

## ANALYSIS OF THE DIVERSITY OF CENDERAWASIH BIRD POPULATIONS IN RHEPANG MUAIF, JAYAPURA REGENCY, PAPUA PROVINCE

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### Abstract

The Cenderawasih bird is one of the endemic and most beautiful birds in Papua. Several areas in Papua have a variety of species of Cenderawasih birds and one of them is Rhepang Muaif Village, Nimbokrang District, and Jayapura Regency. The research objective was to identify the diversity of Cenderawasih birds. The study of observing the population and diversity of Cenderawasih birds in Rhepang Muaif used the IPA methods and then analyzed quantitatively parametrically to see population size and species diversity. The results showed that there are 4 species of Cenderawasih birds in the Rhepang Muaif village, namely the yellow Cenderawasih (*Paradisaea minor*) consisting of 9 individuals, the Wire-dead Cenderawasih (*Seleucidis melanoleuca*) consisting of 2 individuals, the Cenderawasih king (*Cicinnurus regius*) consisting of 7 individuals and the Beak Cenderawasih the Beak Sickle (*Drepanornis bruijnii*) consists of 2 individuals. The diversity of Cenderawasih bird species is in the moderate category ( $H'=1,19$ ).

**Keywords:** Diversity, population, Cenderawasih, Rhepang Muaif, Jayapura

### INTRODUCTION

Papua has more than 602 species of birds with an endemism level of 52%, which is even the largest in Indonesia (Supriatna, 2018). The Cenderawasih bird is one of the endemic species of Papua. It is known that 43 species of Cenderawasih bird are found, 33 species are in Papua New Guinea, and 27 species belong to Australia, Maluku and Halmahera 2 species (Tabba & Nurrani, 2016; Kurniawan & Arifianto, 2017; Supriatna, 2018). A population can also be influenced by environmental factors, the adaptability of certain animal species, and interactions between individuals and species (Nurdin, Supartono, & Nurdiana, 2019). The interaction between humans and animals in their habitat is an important thing that needs to be maintained for the preservation of animals in the future. The beauty of the unique color of the Cenderawasih bird's feathers has high commercial value so humans admire it and want to have it preserved and alive. The high selling price and the large number of enthusiasts of this animal have an impact on the intensity of poaching and high supply. Not realizing that all of this is a threat to animals. Habitat narrowing, cultivation, traditional plantations, and community settlements continue to be carried out, thus having an impact on reducing these animals in their habitat. Based on the condition of the bird population in nature, one of the government's

policies is to protect bird species by law. Some of the protected bird species of Cenderawasih include the Little Yellow Cenderawasih (*Paradisaea m. jobiensis*), the Dewata Raja Bird of Cenderawasih (*Cicinurus reguis*), the 12 Antennae Bird of Cenderawasih (*Seleucidides melamceuea*), the Bela Rattan Bird of Paradise (*Cicinurus magnificus*), and the Blue-breasted Bird of Cenderawasih (*Ptilorus magnificus*) is a bird species protected by the government. The low-risk status and Appendix II established by the IUCN (Internationals Union for the Conservation of Nature and Natural Resources) and CITES for the bird of paradise indicate that the parties need to be serious about protecting this animal (IUCN, 2020; KLHK, 2018). Protection and preservation from the community is the key to the preservation of the diversity of bird of paradise species in nature. The Muaif Rheapang forest area is a habitat where various bird species reside in it and their existence remains sustainable. This cannot be separated from the commitment and role of various parties, especially the Isyo Hills community, in protecting and preserving these animals. Four species of Cenderawasih birds are endemic to Papua whose existence in forest areas continues to be protected with various efforts and efforts to preserve them. The types of birds of Cenderawasih that are in the Muaif Rheapang forest area include the dead-wire bird of Cenderawasih, king of Cenderawasih, lesser bird of Cenderawasih, and white-billed sickle of Cenderawasih. This is in line with the opinion of Lahallo, Tanjung, Suharno, & Sujarta, (2022) that there are two types of birds of Cenderawasih in Rheapang Muaif, namely the Wired Bird of Cenderawasih and the Small Bird of Cenderawasih.

