Richness, Diversity And Evenness Of Birds In Small Island

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Abstract. Birds play an important role as bioindicators of climate change. For this reason, it is important to know the species richness, diversity and evenness of birds found on small islands. The location of the study was in Haruku Island Maluku. Bird data collected included all bird species, taking into account certain bird species that are sensitive to environmental changes. Bird data collected by the Line Transect method is to use work lines on rectangular data plots in the specified location. This method was chosen because it can trace the plot area of data in a short time and allow repetition of data collection in one day according to the desired time. This method of analysis is to determine the level of diversity in the form of diversity indices, then to scale up the species abundance and then to calculate the estimated population density. The results of the study found 23 species of birds. There were 2 large families recorded, namely: Family Columbidae of 4 types, and Family Psittacidae as many as 5 types, while the other Family groups only had 2 or 1 types. The overall value of the bird species wealth index in 5 data transects is MEDIUM with the value of the Type Wealth Index 3.975863. Then the five Diversity Index of data transects is Medium with the Diversity Index value 2.710911452. Furthermore, the evenness index on five data transects has a fairly good value, which is included in the High Equity Index category with the Evenness Index value of 0.864588 which approaches the number one. From the analysis simulation results, it was found that the temperature aspect, in this case the temperature range at the study location when the data collection did not affect the number of bird species at all, while the estimated altitude aspect has the potential to influence the bird species encounter rate. This condition is quite reasonable because if we look at the data on the number of bird species collected on different transects of data placed in different segment elevations, there seems to be a tendency to increase altitude, so the number of species recorded tends to decrease.

1. Introduction

Birds are the most easily encountered species, from the desert to the coast, from the heat of the equator to the coldness of the north pole. Birds are also easily found in rural areas, mountains to urban densities. Birds are important biological agents that control various pests, such as mice and caterpillars. In addition, they are a source of food, pollination of plants and means of communication and others. That’s why birds play an important role in the ecological cycle, especially the food chain. However, this role is reduced by the increasingly damaged earth as a result of the conversion of forested land to other areas of use, various other human activities (anthropogenic) and the development of industries that are not environmentally friendly.
The damage has triggered global warming which causes climate change in the world [1]. Birds are very sensitive if changes occur in their environment. This is because birds have certain links to fairly specific habitats or to certain food sources. Many types of fruit trees or insects that are their source of food are also influenced by climate [2]. Changes in bird food supply will affect birdlife. In general, in subtropical climates it will be very easy to observe this change due to the apparent temperature difference between seasons [3].

This can be observed from the response of bird distribution which avoids areas where the temperature is getting hotter. This will also trigger changes in the structure of the bird community. Small island ecosystems such as those in Maluku tend to have high endemic species compared to the proportion of island size. Small islands have a high risk of environmental change [1]. This change can occur due to pollution and or damage due to sea transportation activities, fishing activities, due to natural disasters such as earthquakes, waves, tsunamis, mining.

In other words, the carrying capacity is limited based on indicators of freshwater availability and production from food crops. Usually, small island marine biodiversity is usually abundant[4]. Considering that small islands are very vulnerable to climate change, the types of birds that exist on small islands such as Haruku Island have been carried out, especially in terms of the richness, diversity and evenness of their species [5].

2. Experimental

2.1 Materials

The research was carried out in Haruku Island, precisely in the hilly region called Boangbesi, the position of the research location is presented in Fig. 1.

**Figure 1.** Location of bird species diversity research at Haruku Island
2.2. Research Procedure

The number of types, number of contacts, and number of individual types obtained in the data collection are key variables in the analysis. This is an initial activity before moving on to the next form of analysis. In this regard, the same and consistent units are needed in mentioning these amounts. The size of these numbers needs to be made in a category based on the range of numbers (range) that is felt to be appropriate and can explain the nature of the encounters of bird species in the study site well. This category will facilitate the comparison between species of birds found in one data transect, as well as between data transects at the research location. Even in the need for further study among research locations this category can also still be used. These categories are as follows number of species, number of contacts and number of individuals 1-4: The least, number of species, number of contacts and number of individuals 5-10: Little (relatively little), number of contact types, number and number of individuals 11 – 20: Enough (Enough means), number of contact types, number and number of individuals 21 – 50: Pretty much, number of contact types, number and number of individuals 51 – 100: Many, number of contact types, number and number of individuals > 101 is Very much.
2.3. Data Processing
The next form of analysis method is used to determine the level of diversity in the form of bird diversity indices. Diversity Index is intended to see the relative abundance of bird species with their communities.

