Inventory and diversity of dragonflies (Odonata) at Kuningan Resort of Mount Ciremai National Park, West Java Province

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Abstract. The presence of dragonflies regarding the sensitivity of nymphs towards environmental changes is considered a bioindicator that can indicate changes in water quality and the environment. The purpose of this study is to take inventory of the species and the diversity of dragonflies at the Kuningan Resort, Mount Ciremai National Park in several representative aquatic habitats. The dragonfly inventory technique used a modified line transect method with observation plots that are not limited by a certain distance or area but by a set time of 15 minutes for each plot observation. The results of the inventory obtained 24 species of dragonflies from 8 families, as many as 591 dragonflies consisting of 58.2% of common dragonflies including of suborder Anisoptera consists of Aeshnidae, Gomphidae, Libellulidae and 41.8% of needle dragonflies including of suborder Zygoptera consist of Platystictidae, Calopterygidae, Chlorocyphidae, Euphaeidae, Coenagrionidae. The dragonfly diversity index (H’ = 1.94 – 2.32) (medium), the species richness index, or the values of Margalef’s diversity index (Dmg) ranged from 1.99 to 2.87 (low), the species evenness index ranges from 0.39 – 0.6)(low – medium).

1. Introduction
The establishment of Mount Ciremai National Park (TNGC) is based on the Decree of the Minister of Forestry Number 424/Menhut-II/2004 dated October 19, 2004, with an area of 15500 ha (Ichwan Muslih, 2011)[1]. Geographically, TNGC lies on 108°01’18” – 108°29’30” EL, and 60°46’57” – 60°58’57” SL. Geological condition, TNGC has volcanic sediment bedrock from its activity of Mount Ciremai. Referring to spatial data of Bandung Geological Agency, bedrock formation of TNGC area consists of volcano quarter, volcano Plio-Plistosen, and sediment bedrock Neogen (Mio-Plio).

The ecosystem of Mount Ciremai National Park has an important value for preserving various types of endangered wildlife such as leopards (Panthera pardus), deer (Muntiacus muntjak), surilis (Presbytis comata), langur (Trachypithecus auratus), and Javan hawk-eagle (Nisaetus bartelsi). In addition, it also serves to protect the function of water systems that have important economic and ecological values for the regencies of Kuningan, Majalengka, and Cirebon [1].

The ongoing ecological dynamics demand data and information updates on the potential of biodiversity in this area. Dragonflies (Odonata) is one of the classes (wildlife) whose potential and distribution are important to be identified. Odonata is the first flying insect in the world. It has appeared since the carbon age (360-290 million years ago), and it still survives today. There are about 700 species of dragonflies in Indonesia, about 15% of the total 5000 species in the world [2].

Odonata is a group of insects that are medium to large and often attractively colorful. The body of the odonata consists of a head (cephalic), chest (thorax), and abdomen which is slender and long and has six limbs. This insect spends most of its life flying. Dragonflies also have a slender body with two
pairs of wings and mesh veins. In addition, they also have short hair-shaped antennae, chewing-type mouthparts, and large compound eyes [3].

The existence of dragonflies (Odonata) can be used as a bioindicator of environmental conditions. The sensitivity of their nymph phase to environmental changes makes them one of the most visible bioindicators of a healthy environment. The reduced number of Odonata in an area can indicate changes in the health quality of water and the environment [4]. Dragonflies as a component of biodiversity play an important role in food chains as herbivores, carnivores, and detritivores [5]. In addition, dragonfly larvae are predators in the water food chain [6]. The role of dragonflies as predators and bioindicators can be realized if the environmental conditions are following their habitat.

The formulation of the problem in this research is: How is the index of diversity and distribution of dragonflies (Odonata) found in Mount Ciremai National Park, West Java Province?

