Analysis of type insect in Javanese Edelweiss (Anaphalis javanica) at Tegal Bungbrun Papandayan Mountain

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Abstract. This research is raining to find out the insect species, diversity index, abundance value, evenness value, dominance index, and insect density value on Javanese Edelweiss (Anaphalis javanica) in Tegal Bungbrun, Mount Papandayan. In this study the method used was purposive sampling using quadratic and Pitfal-trap techniques. The results obtained as many as 13 species belonging to 10 families and 5 orders with a total number of individuals is 235. The calculation results obtained, namely the diversity index at Tegal Bungbrun, Mount Papandayan of 1.0216, including at a moderate level, the highest abundance of insect species among 13 species, namely Apis andreniformis species with a value of 0.1957 are at abundant levels. Evenness value is 0.9171 which means that the insect evenness is in a stable condition. Insect dominance value of 1.9969 included in low dominance, dominated by Apis andreniformis of 0.3915. A density value of 9.4 is included in the low density category.

1. Introduction
Mount Papandayan is one of the mountains in Garut with general field conditions that have steep, hilly and mountainous topography and steep cliffs. According to the Schmidt and Ferguson climate classification [1], this region is classified as type B climate with an average annual rainfall of 3,000 mm, humidity ranges between 70-80% and is an active strato volcano with altitudes reaching 2,665 meters above sea level.

One of the potential flora in the Papandayan mountain area is Javanese Edelweiss (Anaphalis javanica) which lies in the Tegal Bungbrun area. Anaphalis javanica is a genus of the family Asteraceae which is a mountain plant known as the "Eternal Flower" which is also known as "Edelweiss". Javanese edelweiss, including endemic and rare plants, bush-shaped with clumped flowers. The spread of this plant varies, but more often found in rocky areas with an altitude of 2000-2900 m. This plant is non-toxic, even often used in traditional medicine to treat stomach and breathing. Thick hairs that appear are adaptations from the height of the place, and protect plants from cold, dry, and from ultraviolet radiation [2].

Mount Papandayan is an area of diversity, that is, variability among living things from all resources, including on land, aquatic ecosystems, and ecological complexes as well as diversity in species among species and their ecosystems. Ten percent of natural ecosystems in the form of nature reserves, wildlife reserves, national parks, protected forests, and partly for the benefit of germplasm cultivation, are allocated as areas that can provide protection for biodiversity [3].
The role of Edelweiss is a pioneer plant for young volcanic soils in mountain forests and is able to maintain its survival on barren land, being able to form mycorrhizae with certain soil fungi that effectively expand the area covered by its roots and increase efficiency in finding nutrients. However, at present the Anaphalis genus in Indonesia is included in the category of threatened or threatened [4].

When related to the above information about insects, which these insects can affect plant life, the threat of this genus may be caused by insects that inhabit it, bearing in mind the flowers of the genus Anaphalis are very preferred by insects, more than 300 types of insects such as lice, thins, butterflies, flies, wasps and bees are seen visiting it [5].

Knowing the diversity and identity of the observed insects will provide information on the role of these insects, both positive and negative roles for the life of Edelweiss, Java, which is currently under threat. In this article we describe the types of insects found, both those that play a role and threaten the survival of Javanese Edelweiss.

2. Methods
In accordance with the problem under study, this study uses a descriptive method. Placement of sample points through purposive sampling method using quadratic techniques, the area of research used in this study is 10% of the area to be studied. Sampling was carried out using the Pitfall trap trap method, then in each sampling area (plot), divided into 5 stations and distributed in 1 station as many as 10 squares with a size of 5m x 5m using a trap trap Pitfall-trap method, collected then identified. Data obtained in the form of insect diversity index was calculated using the Shannon-Wiener formula [6].

3. Results and discussion
After conducting the research, several types of insects were obtained from the study sites that have been determined, while the types of insects are presented and in Table 1 below:

Table 1. Types and number of insects found in Javanese Edelweiss (Anaphalis javanica) at Tegal Bungbrun.

| No | Ordo      | Insect Type          | Number of Species |
|----|-----------|----------------------|-------------------|
| 1  | Orthoptera| Gryllus mitratus     | 11                |
| 2  | Orthoptera| Gryllus bimaculatus  | 3                 |
| 3  | Orthoptera| Valanga nigricornis  | 17                |
| 4  | Lepidoptera| Macrothylacia rubi | 6                 |
| 5  | Lepidoptera| Agrotis sp           | 21                |
| 6  | Diptera   | musca domestica      | 12                |
| 7  | Diptera   | Hermetia illucens    | 41                |
| 8  | Hymenoptera| Apis andreniformis | 46                |
| 9  | Hymenoptera| Dolichoderus thoracicus Smith | 9 |
| 10 | Hymenoptera| Spodoptera litura  | 21                |
| 11 | Hymenoptera| Polistes sp          | 15                |
| 12 | Hymenoptera| Xylocopa violacea  | 10                |
| 13 | Araneae   | Loxosceles reclusa   | 23                |
|    | Total     |                      | 235               |

The most numerous species found, namely Apis andreniformis as many as 46 individuals. While the fewest were found, namely 3 individual Gryllus bimaculatus species. Based on the results of research that has been carried out obtained as many as 13 species of insects belonging to 10 families and 5 orders with a total number of individuals is 235, consisting of orders: Lepidoptera, Orthoptera, Diptera, Hymenoptera, and Araneae.