**Richness Index (R1).** Richness Index is the total number of species in a community, the amount depends on the sample size of the area and the time required to achieve it. The sample size and time referred to are already explained in the data collection method above. Richness index (R1), using the Margalef equation [3].

\[ R = \frac{(S-1)}{\ln N} \]  

Where \( R \) is index of species richness Margalef, \( S \) is number of species observed, \( N \) is number of individual (all types observed), \( \ln = \) natural logarithm value. Classification of Margalef richness index values using criteria as presented in Table 1.

| Index Value | Category             |
|-------------|----------------------|
| \( R < 2.5 \) | Low species richness |
| \( 2.5 > R < 4 \) | Medium species richness |
| \( R > 4 \) | High species richness |

**Diversity Index \( (H') \).** Diversity Index is intended to determine the distribution of individuals between types found, assuming; \( H' = 0 \) if there is only one type in the sample data collected, and \( H' = \text{Maximum} \) if there are as many types as possible. Diversity Index \( (H') \), using the Shanon-Wiener equation [3].

\[ H' = -\sum_{i=1}^{n} p_i \ln p_i \]  

Where \( H' \) = diversity index, \( p_i = n_i/N \), \( n_i = \) number of individual types \( i \), \( N = \) total number of individuals of all types. Classification of diversity index values using the criteria in Table 2.

| Index Value | Category          |
|-------------|-------------------|
| \( H < 1 \) | Low diversity     |
| \( 1 > H' < 3 \) | Medium diversity |
| \( H' > 3 \) | High diversity    |

**Evenness Index**
Evenness Index or Equity Index is intended to find out how the data on the number of individuals of one type (abundance of species) is spread out among the many species found (abundance of all types). This is to find out how the number of individuals of one type is scattered in a data sample (community). If all types in a data sample have an individual number that goes to the same number or has the same number of numbers; it shows that the evenness index is equal or not difference. If all types really reach the same number (one number); means that evenness is perfect, and will go to
zero (0) as an abundance of uneven or unequal species. Evenness Index Analysis (E) uses the Magurran equation. [2]

\[ E = \frac{H'}{H_{\text{max}}} \]  

(3)

Where E is evenness index, H’ is value of evennes index, H_{\text{max}} is ln S, S is number of species. The evenness index value classification uses the criteria in Table 3.

| Index Value         | Category                                                                 |
|---------------------|---------------------------------------------------------------------------|
| E approaches 0      | The distribution of individuals between species is uneven / unequal        |
|                     | Unstable species abundance distribution conditions                        |
| E approaches 1      | Distribution of individuals between types is evenly distributed            |
|                     | Stable species abundance distribution conditions                           |

3. Results and Discussion

3.1. Number of bird species

There are 23 species of birds in the hamlet of Oma, which are included in 12 families. Noted there are 2 families whose number of species of birds are often found namely; Family Columbidae four types, and Family Psittacidae 5 types, while the other Family groups only have one or two type. The types of birds are presented in Table 4.

The types of birds in Table 4 are found with different numbers of contacts and individuals. There are 4 species found with the number of contacts and the number of individuals more than other bird species, namely; Pergam mata putih with the number of contacts 20 and the number of individuals 42, then Walet sapi with the number of contacts 15 and the number of individuals 33, Perling Maluku with the number of contacts 4 and the number of individuals 28, and Cabai kelabu with the number of contacts 19 and the number of individuals 25. Noted there are 6 types found with a significant amount with the number of individuals between 11-15 tails namely; Bird of madu Sriganti, Perlingungu, Walik dada lembayung, Betet kelapa paruh besar and Nuri Maluku. While other species were found with a smaller number of contacts and the number of individuals, there were 3 species of birds recorded with number of contacts 1 and number of individuals 1 namely; Elang bondol, Raja Ulang sungai and Kehicap pulau. The birds species encounter data in 5 data transects is presented in Fig-3. It shows that there are variations in the number of species species encounters in each transect, where; on Transect 1: 15 types, Transect 2: 11 types, Transect 3: 9 types, Transect 4: 11 types and Transect 5: 13 types.