Community participation in the conservation and population of birds of Cenderawasih is a commendable attitude to maintain the existence of these animals in their habitat (Raunsay E. K., 2014). According to Raunsay and Koirewoa (2019) the active role of the community, especially the younger generation, in protecting and preserving habitat has indirectly conserved the bird of Cenderawasih. This role can be carried out as an effort to protect and maintain their habitat (Raunsay E. K., 2022). Habitat as a provider of food, mating trees, nests, and play is very necessary for the existence of birds of Cenderawasih (Raunsay E. K., 2014). The existence and abundance of populations of various species of birds of Cenderawasih in Rheapang Muaif are maintained and continue to be preserved with various protection and management efforts, but this deficiency is not optimal due to comprehensive and published research data regarding species and their diversity. The research objective was to identify the diversity of Cenderawasih birds in Rheapang Muaif, Jaya Pura. It is hoped that this study can be carried out so that the data is well documented and published to the public so that the types of birds of paradise and their diversity can be recognized.

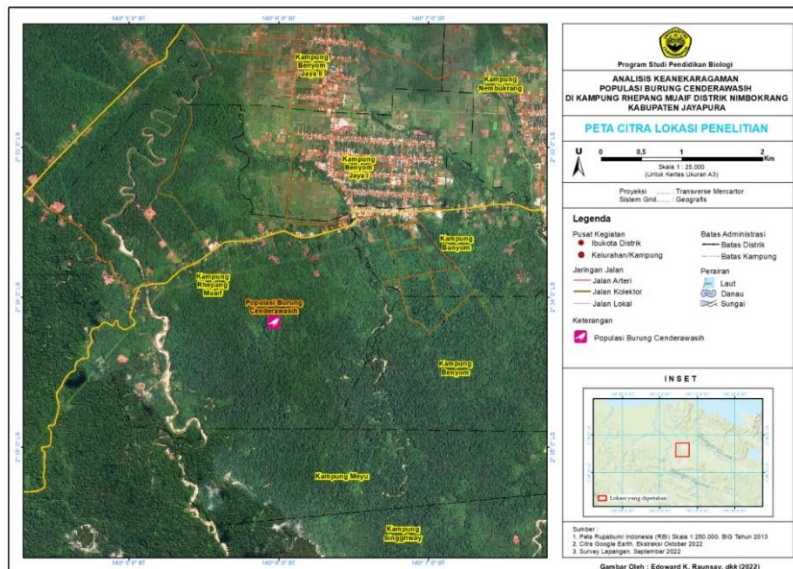
## **METHOD**

This study was carried out in Rheapang Muaif, Jayapura Regency, and Papua Province in July-August 2022 (Figure 1).

### **Population and Sample**

The population and this study were all bird species found in Rheapang Muaif, Nimbokrang District, Jayapura Regency, while the sample was the Cenderawasih bird species found at the observation point.

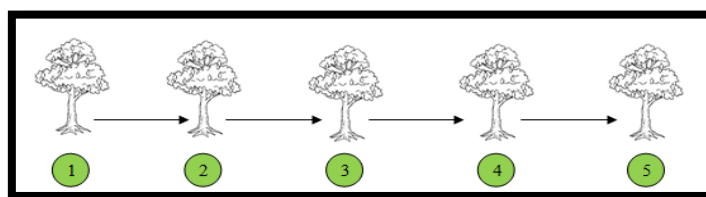
Figure 1: Research Locations



**RESEARCH METHODS**

Data collection on the Cenderawasih population in this study used the Index Ponctualle De'abundance (IPA) method. Station points were determined based on information from the community related to leg/play trees or trees which are usually places for birds of paradise to play and can be seen in Figure 2. This is in line with what research has shown that calculating bird populations are done based on information from the community and this information supports data obtained in the field.

Figure 1: Index Poncyualle DeAbundance (IPA) method



Field study data were analyzed for diversity, population size, density, and sex ratio.