The results of mathematical calculations for the ecological value of insect species in Javanese Edelweiss (Anaphalis javanica) flowers in the Tegal Bungbrun area of Mount Papandayan, Garut regency can be seen in the Table 2.
Table 2. Diversity index, abundance value, evenness value, domination index, and insect density value in Javanese Edelweiss (Anaphalis javanica) at Tegal Bungbrun.

| No | Insect Type             | Σ | H | K  | E  | c  | X  |
|----|-------------------------|---|----|----|----|----|----|
| 1. | Gryllus mitratus        | 11| 0.0622 | 0.0468 | 0.0936 | 0.44 |
| 2. | Gryllus bimaculatus     | 3 | 0.0242 | 0.0128 | 0.0225 | 0.12 |
| 3. | Valanga nigricornis     | 17| 0.0825 | 0.0723 | 0.1447 | 0.68 |
| 4. | Macrothylacia rubi      | 6 | 0.0407 | 0.0255 | 0.0511 | 0.24 |
| 5. | Agrotis sp              | 21| 0.0937 | 0.0849 | 0.1787 | 0.84 |
| 6. | Musca domestica         | 12| 0.0660 | 0.0511 | 0.1021 | 0.48 |
| 7. | Hermetia illucens       | 41| 0.1323 | 0.1745 | 0.3489 | 1.64 |
| 8. | Apis andreniformis      | 46| 0.1386 | 0.1957 | 0.3915 | 1.84 |
| 9. | Dolichoderus thoracicus Smith | 9 | 0.0543 | 0.0383 | 0.0766 | 0.36 |
| 10.| Spodoptera litura      | 21| 0.0937 | 0.0894 | 0.1787 | 0.84 |
| 11.| Polistes sp             | 15| 0.0763 | 0.0638 | 0.1277 | 0.6  |
| 12.| Xylocopa violacea       | 10| 0.0583 | 0.0426 | 0.0851 | 0.4  |
| 13.| Loxosceles reclusa      | 23| 0.0988 | 0.0979 | 0.1957 | 0.92 |
|    | Total                   | 235| 1.0216 | 0.9575 | 0.9171 | 1.9969 | 9.4 |

The species found at the study site had several beneficial and detrimental roles for plants, especially the Javanese Edelweiss. Insects that are included are useful, namely Apis andreniformis, Dolichoderus thoracicus Smith, Xylocopa violacea, and Hermetia illucens. Like Apis Andreniformis which is an insect belonging to the order Hymenoptera, its food is from nectar and pollen [7], which will help in the process of pollinating plants, this is very helpful in plant breeding. Then Dolichoderus thoracicus prey on borer larvae, this shows that these insects have the potential to be used as biological agents, especially for controlling plant pests [8]. Furthermore, Xylocopa violacea is an insect that plays an important role, this insect belongs to the pollinating insect which in biotic factors the presence of pollinating insects is very important and Hermetia illucens [9], according to Bokau and Witoko larvae of this insect consumes organic waste and then metabolizes the chemical compounds in it into nutrients. Naturally, female Hermetia illucens insect lay their eggs around food sources, such as around chicken farms, piles of palm oil cake waste, and around animal waste [10]. At the research site, this insect activity was proven by the abundance of animal droppings under the Edelweiss plant.

In this study sampled harmful insects, namely Agrotis sp. These insects, according to Kaufman, are harmful insects because they damage the stems or twigs of plants by piercing, broaching, breaking or wounding them, this condition if left unchecked can threaten the life of Javanese Edelweiss plants (Anaphalis javanica) [11]. However, overall it can be said that the ecosystem of the location under study is still in a balanced state. This can be seen from the types of insects that are caught in a variety (heterogeneous) in the presence of harmful insects, insects that are natural enemies (predators and parasitoids), and useful insects. Jones et al., states that in a stable ecosystem, the population of a type of organism is always in a state of balance with the population of other organisms in its community [12].

Furthermore, if related to the information above about insects that can harm plant life, especially Edelweiss plants, the threat of these plants might be caused by insects that inhabit them, considering that the flowers of the genus Anaphalis are highly favored by insects, more than 300 types of insects such as lice, fins, butterflies, flies, wasps and bees are seen visiting him [13].