These research objectives are to examine the diversity of dragonflies (Odonata) in Mount Ciremai National Park, West Java Province, and to examine the distribution of dragonflies (Odonata) in Mount Ciremai National Park, West Java Province. These research significances are as a source of information for researchers and the public on the existence of dragonflies (Odonata) regarding diversity and distribution aspects of dragonflies (Odonata) in several different ecosystems or habitat types, and as a reference and information for the management of national park area.

2. Method

2.1. Research site
This research on the diversity of dragonflies (Odonata) was conducted at the Kuningan Conservation Resort, Mount Ciremai National Park, West Java Province. The research duration was ±60 days from October to December 2020.

2.2. Tools and materials
The tools used were Global Positioning System (GPS), stopwatch, camera, thermometer, and writing instruments. The materials used were field guides including Insect Fauna of Mount Ciremai [7], Naga Terbang Wendit [2], Dragonflies of Cihuni [8], and Odonata Semaran Raya [9], litmus paper, and tally sheet.

2.3. Types and collection techniques of data
The types of data collected were species diversity, species diversity index, encounter time, number of individuals, and dragonfly activities. In addition, habitat data included water quality and vegetation conditions. The data collection techniques were direct observation and time search. The direct observation technique is to meet the observed individual directly. The time search method is an inventory technique with plots that have a time limit (minutes). Sampling was conducted in the morning at 08.00-10.00 wib, in the afternoon at 12.00-14.00 wib, and 16.00-18.00 wib. The length of observation time was determined consistently in which the calculation time of the observation plot began when the first individual was found until the specified time ended, followed by subsequent plots until the n-th plot. All individuals in the plot were recorded by types [10]. The observation plot for the time search method is presented in figure 1.
Figure 1. Observation plot of time search method

Data collection on the habitat of each species covered the environmental conditions surrounding the species and the distance between the species and water sources. Data on dragonfly habitats can be obtained in several ways, namely temperature and humidity measurements, and pH level quality of water.

2.4. Data analysis

Data analysis was carried out both qualitatively and quantitatively. Qualitative analysis was conducted by describing dragonflies to generate an interpretation of the dragonfly fauna and its habitat. Quantitative analysis was conducted by calculating the parameters of dragonfly diversity including species abundance, richness, diversity, evenness, and similarity.

a. Abundance of types

The abundance value indicates the number of individuals found at each location observed. The calculated abundances were the number of orders, families, species, and individuals in each ecosystem.

b. Diversity (Shannon-Wiener Diversity Index)

Shannon-Wiener diversity index indicates the amount of species diversity found in a habitat. The value scale is $H'<1$ indicating a low level of diversity, an $H'$ value between 1-3 indicating a moderate level, and a value of $H'>3$ indicating a high level of diversity [11]. The formula used is as follows.

$$H' = -\sum p_i \ln p_i$$  \hspace{1cm} (1)

Explanation:

$H'$ : Indeks of diversity of Shannon-Wiener

$p_i$: Proportion of species to-i, with

$$p_i = \frac{n_i}{N}$$  \hspace{1cm} (2)

Explanation:

$n_i$: The sum of species individu to-i

$N$: Total of the sum of all species individu are found
c. The richness of species (Index of species richness)
The formula that used to encounter the richness of species of dragonfly is:
\[ DMg = \frac{S - 1}{\ln N} \]  
(3)

Explanation:
DMg = Index of species richness
S = The sum of species is found
N = The sum of all species individu is found

Based on [11], the criteria for the species richness index value:
If the DMg value is < 3.5, the species richness is low,
If the DMg value = 3.5 – 5, the species richness is moderate,
If the DMg value is > 5, the species richness is high.

d. Evenness of species (Index of Evenness)
Evenness Index (E) serves to determine the even distribution of each species in each habitat encountered. The more evenly spread of individuals between species, the more balanced the ecosystem will be. To determine the individual distribution of a species, uniformity between species is measured [12], using the formula:
\[ E = \frac{H'}{\ln S} \]  
(4)

Explanation:
E: Index of Evenness (The value between 0-1)
H': The value of Index of diversity of Shannon-Wiener
S: The sum of species is found