**a. Shannon-Wiener diversity index (H)**

Diversity is analyzed with the Shannon-Wiener (H) Diversity Index as follows:

$$H = -\sum p_i \ln p_i$$

**b. Population size and density**

Sampling intensity (f) is determined by the formula:

$$F = \frac{\text{Observed track area}}{\text{Observation area}}$$

Example average value (y) is calculated by the formula (Santoso Y. 1993):

$$y_i = \frac{\sum y_i}{n_i} \quad n_i = \frac{A_i}{A_t} \times nt$$

Where:

$y_i = \text{the } \bar{y} \text{ average number of individuals}$

$y_i = \text{the number of individuals in the } i^{\text{th}} \text{ ecosystem}$

$n_i = \text{number of observation paths in the } i\text{-th ecosystem}$

$A_i = \text{area of ecosystem type } i$

$A_t = \text{total area of observation}$

$nt = \text{total number of paths observed sex Ratio}$

### c. Sex ratio

The sex ratio (S) is calculated using the formula:

$$\frac{J_i}{B_i}$$

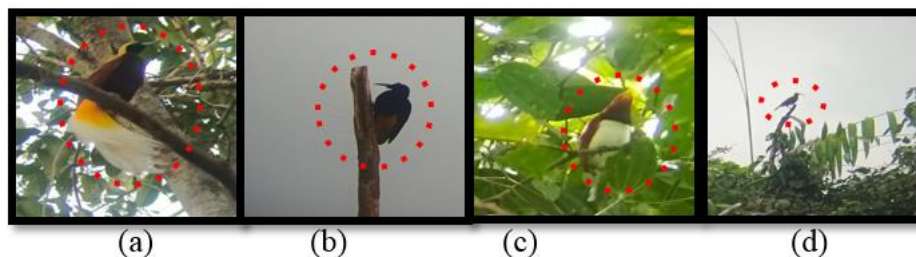
Note:

$J_i = \text{the number of males in the } i\text{-i}$

$B_i = \text{the number of females in the } i\text{-ecosystem type}$

## RESULTS AND DISCUSSION

**Figure 3. (a) Yellow Bird of Cenderawasih (*Paradisaea minor*); (b) Dead Wire (*Seleucidis melanoleuca*); (c) King Bird of Cenderawasih (*Cicinnurus regius*); (d) White-billed Crescent Bird of Cenderawasih (*Drepanornis bruijnii*)**



Field data shows that there are 4 species of bird of Cenderawasih in Rheapang Muaif, namely the yellow bird of Cenderawasih (*Paradisaea minor*) consists of 9 individuals, the wired bird of Cenderawasih (*Seleucidis melanoleuca*) consists of 2 individuals, the king bird of Cenderawasih (*Cicinnurus regius*) consists of 7 individuals, the beaked bird of White Cenderawasih (*Drepanornis bruijnii*) consists of 2 individuals which can be shown in Figure 3

and Table 1. The same research conducted by Lahallo, Tanjung, Suharno, & Sujarta (2022) in the village of Rheapang Muaif found 2 types of birds of Cenderawasih, namely the Dead Bird of Cenderawasih and the Bird of Cenderawasih Small.

The four types of Cenderawasih birds found in Rheapang Muaif also have distribution in several areas in Papua. Pattiwael & Turot (2020) found 7 individuals of *Paradisaea minor* and 5 individuals of *Cicinnurus regius* in the village of Malagufuk, Sorong Regency. According to Yoga, Septi, & Chandra (2016) in the Cycloops Mountains Nature Reserve, there are 9 types of bird of paradise, namely *Manucodia glossy* (*M. atra*), *Manukodia Curly Neck* (*M. cchalybata*), *Manukodia Jobi* (*M. jobiensis*), *Toowa Brilliant* (*P. mmagnificus*), *Dead-wire Bird of Cenderawasih* (*S. mmelanoleucus*), *White-beaked Crescent Bird of Cenderawasih* (*E. bbruijnii*), *King of paradise Bird of Cenderawasih* (*C. regius*), *Rattan-split Bird of Cenderawasih* (*C. magnificus*), and *Small-Yellow Bird of Cenderawasih* (*P. minor*). While Arief (2012) in his research in Keerom Regency, Papua, found 10 species of Cenderawasih birds including the *Red Cenderawasih* (*P. rubra*), *Loria Cenderawasih* (*C. loriae*), *Silky Cenderawasih* (*L. sericea*), *Small Cenderawasih* (*P. minorr*), *Greater Cenderawasih* (*P. aapoda*), *Cenderawasih Raggiana* (*P. raggiana*), *Cenderawasih Dead Wire* (*S. melanoleuca*), *Cenderawasih Bald* (*C. republica*), *Cenderawasih Split Rattan* (*C. magnificus*) and *Cenderawasih King* (*C. regius*).