| No | Family       | Family    | No sp | Local names          | Scientific names        | Number of contact | Number of individual |
|----|--------------|-----------|-------|----------------------|-------------------------|-------------------|---------------------|
| 1  | ACCIPITRIDAE | Elang bondol | 1     | Haliasturindus       |                         | 1                 | 1                   |
| 2  | COLUMBIDAE   | Uncalambon | 2     | Macropygia amboinensis |                        | 1                 | 2                   |
| 3  |              | Pergam mata-putih | 20 | Duculapers picillata |                         |                   |                     |
| 4  |              | Walik raja    |       | Ptilinepus superbus  |                         | 2                 | 6                   |
When separated between the results of data collection in the morning and afternoon for each transect there will be variations in the number of different types of encounters, as presented in Fig.4.
Figure 4. Number of bird species found in each data transect between morning and evening collections

The number of contacts and the number of types of individuals found in each data transect in the morning and evening is presented in Fig 5. The number of contacts and the number of individuals in the morning as a whole transect was higher than the number of contacts and the number of individuals in the evening. The number of contacts in the morning 68 times and the number of contacts in the evening 61 times, while the number of individuals in the morning 147 individuals and the number of individuals in the evening 105 individuals.

Figure 5 Number of contacts and number of individual bird species in each data transect for morning and evening data collection

The number of individual bird species is an important aspect in this research study because it can provide information on the condition of the presence of bird species in the study location clearly and close to the actual situation. For this reason, the number of individual bird species in each data transect is presented in Table 2 to give a more detailed picture of birds in the field as per the data in Table 5, the Total Number of Individuals per Transect shows that; Transect 1 has the most total number of individuals: 75, then followed by Transect 2 and Transect 4 with the same total number.
of individuals, then Transect 5 with 42, and Transect 3 with the least total number of individuals is 36.

Table 5. Number of individual bird species found for each data transect

| No | Species                              | Number of Individual |
|----|--------------------------------------|----------------------|
|    | Local names– Scientific names        | Tr. 1    | Tr. 2 | Tr. 3 | Tr. 4 | Tr. 5 |
| 1  | Elang bondol (Haliasturindus)        |          | 1     |       |       |       |
| 2  | Uncal Ambon (Macropygia amboinensis) |          | 2     |       |       |       |
| 3  | Pergam mata putih (Duculoperspicillata) | 9  | 6     | 8     | 10    | 9     |
| 4  | Walik raja (Ptilinopus superbus)     |          | 2     |       |       | 4     |
| 5  | Walik dara lembayung (Ptilinopus viridis) | 1 | 4     | 3     | 4     |       |
|    | Betet – kelapa paruh- besar (Tanygnathus megalorynchus) |         | 7     |       |       | 4     |
| 7  | Nuri Maluku (Eos bornea)             |          | 8     | 3     |       |       |
| 8  | Nuri pipi-merah (Geoffroyus geoffroyi) | 1 | 5     |       | 1     |       |
| 9  | Perkici pelangi (Trichoglossus haematodus) | 4 |       |       |       |       |
| 10 | Perkici dagu merah (Charmosynaplacentis) | 2 |       |       | 2     |       |
| 11 | Walet Sapi (Collalacia scalenta)     |          | 2     | 9     | 15    | 7     |
| 12 | Walet Maluku (Collalalia infuscate)  |          |       | 4     | 4     |       |
| 13 | Raja – udang sungai (Halcyon chloris) |       |       | 1     |       |       |
| 14 | Kutilang emas (Ixosaffinis)          |          |       | 2     | 2     |       |
| 15 | Srigunting lencana (Dicrurus bracteatus) | 6 |       |       |       |       |
| 16 | Cikrak pulau (Phylloscopus poliocephalus) |       | 2     |       |       |       |
| 17 | Sikatan kelabu (Mygra galeata)       |          | 1     | 1     | 1     |       |
| 18 | Kehicap pulau (Monarchacinerascens)  |          |       |       |       | 1     |
| 19 | Perling Maluku (Aplonismyosolensis)  | 15      | 4     | 5     | 4     |       |
| 20 | Perling ungu (Aplonismetalica)       |          | 12    |       |       |       |
| 21 | Madu hitam (Nectarinia Aspasia)      |          | 2     | 6     | 3     | 3     |
| 22 | Madu sriganti (Nectarinia jugularis)  |          | 5     | 2     | 3     | 1     |
| 23 | Cabai kelabu (Dicaeum vulneratum)    |          | 6     | 8     | 3     | 4     | 4     |
|    | Total of Individual/transect         |          | 75    | 50    | 36    | 50    | 42    |
|    | Number of species                    |          | 15    | 11    | 9     | 11    | 13    |