The value of Index of Evenness ranges between 0-1 with criteria:
0 < E ≤ 0.4: The Evenness is low, the community is oppressed
0.4 < E ≤ 0.6: The Evenness is moderate, the community is labile
0.6 < E ≤ 1: The Evenness is high, the community is stable

e. Similarities of species
Analysis of similarity index of species between habitats is calculated using the formula [12,13]:
\[ IS = \frac{2C}{(A+B)} \]  
(5)

Explanation:
A = The sum of species of A community, B = The sum of species of B community
C = The same of the sum of species in both communities

The criteria of the same community (IS) [12]:
1- 30% : the low category
31- 60% : the moderate category
61- 91% : the high category
> 91% : the very high category

3. Results and Discussions

3.1. The species and amount of dragonflies
At the Kuningan Resort, Mount Ciremai National Park, two groups of dragonflies were found: the Anisoptera and Zygoptera suborders. Members of Anisoptera are characterized by a pair of fused
compound eyes, a larger body size than Zygoptera, and wider front wings than hind wings. In addition, the abdomen is wider and not slender. This suborder was found in as many as 16 species from 3 families (Aeshnidae, Gomphidae, and Libellulidae). Members of Zygoptera, called needle dragonflies, are characterized by a pair of separate compound eyes, same sized front and hind wings, folded wings over the body when perched, and smaller and elongated abdomen. There were 8 species identified from 5 families (Platystictidae, Calopterygidae, Chlorocyphidae, Euphaeidae, and Coenagrionidae) [14].

At the Kuningan Resort, Mount Ciremai National Park, there were 24 species of dragonflies identified and belonged to eighteen families. The number of dragonflies was 591, consisting of 58.2% of common dragonflies (Anisoptera) and 41.8% of needle dragonflies (Zygoptera). The highest number of dragonflies were found consecutively in the habitats of Remis Lake (265), Sagarahiang (92), Balong Dalam (89), Nilem Lake (89) and Cilengkrang (56) (Table 1). The order Odonata found was classified into 8 families, with Libellulidae as the most abundant family (57.9%). Other families with the number of more than 50 individuals found were Platycnemididae and Coenagrionidae.

The next, it was shown those figures of dragonflies (Odonata) in figure 2 below. The highest number of species of common and needle dragonflies were respectively identified in Remis Lake (16 species), Sagarahiang (14 species), Balong Dalam (12 species), Nilem Lake (9 species), and Cilengkrang (9 species). Each habitat condition supports the quantity and variety of dragonflies as follow: Habitat of Remis Lake is of 3.25 ha, its surrounding is dominated by pine and beringin stand. Habitat of Sagarahiang looks natural, shrubs and grasses grow rich. There is waterfall which flows throughout the year, its surrounding was the slopes which grows stand of hard tree and fern plant. Habitat of Balong Dalam Site is the big enough pool and springs in it. Vegetation in around site are close enough by stand of large enough diameter. Habitat of Nilem Lake was not far grom Remis Lake. In Nilem Lake were ikan nilem fish, water plant and moss. Surrounding of Nilam Lake grow pine stand and beringin naturally. The last habitat of Cilengkarang has broad enough area consist of Cilengkarang river, waterfall, Cilengkarang valley as natural attractions, source of hot water naturally and waterfall of Kembar. It can be concluded that, in generally, the five habitats are aquatic habitat. Those are very liked by dragonflies to live, breed, and other activity as insects. These suited with statement of [15], that some habitat type where dragonflies founded are small lake, pond with floating vegetation, swamp and river.

[14] also stated that dragonflies have broad distribution and very abundant quantity so that easy to get.

3.2 Diversity of Dragonfly Species
The condition of the diversity of dragonfly species in each habitat at the Kuningan Resort, Mount Ciremai National Park is presented in Table 1. Two species from 24 species found were represented by only one individual (singleton), and other species had a low abundance (3-10 individuals). In particular, the dragonfly species of Orthethrum sabina, Copera marginipes, Crocothemis servilia, and Pseudagrion microcephalum were the most abundant species (>40 individuals). All of these abundant species were found in the habitat of Remis Lake, and Orthethrum sabina species were found in all habitats.