**Table 1: The population of birds Cenderawasih in the forest area of Rheapang Muaif**

Family	Species Name	Commercial Name	Amount		
			Male	Female	Total
Paradisaeidae	<i>Paradisaea minor</i>	Yellow Cenderawasih	6	3	9
Paradisaeidae	<i>Seleucidis melanoleuca</i>	Cenderawasih Mati Kawat	1	1	2
Paradisaeidae	<i>Cicinnurus regius</i>	Cenderawasih King	4	3	7
Paradisaeidae	<i>Drepanornis bruijnii</i>	White-billed Crescent Bird-of-Cenderawasih	1	1	2
<b>Total</b>					20

Of the four types of Cenderawasih birds found in the village forest of Rheapang Muaif, some are male and female. There were 6 male and 3 female individuals *Paradisaea minor*, *Seleucidis melanoleuca* 1 male and female individual, 4 male and 3 female individuals *Cicinnurus regius*, *Drepanornis bruijnii* consisted of 1 male and 1 female individual.

The sex ratio is divided into global and reproductive ratios (Sampurna, Santoso, & Rahmat, 2014). The sex ratio calculation is carried out for each bird of paradise, where *Paradisaea minor* (1:2) or the density is 4.5 individuals/ha, *Seleucidis melanoleuca* (1:1) or the density is 1 individual/ha, *Cicinnurus regius* (1:1.3) or the density is 1.3 individuals/ha and *Drepanornis bruijnii* (1:1) or the density is 1 individual/ha. The research data shows that the sex ratio is very

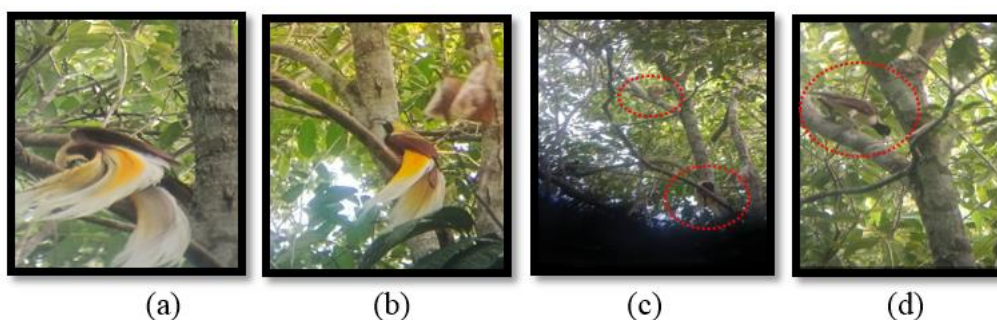
different. This difference is closely related to the encounter between males and females. When the number of males is found to be more, the comparison is very striking as shown in Figure 4 and Table 2.

The existence of 4 species of Cenderawasih birds, both male and female, found in the village forest of Rhepang Muaif is inseparable from the commitment of the parties, especially the Isyo Hill community, to preserve these animals. A strong commitment and support from various adequate facilities mean that this bird of paradise is protected from various threats. Management of forest areas or animal habitats in an integrated manner is an important thing that is continuously maintained for the sake of the conservation of birds of paradise.

The dominance of the male bird of paradise in the village forest of Rhepang Muaif as its habitat indicates that male sex animals can adapt to their environment. One of the environmental factors that influence the presence of male Cenderawasih more dominantly than females is the habitat or the availability of tree canopies that provide comfort in carrying out various activities. Raunsay & Abidondifu (2022) explained that the vegetation structure that makes up the forest as a habitat is a factor in providing comfort for the existence of birds of paradise.

*Paradisaea minor* prefers an open tree canopy or stature in carrying out activities such as playing, singing, showing off, and cleaning its fur. According to Raunsay (2014), the *Paradisaea minor* prefers to play in large tree canopies and has a broad stature. The selection of tree canopies that are open to male species aims to show off the beauty of their fur to attract female species. According to Raunsay (2020), Halini says that the male bird Cenderawasih dances, showing off its feathers so that the female approaches it and continues with the mating process.