Observation nature of birds

The nature of the observation is interesting to note because it is an indication of how easy or difficult it is to collect bird data at the study site. The data in Table 6 shows the nature of bird species observations in the field [6]
Table 6. Nature of bird species observations in Haruku Island

| Species                        | See | Listen | Fly | Roost |
|-------------------------------|-----|--------|-----|-------|
| Haliasturindus sp             | 1   | 1      |     |       |
| Macropyga aamboinensis        |     | 1      |     | 1     |
| Duculapers picillata         | 3   | 17     | 1   | 19    |
| Ptilinopus superbus sp        | 1   | 1      |     | 2     |
| Ptilinopus viridis sp         | 2   | 5      | 3   | 4     |
| Tanygnathus megalorynchos sp | 4   | 2      | 3   | 3     |
| Eos bornea                    |     | 1      | 2   | 4     |
| Geoffroyus geoffroyi          | 1   | 5      | 2   | 1     |
| Trichoglossus haematodas      | 1   | 1      |     |       |
| Charmosynaplacentis           | 1   | 1      | 2   |       |
| Collacaliaesculenta           | 15  | 15     |     |       |
| Collacalia infuscate          | 3   | 3      |     |       |
| Halcyon chloris               |     | 1      | 1   |       |
| Ixosaffinis                   | 4   | 4      |     |       |
| Dicrurus bracteatus           | 2   | 2      |     |       |
| Phylloscopus poliocephalus    | 1   | 1      | 1   | 1     |
| Myagragaleata                 | 3   | 1      | 2   |       |
| Monarchacinerascens           | 1   | 1      |     |       |
| Aplonis mysolensis            | 2   | 2      | 3   | 1     |
| Aplonis metalica              | 1   | 2      | 3   |       |
| Nectarinia Aspasia            | 6   | 8      | 4   | 10    |
| Nectariniai jugularis          | 2   | 7      | 3   | 6     |
| Dicaeum vulneratum            | 8   | 11     | 8   | 11    |

**Number of observation**

|                   |     |     |     |
|-------------------|-----|-----|-----|
| Total Observation | 129 | 129 |     |
Table 7. Indices of bird species diversity in each data transect at Haruku Island

| Transect | Number of species (S) | Total Individual (N) | Richness Index (R1) | Diversity Index (H') | Evenness Index (E) |
|----------|----------------------|---------------------|-------------------|--------------------|------------------|
| Transect 1 | 15                  | 75                  | 3.242626          | 2.387938          | 0.553085          |
| Transect 2 | 11                  | 50                  | 2.556222          | 2.289566          | 0.585264          |
| Transect 3 | 9                   | 36                  | 2.232443          | 1.982378          | 0.553193          |
| Transect 4 | 11                  | 50                  | 2.556222          | 2.074108          | 0.530188          |
| Transect 5 | 13                  | 42                  | 3.210557          | 2.315384          | 0.619473          |

Margalef Richness Index
The Margalef Richness Index Value (R1), shows that the data transects in the field have a medium and low Bird Richness Index, there are 4 transects in the MEDIUM category, namely Transects 1, 2, 4 and 5, with the Richness Index value being at number 2.556222 to 3.242626 (2.5 < R1 < 4). Then 1 transect is in the LOW category, namely Transect 3 with a Richness Index value of 2.232443 (R1 < 2.5). This condition is caused by the small number of bird species found in 5 data transects in the field; ranging from 9 types to 15 species, and the total number of species recorded as many as 23 species. While the area covered for data collection in the field is also small, only 5 ha.

Shanon Winer Diversity Index
The Shanon-Winer Diversity Index Value (H') shows that all 5 data transects in the field have a medium species diversity index value, with the Diversity Index value ranging from 1.982378 to 2.387938 (1 < H' < 3). This condition is caused because the number of bird species found in 5 data transects in the field is indeed not much; ranging from 9 species to 15 species, while the total number of individuals recorded in 5 data transects is also not very large, between 36 to 75 individuals.