The diversity of dragonflies at the Kuningan Resort, Mount Ciremai National Park was in the medium category, with a diversity index value of $H= 1.91 - 2.34$, and the distribution of individuals for each species was moderate. The most dominating species at Kuningan Resort is Orthetrum sabina, including the family of Libellulidae with 146 individuals. The fewest species were Anax guttatus (family of Aeshnidae), Ictinogomphus decoratus (family of Gomphidae), Diplacodes trivialis (family of Libellulidae), Pseudagrion prinosum (family of Coenagrionidae) with one individual each. Regarding the habitats, the highest diversity index of dragonflies was found in Sagarahiang, followed sequentially by Cilengkrang, Balong Dalam, Remis Lake, and Nilam Lake. This means that dragonflies inhabit all types of habitats from flowing to stagnant waters with good to bad quality. Dragonflies mostly inhabit flowing water habitats.
Figure 2. Apparation of dragonflies that found at Kuningan Resort of Mount Ciremai National Park, West Java Province.
Remarks: (1) Anax parthenope (Burmeister, 1839), (2) Ictinogomphus decoratus (Selys, 1854), (3) Brachythemis contaminata (Fabricius, 1793), (4) Crocothemis servilia (Drury, 1770), (5) Diplacodes trivialis (Rambur, 1842), (6) Neurothemis ramhuri (Kauf in Brauer, 1866), (7) Orthetrum crysis (Burmeister, 1839), (8) Orthetrum glaucum (Brauer, 1865), (9) Orthetrum pruinosum (Rambur, 1842), (10) Orthetrum sabina (Drury, 1770), (11) Orthetrum testaceum, (12) Pantala flavescens (Fabricius, 1798), (13) Potamarcha congener (Rambur, 1842), (14) Rhodothemis rufa (Rambur, 1842), (15) Trihexis festiva (Rambur, 1842), (16) Zyxomma obtusum (Albarda, 1881), (17) Copera marginipes (Rambur, 1842), (18) Vestiols luchuosa (Burmeister, 1839), (19) Heliocypha fenestrata (Burmeister, 1839), (20) Euphaea variegata (Rambur, 1842), (21) Agriocnemis pygmaea (Rambur, 1842), (22) Ischnura senegalensis (Rambur, 1842), (23) Pseudagrion microcephalum (Rambur, 1842), (24) Pseudagrion pruinosum (Burmeister, 1839)
Table 1. Species, amount and of dragonfly variety index at Kuningan Resort of Mount Ciremai National Park