**Figure 4: (a) Male *Paradisaea minor* cleaning its feathers; (b) male *Paradisaea minor* perched in the open canopy; (c) Male and female *Paradisaea minor***



*Seleucidis melanoleuca* in playing or perching activities has more dry shoots or ends of the wood. The identification results showed that the types of wood used for perches were *Intsia bijuga* and *Arthocarpus* sp. This species tends to prefer habitats or environments that are more open and do not come into direct contact with dense tree canopies because they are related to their 12 antennae. If it comes into contact with the canopy or dense branches of trees or lianas, the antennae will become entangled, becoming a trap for this species's existence (Figure 5).

**Figure 5: Seleucidis melanoleuca perched on a dry shoot/tip**



*Cicinnurus regius* is a bird of Cenderawasih which is very difficult to find in its habitat. With a body size that is not so large compared to *Paradisaea minor*, finding this Cenderawasih Raja requires high precision and patience. These animals are very sensitive to human voices, footsteps, and also the sound of litter on the forest floor. To find it, the thing to do is to hear his voice first. When you have confirmed the sound of this animal, then it is necessary to look carefully and confirm its presence in the dense tree canopy overgrown with various types of epiphytic lianas. This species prefers or often perches on certain lianas with broad leaf structures and dense tree canopies. This is thought to be a means of avoiding or protecting oneself from predators, especially poaching.

**Gambar 2: *Cicinnurus regius* bertengger pada kanopi pohon yang lebat.**



*Drepanornis bruijnii* or White-beak Crescent Bird-of-paradise is an animal that likes the sticks (tips) of rattan trees (*Calamus* sp) as a perch. The body is small in size, making it easier for these animals to fly freely to explore the forest as their habitat. It has a long sickle-shaped beak, making it easier for these animals to find food. Usually, these animals consume insects or caterpillars in hollow wood. Finding this species takes great effort and effort. Rattan sticks are one of the important plants for perching, so it can be difficult for anyone to observe them. Therefore, the Monitoring Tower is a supporting facility that must be prepared so that the whereabouts of these animals can be identified.

**Figure 7: *Drepanornis bruijnii* perched on a rattan stick (shoot).**



Apart from trees as a playground that can affect the presence of both male and female birds of Cenderawasih, another important factor that is the key to the presence of these animals is the time of observation. Presence of male and female species in certain habitats or trees at different times. The presence of *Paradisaea minor* in habitat or playing trees during this research was carried out in the morning with a time range of 06.00 wit–17.00 wit the afternoon. At such times, what can be observed is the male bird of Cenderawasih, while the female will only appear at certain times to be interested in the male's dance activities. The presence of the female tends to be found in the morning. Based on observations in the field, female birds were found at 06.40-06.46 minutes. The activity between the two partners only lasted  $\pm 6$  minutes and then left the male. Even though during this period, these animals did not always stay in trees that were used as playgrounds, however, these animals had roaming activities around the trees they played with. This can be known through a very distinctive sound.

Playing time or presence of *Cicinnurus regius* at the time the research was conducted was at 07.00-17.00 wit. These animals have a very long time in certain habitats or trees or lianas. The presence of this species on a tree can occur individually but also in pairs. Males have a longer time in playing activities compared to females. The presence of female individuals is more likely to be found in the morning around 07.16 wit-07.30 wits or around  $\pm 15$  minutes with the male partner and then leaving. From noon to evening, female species are very hard to find or are in trees as their habitat.

