Rizky et al. 2025). This is reinforced by research which states that the quality and complexity of the habitat is factor main in determine diversity birds in ecosystems that are experiencing pressure environment (Shaw et al. 2024). In contrast, plantation habitats people tend own more vegetation open and homogeneous, and intensity activity more human high. Condition the causing this habitat more Lots inhabited by species that have ability adaptation tall to change environment and disturbances anthropogenic.

4. CONCLUSION

Study This show that community birds in the Patok RPTN area Picis different significant between forest and plantation habitats people. Forest habitat own diversity more height ($H' = 3.651$) and evenness more stable ($E = 0.71$) compared plantation people ($H' = 2.228$; $E = 0.51$), which was confirmed through the Hutchinson Test (t- count 4.3121 > t- table 2.005). Index dominance in both habitats is low so that no there is species that are ecological dominate. Difference community This especially influenced by variations structure vegetation, availability feed, condition microhabitats, as well as level disturbance anthropogenic. In overall, results study confirms importance guard cover forests and improve buffer habitat quality for support sustainability community birds in the Patok RPTN area Picis.

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