| Subordo, family and species (scientific name) | SH | CK | BD | TR | TN | Total | $\sum$ | $\sum H'$ | $\sum H'$ | $\sum H'$ | $\sum H'$ | $\sum H'$ |
|---------------------------------------------|----|----|----|----|----|-------|-------|-----------|-----------|-----------|-----------|-----------|
| **ANISOPTERA**                              |    |    |    |    |    |       |       |           |           |           |           |           |
| Aeshnidae                                   |    |    |    |    |    |       |       |           |           |           |           |           |
| *Anax guttatus*                             | 1  | 0,05| 1  | 0,05| 1  |       |       |           |           |           |           |           |
| Gomphidae                                   |    |    |    |    |    |       |       |           |           |           |           |           |
| Ictinogomphus decorates                     | 1  | 0,07|     |     |     |       |       |           |           |           |           |           |
| Libellulidae                                |    |    |    |    |    |       |       |           |           |           |           |           |
| Brachythemis contaminata                    | 4  | 0,14| 3  | 0,16| 2  | 0,09 | 5  | 0,07 | 8  | 0,22 | 63        |
| Crocothemis servilia                       | 5  | 0,16| 4  | 0,19| 5  | 0,16 | 41 | 0,29 | 8  | 0,22 | 63        |
| Diplocoris trivialis                       | 1  | 0,05|     |     |     | 3    | 0,11| 4       |
| Neurothemis ramburii                       | 9  | 0,23| 5  | 0,22| 7  | 0,20 | 14 | 0,16 | 6  | 0,18 | 41        |
| Orthetrum Chrysis                           | 1  | 0,05|     |     |     | 3    | 0,11| 5       | 0,07 | 9  |
| Orthetrum glaucum                          | 2  | 0,08|     |     |     |     | 6    | 0,09 | 8       |
| Orthetrum prauniosum                       | 11 | 0,25| 2  | 0,09| 5  | 0,07 | 8  | 0,18 | 18      |
| Orthetrum sabina                           | 14 | 0,29| 21 | 0,37| 23 | 0,35 | 55 | 0,33 | 33 | 0,37 | 146      |
| Orthetrum testaceum                        | 3  | 0,05|     |     |     | 6    | 0,18| 6       |
| Potamarcha congener                        | 6  | 0,18|     |     |     | 6    | 0,18| 4       | 0,14 | 16      |
| Rhodothemis rufa                           | 3  | 0,05|     |     |     | 5    | 0,07| 5       |
| Trithemis festiva                          | 5  | 0,07|     |     |     | 3    | 0,16| 6       |
| Zyxomma obtusum                            | 3  | 0,16|     |     |     |     | 3    | 0,11| 6       |
| Sub Total                                  | 53 | 1,43| 37 | 1,17| 57 | 1,47 | 141| 1,25 | 55 | 1,07 | 344      |
| **ZYGOPTERA**                              |    |    |    |    |    |       |       |           |           |           |           |           |
| Platycnemididae                            |    |    |    |    |    |       |       |           |           |           |           |           |
| Copera marginipes                          | 7  | 0,20|     |     | 13 | 0,28 | 56 | 0,33 | 13 | 0,28 | 89       |
| Calopterygidae                             |    |    |    |    |    |       |       |           |           |           |           |           |
| Vestalis luctuosa                          | 21 | 0,34| 7  | 0,26|     |     |     | 28     |
| Chlorocyphidae                             |    |    |    |    |    |       |       |           |           |           |           |           |
| Heliocypha fenestrate                      | 5  | 0,16| 5  | 0,22| 15 | 0,30 | 25 |       |
| Euphaeidae                                 |    |    |    |    |    |       |       |           |           |           |           |           |
| Euphaea variegata                          | 5  | 0,16| 7  | 0,26| 4  | 0,14 | 16 |       |
| Coenagrionididae                           |    |    |    |    |    |       |       |           |           |           |           |           |
| Agriocnemis pygmaea                        | 7  | 0,10| 5  | 0,16|     |     | 12 |       |
| Ischnura senegalensis                      | 7  | 0,10|     |     |     | 7    |     |       |
| Pseudagrion microcephalum                  | 46 | 0,30| 6  | 0,18|     |     | 52 |       |
| Pseudagrion pruiniosum                     | 1  | 0,05|     |     |     | 7    | 0,10| 10     | 0,25 | 18     |
| Sub Total                                  | 39 | 0,91| 19 | 0,75| 32 | 0,72 | 123| 0,83 | 34 | 0,87 | 247      |
| **Total**                                  | 92 | 2,34| 56 | 1,91| 89 | 2,19 | 265| 2,18 | 89 | 1,94 | 591      |
| Total species                              | 15 | 10  | 13 | 16  | 11 | 4    | 24 |       |
| Total genus                                | 11 | 9   | 10 | 9   | 9  | 3    | 19 |       |
| Total family                               | 6  | 6   | 4  | 3   | 4  | 8    | 8  |       |

Description:
SH= Sagarahiang,
CK= Cilengkrang,
BD= Balong Dalam,
TR= Telaga Remis, dan
TN= Telaga Nilam.
3.3 Wealth, Evenness and Similarity of dragonfly types between habitats

Results of the species richness index of dragonflies (table 2) indicated that all habitats were in low category (<3.5). This condition show that in five habitats, there are possibilities of lack of food availability, polluted environmental conditions, or insufficient light intensity. The value of Margalef Diversity Index (DMg) is strongly influenced by the total number of individuals found in a certain area. The values (Dmg) identified in Balong Dalam and Telaga Nilem habitats were very distinctive, despite the same number of individuals, the number of species was different.