The diversity index ranges from 1.0216. According to the Shannon-Winner formula [14], the level of diversity in Tegal Bungbrun is 1 <H <3. This shows that the diversity of insects in Edelweiss Java in Tegal Bungbrun, Mount Papandayan is included in the category of being abundant [15].
As is known, species diversity is all the differences found in living things between species or between species that are measured from the total number of species both animals, plants, microorganisms on earth. Cleland states that species diversity has two components that can react differently to geographical, developmental, or physical factors [16]. The two components are the richness of the types or components of the variety in the unity of the area and equality or aguitability in the equal distribution of individuals between the two types.

A community is said to have high diversity if the community is composed by many species with the same abundance of species and about the same. Conversely, if a community is composed of few species and if only a few species are dominant, the species diversity is low. Uplands usually have lower diversity and abundance compared to lowlands [17]. As for what happened at the study site, the diversity index is in the medium abundance category, meaning that the community at the study site is composed of sufficient or moderate species with an abundance of species that are not the same but close to the same.

The abundance of insect species is largely determined by its reproductive activities which are supported by a suitable environment and the fulfillment of its food source needs. This is consistent with the statement from van Leeuwen's report that Edelweiss flowers have a high ecological benefit, which is a food source for insects derived from the order Hymenoptera. In addition, a species is declared to have a high abundance value if the species in one region is found in large numbers compared to other species in a certain region [18].

The abundance of resources contained in these population areas can cause prevalence, i.e. increasing the frequency of the presence of an organism in that region or space within a certain time. An animal species with a high prevalence can be seen more often, because of its wide distribution area. Conversely, for a species whose prevalence is low, it can only be found in certain places because the distribution area is narrow [19].

The results of this study are known to have an evenness index ranging from 0.9171. According to Odum when referring to the provisions, the value of the agreement is at the value $0.75 < 1.00$ which includes evenness is in a stable condition [20]. The results of this study indicate that the insect population in each study location is relatively evenly, there is no prominent number of insects. Evenness illustrates the size of the number of individuals between species in a community. The more even distribution of individuals between species, the balance of the ecosystem will increase.

Furthermore, it is known that the dominance index is around 1.9969, the results obtained are classified as low dominance. The value of dominance is to see whether there is a dominant species in an ecosystem [21]. As is known, the dominance of a value in the community that is not expressed by the taxonomic relationship, because dominance is able to control or become a ruler who is usually often referred to in the taxonomic groups are far different who have a synergenic relationship than competitive relations. In addition, the degree of dominance is concentrated in one, several, or several types that can be explained in the index of domination which aims to be able to add up the value of each species in relation to the community as a whole [22]. As for this study, it shows that the dominance index is low, it can be said that no insect species have been found that dominate or dominate the location of the study.

Insect diversity can be used as a reference for indicators of environmental damage. The damage to an environment is seen by the high and low diversity of an insect species. The Tegal Bungbrun area on Mount Papandayan is a Javanese Edelweiss field (Anaphalis javanica) which has a wide area, where Edelweiss is a pioneer plant in volcanic land, which has many benefits such as for treatment and is currently in an endangered status. A field where Edelweiss is not free from pests or diseases caused by various factors inside and outside.

Insects found in the Tegal Bungbrun area at the time of the study consisted of a variety of different species and families. The insects found were found in several sampling stations. The ecological index conditions of insects produced in Tegal Bungbrun are influenced and supported by environmental factors, namely biotic and abiotic factors. In addition, differences in the structure and composition of the composition of an ecosystem cause differences in the character of ecosystems that affect the diversity and abundance of biota that live in them. Uplands usually have lower diversity and abundance compared to lowlands [23].
4. Conclusion

To conclude, the study found 13 species of insects belonging to 10 families and 5 ordo with a total of 235 individuals. Musca domestica with 12, Agrotis sp with 21, Apis andreniformis with 46, Hermetia illucens with 41, Dolichoderus thoracicus Smith 9, Spodoptera litura 21, Loxosceles reclusa 23, Xylocopa violacea 10, and Valanga nigricornis 9, totaling 17. Diversity Index of 1.0216 included in the category of being abundant, the Abundance index of 0.9575 which was included in the category of abundance, the value of Evenness was stable, the Dominance value was 1.9969 which was included in the low dominance, and the value of The density of 9.4 is included in the low category.

Acknowledgment

This work will not be possible without financial support from the Institut Pendidikan Indonesia of Garut. I am especially indebted to Dr. Nizar Alam Hamdani, M.M., M.T., M.Si, Chancellor of the Institut Pendidikan Indonesia of Garut, who supported and gave me time to complete this research.

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