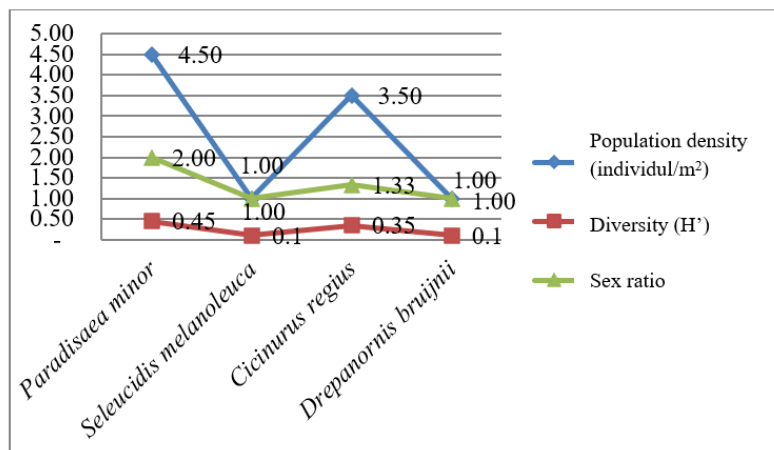
*Seleucidis melanoleuca* is easy to find in the morning. These animals tend to be present or at the habitat (tip) of dry wood  $\pm 04.20$  wits. During field observations, these animals were present or perched on wood as their habitat at 05.49-05.59 wit. Within 10 minutes, these animals carry out playing activities such as jumping and sometimes they don't do any activity and just stay calm. These animals are also very sensitive to human voices, the sound of the litter when we walk, and other noise disturbances.

During field observations, *Drepanornis bruijnii* can be found from 04.30-05.00 in the morning and 15.00-15.26 in the afternoon. At these times, these animals can still be seen active on various rattan sticks (*Calamus* sp). The activity will move from one rattan stick to another by occasionally making a loud, bouncy sound until within a certain distance the sound can still be heard.

Animal sounds, especially the unique species of Cenderawasih birds, are an important indicator in making observations in the field or their habitat. The importance of knowing the sound characteristics of various species of birds of paradise is an important asset in carrying out various aspects of good observation, species identification, population abundance, evenness of species, and also the diversity of species of birds of Cenderawasih.



Figure 8: Graph of diversity index, population density, and sex ratio



The diversity of Cenderawasih bird species in Rheapang Muaf, Nimbokrang District, Jayapura Regency can be categorized as moderate with a diversity index value ( $H'=1$ ). The diversity of the Cenderawasih bird population in Rheapang Muaf is thought to be influenced by environmental factors such as the habitat which is composed of the structure and composition of the vegetation that provides comfort for these animals. Damage to an animal habitat or area conversion for various purposes such as traditional agriculture and certain investments can pose a threat to the Cenderawasih bird (Healey, 2016). In addition, the availability of food, play trees, and nest trees in the habitat for Cenderawasih birds can affect their existence to remain in their habitat. In the opinion of Raunsay (2014) said that the availability of various plants as food in bird habitats can provide comfort. The availability of trees as a place to play and basic materials for making nests can provide a sense of security for animals to remain in their habitat (Raunsay K. E., 2020). Raunsay's research (2022) said that a good habitat will provide comfort for birds of paradise in their various activities. The structure and composition of vegetation are important factors that can affect the presence of birds of paradise in their habitat (Raunsay & Abidondifu, 2022).

Table 1: Diversity, population density, and ratio sex ratio of Cenderawasih bird

Family	Species name	Commercial name	Diversity ( $H'$ )	Population density (head/m <sup>2</sup> )	Sex ratio	Ratio
Paradisaeidae	Paradisaea minor	Yellow Cenderawasih	0.45	4.50	1:2	2
Paradisaeidae	Seleucidis melanoleuca	Dead Wire Cenderawasih	0.1	1	1:1	1
Paradisaeidae	Ciccinnurus regius	King Cenderawasih	0.35	3.0	1:1.3	1.3
Paradisaeidae	Drepanornis bruijnii	White-billed Crescent Beak Cenderawasih	0.1	1.0	1:1	1
			1	10	4:5.3	5.33

## CONCLUSION

There are four (4) species of birds of paradise in Rheapang Muaif, Nimbokrang District, Jayapura Regency with population diversity categorized as moderate ( $H'=1$ ). The diversity of the populations of the four species of birds of paradise found in Rheapang Muaif, Jayapura Regency, is in the moderate category, so there is an urgent need for ecological efforts, namely to carry out habitat engineering by making efforts to incorporate the nest-indicator plant *Asplenium nidus* so that these animals can nest. This is also important to do to answer the mystery so far that the bird of paradise's nest is very difficult to find in its habitat.

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