Evenness Index
Evenness Index Value (E) shows that all 5 data transects at the study site had an Evenness Index, with an evenness index value of 0.530188 to 0.619473.(evenness conditions that are between the numbers 0 and 1). Transect 4 has the lowest medium index of 0.530188 because there is one species, namely Swallow cattle, which is recorded with a rather large number of individuals, 15 more than other bird species.

Overall Transect Data Diversity Index
When all the data collected in the 5 transects are combined, the resulting Diversity Index value indicates that overall the location studied has a medium and high Diversity Index value as presented in Table 8.
Table 8. Overall index of bird species diversity in Haruku Island

| The Location       | Number of Species (S) | Total Individual (N) | Richness Index (R₁) | Diversity Index (H') | Evenness Index (E) |
|--------------------|-----------------------|----------------------|---------------------|----------------------|-------------------|
| Transect 1 to Transect 5 | 23                    | 253                  | 3.975863            | 2.710911452         | 0.864588          |

Table 8 shows that the overall bird species Richness Index value in the 5 data transects is medium with a species Richness index value of 3.975863. Then the 5th Diversity Index of data transects is medium with a Diversity Index value of 2.710911452. Furthermore, the Evenness Index in 5 data transects has a pretty good value which is entered into the category of the High Evenness Index with an evenness index value of 0.864588 which is close to number one. The Equity Index has a better value than the other two diversity index values because overall there are no species of birds that have a very dominant number of individuals or are too conspicuous than the other types. Based on the data collected it can be seen that the number of individuals of all species of birds ranges from numbers 1 to 15, and among those numbers there are other numbers that are spread fairly evenly to form a fairly regular segmentation and no large gaps. To give a visual representation of the types of birds found in the hills of Boangbesi, Oma Haruku Island, several species of birds found and successfully documented in the field are presented in Fig 6.

![Eos Bornea](image1)

![Trichoglossus haematodus](image2)

**Figure 6.** Species of birds found at Haruku Small Island

According to the list of bird species collected in Table 5, there were 23 species of birds recorded, the number of these species was found in the sample area of 5 ha and the time of data collection was 1 day with 2 times the data collection; once in the morning and once in the evening according to the established method. When looking at the sample area of only 5 ha and the type of land cover in the field in the form of semi-green wet forests. There are community garden lands either in the form of new plantations with crops and old plantations (in the form of agroforestry traditional *dusung*). The encounter with 23 species of birds in this field is a significant number of species meeting. Table-5 shows that there are 4 types which are recorded to have quite a number of individuals namely: Pergam mata-putih with 42 individuals, 33 Walet-sapi, 28 Perling Maluku and 25 Cabai
kelabu. Then 10 species were recorded to have a significant number of individuals with a number of individuals between 11 to 15 individuals, namely; burung madu Sriganti, Walik raja, Srigunting lencana, Sikatan kelabu, Sriganti. While 9 species were recorded with a small number of individuals between 1 to 4 individuals.

Animals need a place that can guarantee all their necessities of life, whether food, water, breeding grounds, shelter, or childcare. A good habitat in it contains a variety of food sources, making it possible to have many species of birds [7]. With more and more species of trees means that there will be created many ecological niches that enable various species of birds to live together [8]. The presence of birds is a counterweight to the environment in the ecosystem component, because birds have a role as top predators, seed-breaking animals, pollinating animals and pest predators. In Fig. 4 shows the number of species found in 5 data transect is quite varied between 9 to 15 types. When separated for data collection in the morning and in the evening in Fig. 5, the number of species encounters shows a clearer variation pattern between the encounters of the number of species in the morning and evening. In the morning, it tends to be evenly distributed between 6 - 9 species are 3 transects that are found in all 9 types. In the evening the meeting of bird species is more varied in data transects with a number of species between 6 - 11 species. This condition shows that the movement of bird species in the field is more evenly distributed in the morning than in the evening. In other words, the movement of birds in the morning spreads more than in the evening. This is confirmed in Fig. 6. Data on the number of contacts and the number of individual types between observations in the morning and evening are different. The number of contacts with bird species in the morning was recorded 68 times slightly higher than the number of contacts in the evening which was 61 times. The number of individuals gives a stronger description where the number of individuals found in the morning is 147, which is higher than the number of individuals found in the evening, which is only 105 individuals. The factors that influence the value of species diversity (H') are environmental conditions, the number of species and the distribution of individuals in each type [9].