**Table 2. The wealth of dragonfly species at Kuningan Resort of Mount Ciremai National Park**

| No | Habitat location | ∑ Species (S) | ∑ Individual (N) | Variety of species (H') | Richness of species (DMg) | The evenness of species (E) |
|----|------------------|---------------|------------------|-------------------------|--------------------------|---------------------------|
| 1  | Sagarahiang      | 15            | 92               | 2,34                    | 2,87                     | 0,51                      |
| 2  | Cilengkrang      | 10            | 56               | 1,91                    | 1,99                     | 0,47                      |
| 3  | Balong Dalam     | 13            | 89               | 2,19                    | 2,45                     | 0,49                      |
| 4  | Telaga Remis     | 16            | 265              | 2,18                    | 2,51                     | 0,39                      |
| 5  | Telaga Nilem     | 11            | 89               | 1,94                    | 2,01                     | 0,43                      |

Moreover, based table 2, the results of evenness index value of dragonfly species in five habitats were in low and moderate categories. Remis Lake had a low species evenness value (E=0.39), while other habitats were categorized as moderate (E=0.4-0.6). This condition shows that the evenness of species in the four habitats is considered good, indicating that the abundance of each species is almost evenly distributed. The more evenly distributed individuals between species, the ecosystem balance will increase. The value of species evenness index (E) is used as an indicator of dominance among each species in the community. The evenness index values in all habitat types range from 0.4 to 0.6, meaning that no dragonfly species dominates.

Dragonflies found in five habitats at the Kuningan Resort have the same types of species between habitats. The results of calculation of the Sorensen’s similarity index at the Kuningan Resort are presented in table 3. The locations of Sagarahiang and Balong Dalam have a high level of species similarity, while the others show moderate similarity results.

**Table 3. The evenness of dragonfly species at Kuningan Resort of Mount Ciremai National Park**

| Habitat | SH | CK | BD | TR | TN |
|---------|----|----|----|----|----|
| SH      | -  | 60,87 | 84,62 | 62,07 | 50 |
| CK      | -  | -   | 57,14 | 33,33 | 42,11 |
| BD      | -  | -   | - | 51,85 | 45,45 |
| TR      | -  | -   | - | - | 56 |
| TN      | -  | -   | - | - | - |

Description:
SH= Sagarahiang,
CK= Cilengkrang,
BD= Balong Dalam,
TR= Telaga Remis, and
TN= Telaga Nilem.

3.4 Related previous researches

Research on dragonflies and data collection of species and their distribution in Java were carried out by [16]. The total recorded species of dragonflies were 142 classified into 10 families: Calopterygidae,
Euphaeidae, Libellaginidae, Lestidae, Megapodagrionidae, Platystictidae, Agrionidae, Libellulidae, Cordulegasteridae, Gomphidae, and Aeshnidae, and five subfamilies: Protoneurinae, Platycneminae, Agrioninae, Libellulinae, and Corduliinae [17]. The distribution locations are West Java, Central Java, and East Java.

During the period of 2010-2014, Indonesia Dragonfly Society (IDS) found 88 species belonging to 14 families on the island of Java [18]. However, IDS has not obtained data regarding the types of dragonflies in Mount Ciremai National Park area. In 2008-2009, Indonesian Institute of Sciences (LIPI) conducted observations of dragonflies and found 20 types of dragonflies in Mount Ciremai area [7].

Referring to the data of dragonfly identifications and literature reviews as presented in table 4, all types of dragonflies at the Kuningan Resort of Mount Ciremai National Park are categorized in the Least Concern (LC) category, according to the International Union for Conservation of Nature (IUCN). Species classified as Least Concern or low risk means that this population or species is not included in the category of near threatened, vulnerable, or critical [19]. Indonesian government has also established some regulations regarding protected species of plants and animals; however, there has been no protection category for the types of dragonflies in this research location.

In 20 types of dragonflies found by [7], there are four species that were not found in this study: Lathrecista asiatica, Neurothemis terminata, Agriocnemis femina, and Coeliccia membranipes. Despite there was no encounter of these species, it does not mean that the species are extinct. Varied observation sites and research times are the reasons these species have not been rediscovered.

Table 4. Previous research data of dragonflies and species conservation status at Kuningan Resort of Mount Ciremai National Park

| No | Nama Ilmiah                  | Lieftinck (1934) | LIPI (2011) | IDS (2014) | IUCN   | P.106 2018 |
|----|------------------------------|-----------------|-------------|------------|--------|------------|
| 1  | *Anax guttatus*              | V               | V           | V          | LC     | -          |
| 2  | *Ictinogomphus decorates*    | V               | V           | V          | LC     | -          |
| 3  | *Brachythemis contaminata*   | V               | V           | V          | LC     | -          |
| 4  | *Crocothemis servilia*       | V               | V           | V          | LC     | -          |
| 5  | *Diplacodes trivialis*       | V               | V           | V          | LC     | -          |
| 6  | *Neurothemis ramburii*       | V               | V           | V          | LC     | -          |
| 7  | *Orthetrum chrysis*          | V               | V           | V          | LC     | -          |
| 8  | *Orthetrum glaucum*          | V               | V           | V          | LC     | -          |
| 9  | *Orthetrum pruinoseum*       | V               | V           | V          | LC     | -          |
| 10 | *Orthetrum sabina*           | V               | V           | V          | LC     | -          |
| 11 | *Orthetrum testaceum*        | V               | V           | V          | LC     | -          |
| 12 | *Pantala flavescens*         | V               | V           | V          | LC     | -          |
| 13 | *Potamarcha congener*        | V               | V           | V          | LC     | -          |
| 14 | *Rhodothemis rufa*           | V               | V           | V          | LC     | -          |
| 15 | *Trithemis festiva*          | V               | V           | V          | LC     | -          |
| 16 | *Zyxomma obtusum*            | V               | V           | V          | LC     | -          |
| 17 | *Coperia marginipes*         | V               | V           | V          | LC     | -          |
| 18 | *Vestalis luctuosa*          | V               | V           | V          | LC     | -          |
| 19 | *Heliocypha fenestrata* *    | V               | V           | V          | LC     | -          |
| 20 | *Euphaea variegata*          | V               | V           | V          | LC     | -          |
| 21 | *Agriocnemis pygmaea*        | V               | V           | V          | LC     | -          |
| 22 | *Ischnura senegalensis*      | V               | V           | V          | LC     | -          |
| 23 | *Pseudagrion microcephalum*  | V               | V           | V          | LC     | -          |
| 24 | *Pseudagrion pruinoseum*     | V               | V           | V          | LC     | -          |
4. Conclusion and Suggestion

4.1. Conclusion
There are 24 species of dragonflies included in two suborders, eight families, 19 genera, found at Kuningan Resort, Mount Ciremai National Park. The diversity index of dragonflies found at Kuningan Resort ranged from 1.91 to 2.34 with moderate diversity criteria. The distribution and number of species of dragonflies were respectively identified in Remis Lake (16 species), Sagarahiang (14 species), Balong Dalam (12 species), Nilem Lake (9 species), and Cilengkrang (9 species). Every habitat condition supports the quantity and variety of dragonflies.

4.2. Suggestion
Further research is required to find out more information on the diversity of dragonflies including resorts throughout Mount Ciremai National Park area. The range of locations and habitat types needs to be expanded, and the observation period needs to be lengthened as well to obtain a complete data series.

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