The number of individual bird species in each data transect in Table 6 shows a more detailed distribution of species. It can be seen that in each transect there are several species that have slightly more individuals than other types, overall there are 4 species of birds that have more number of individuals in five data transects namely; Pergam mata putih, Waletsapi, Perling Maluku and Cabai kelabu, the presence of 4 species of birds that affect the total number of individuals of all species in each data transect. From the nature of the observation of bird species shows that more birds are found in the field are known and recorded from the results of observations heard 75 times the sound, while those known from seeing directly the number is less that is 54 times. Then the number of contacts when the bird is perched is more than the number of contacts when the bird is seen flying. Where is the contact when perched 76 times and the contact when a bird is seen flying 53 times. This condition gives the impression that there are not many birds that can be found at the study site or that birds are difficult to find [10].

The number of 23 species of birds found at the Oma island is not the ideal number of species for a forest area, even though this location is an area that has good forest stands for Haruku Small Island, the number of these species is still relatively low because the work done is indeed it is not enough that there are only 2 times the tracing of the area in the data plot and the time used in this study is also short, which is only 1 day, but the number of these species can be a clue that the study sites visited have sufficient bird species richness. This condition is confirmed by the species.
Richness Index Value in 5 data transects at the study site Table 7 which shows the value of the medium and low type Richness Index which is between 2.232443 to 3.242626. But overall the value of the Richness Index type in 5 data transects is medium which is 3.975863.

In the Diversity Index per data transect in Table 7 shows that the 5 data transects have a medium Diversity Index value between 1.982378 to 2.387938, this condition is confirmed by the overall Diversity Index data transect value in Table 8 which shows the medium Diversity Index value, which is 2.710911. In the Evenness Index values of Table 8 all data transects show the Mean Evenness Index values is 0.530188 to 0.619473. The Evenness index values tend to lead to good categories and the condition is confirmed by the value of the Evenness Index data showing the Evenness Index values generated is classified as high which is equal to 0.864588. The high evenness index value overall shows that the types of birds that exist in the study site spread quite well and evenly when observed this description reinforces the description in Figs 2, 3 and 4 above.

Availability of feed in a habitat type is one of the main factors for the presence of bird populations. This also relates to the ability of birds to choose habitats that are in accordance with the availability of resources for their needs. The spread of birds in the forest to be stable because the value of the evenness index (E) of birds whose value is close to 1. The evenness index value ranges from 0-1. If the value of E approaches 0, it means that the evenness between species is low, whereas if the value of E approaches 1, the distribution between species is relatively uniform [2] The fairly even distribution of birds in the forest area is caused by the habitat compilation vegetation that supports the survival of various species of birds there. That various types of forests, such as primary forests, secondary forests and open land / shrubs are habitats for various species of birds. Some species of birds even use various types of habitat to look for food, reproduction, and maintain their survival. Feed needed by birds can be seen from the habitat where the bird is located. Voice or vocal activity is a form of interaction or relationship with others, these activities can be in the form of singing, calling, carrying out attacks, defending the territory when in the nest, or in the form of a sign of a threat from predators. Then the activity of moving or moving is a strategy of individuals and populations to adjust and take advantage of environmental conditions in order to live and reproduce normally. Moving activities can occur at any time such as when looking for food or maintaining territorial areas [2].

4. Conclusion
Total of 23 bird species were found in the hills of Boangbesi, Oma Island in the area of the sample area of 5 ha, when looking at the form of land cover in the form of semi-ever wet secondary forest with a few spots of primary forest, especially in the valley. Besides that, there are community gardens both in the form of new plantations with crops and old gardens that have been in the form of traditional agroforestry area or Dusung. Thus, the location of this study should be a pretty good location for bird habitat, but because the effort is not much, the number of species recorded is also not much. If more effort and time are used for data collection, more bird species will be recorded. Therefore, the encounter with 23 species of birds in this field is a significant number of species. The number of these species can be a clue that the location of this study has a richness of bird species at a certain level. This condition is confirmed by the overall diversity index values which indicate that the value of the bird species Richness Index at this location is medium, then the Diversity Index value is medium, while the Evenness Index value is high. With the knowledge of the state of richness, diversity and evenness of bird species on the small island of Haruku, by conducting regular research it will be known whether there has been a change in conditions or not.
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