

Lepidoptera morphological structure as a basic of taxonomy in the area of Lafarge cement Indonesia plant in Lhoknga, Aceh Besar Distric, Indonesia

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Abstract. The study of Lepidoptera that took place around the factory of Lafarge Cement Indonesia (LCI) was aimed to determine the structure of dominance of Lepidoptera and morphological structure as basic determination of taxonomy category of LCI plant Lhoknga Kabupaten Aceh Besar. The study was conducted from April to June 2012. The area of the study was divided into four locations; Gunung Bale Area (location I), Gunung Badak Area (Location II), LCI factory (Location III) and Gunung Oshing (location IV). The methods were survey and capture. The structure of the dominance was analysed by dominance formula and the species was analysed descriptively. The findings showed that there were 13 species and 1 species with dominance index (ID) were 0.0-0.25 and 0.26-0.50 respectively, and none of them with ID > 0.50. The species can be potentially used as the learning media of the course were 13 species, including the morphology and anatomy of each species. The parts of the body of Lepidoptera comprising of podos, chephal, torax, abdomen, and ptera are the basic determination of the taxonomy. In brief, it was found that Lepidoptera with categories were sub-dominant and not dominant. Determination of the taxonomy relied on the various structure of morphology of each members of Lepidoptera according to examined level of taxonomy.

Keywords: Lepidoptera, Dominance Index, Lafarge, Lhoknga

Introduction

Lafarge Cement Indonesia (LCI) is a cement factory located in Lhoknga Aceh Besar, Aceh Province. It is between Mountain range Kubu (Gle) Badek, Gle Bale, and Gle Oshing of the group of Mountain Judah Aceh Besar (Ali *et al*, 2012). Cement is produced by several steps. The first step is exploding the lime stone as the raw material which is available in the mountain ranges around the factory. The lime stone is then processed to be materials that will bind with other materials before they become cement (Darusman, 2006). The area of Lafarge Cement Indonesia has many varieties of plants composing forest ecosystem around it (Ali *et al*, 2012). The ecosystem, natural and artificial, is the habitat of invertebrates and vertebrates.

Invertebrates are the groups of animal which are absent of vertebrae. Those animals are grouped into several phylums; Porifera, Annelida, Mollusca, Echinodermate and Arthropoda (Suwignyo, S., *et al*, 2005). They live in terrestrial and aquatic areas which the main ecosystems are forest, grassland, brackish water, fresh water, and sea. Each phylum has class, order, family, genus, and species that occupy each ecosystem. Arthropoda is one of the group of invertebrates in the area of the factory. The Arthropoda was found during sample collection from April to June 2012 consisting of Class Crustacea (5 species), Arachnida (2 species), and Insecta (36 species) (Ali *et al*, 2012).

Insecta living in the area according Ali *et al* (2012), comprises of 6 orders. The orders are Lepidoptera (Butterfly) 13 species, Odonata (Dragonfly) 5 species, Orthoptera (Locust) 10 species, Coleoptera, Homoptera 1 species and Diptera 2 species. Lepidoptera is one of orders with greatest number of species found in the area of LCI factory Lhoknga. The order is enriched by unique characteristics compared to others which are attractive body structure, various structure and colorful of wings, high reproductivity, complete metamorphosis, occupy unspecified habitat (Jumar, 2000).

These characteristics has put Lepidoptera as one of appropriate specimens used in learning and teaching activity. Determination their body parts can be used as the basic concept in verifying their taxonomy that is one of learning activities in studying insecta comprehensively. The species used as the specimen in practicum is a representative sample of a variety of insecta. This due the structure of the body, wings, and complete legs, and metamorphosis. Lepidoptera found in the area of LCI plant was 13 species. They had different species dominance level. Variation of their body and wings can be used as more detailed characteristics of basic determination to study the insecta in Kabupaten Aceh Besar dan Kota Banda Aceh. The study was aimed to determine 1) the structure of dominance of

Lepidoptera in the area of LCI plant Lhoknga Aceh Besar District, and 2) their morphological structures as basic determination of taxonomy in the area of LCI plant Lhoknga Kabupaten Aceh Besar. The benefit of the study is analysis of environmental changes occur in the area of the plant can be studied according to the existence of Lepidoptera.

Materials and Methods

The study was done in the area of Lafarge Cement Indonesia Lhoknga Kabupaten Aceh Besar from April to June 2012. The samples were collected in the location and identification done in laboratory of Biology Education FKIP Unsyiah Darussalam Banda Aceh.

The area of the study was divided into four stations; the area of Mountain Bale (Station I), the area of Mountain Kubu Badak (Station II), the area of Mountain Gle Bruek (Oshing) (Station III), and the area of LCI plant Lhoknga (Station IV). The stations were set according to types of ecosystem, condition and range of vegetation.

The point of observation was set for each station based on the presence of Lepidoptera in the area. The observation was done by exploration. The species found in the location were recorded. The collected Lepidoptera were grouped according to their characteristics. The characteristics were studied to find specific structures to determine the appropriate taxonomy.

Dominance of Lepidoptera was analysed by Index Dominance Formula as follows;

$$C = \sum \left[\frac{ni}{N} \right]^2$$

Where, C = dominan index of Lepidoptera, ni = jumlah individu setiap species, N = total individu semua species, if $0 < C \leq 0,5$ meaning low dominancy, $0,5 < C \leq 0,75$ meang moderate dominancy, $0,75 < C \leq 1,00$ is higher dominancy (Odum, 1971)

Results and Discussion

Lepidoptera Dominancy

The species of Lepidoptera dominantly found in the area of LCI plant Lhoknga Kabupaten Aceh Besar is shown in Table 2. There were 5 species of Lepidoptera found in Location I with dominance index was between 0.10 and 0.30. This indicated that the level of dominance was not dominant to subdominant. Lepidoptera found in Location II were 7 species with the index was 0.05 to 0.43. In location III, 11 species of Lepidoptera were identified with the index between 0.03 and 0.16. Eight species were found in Location IV with the index from 0.10 to 0.20. Those indexes indicated that the level of dominance were not dominant to subdominant (Tabel 1).

The study of one individual of Lepidoptera showed that there were seven body parts used as caharacteristics to determine their taxonomy. They were legs used in to determine the phylum. The legs had internodes. Therefore, they belonged to Lepidoptera. Borrer (1992) states that Arthropoda has internoded legs consisting of insects, prawn, spider, crabs, and Balanus. The legs vary according to each class and order. Generally, Crustacea and Insecta have ten and six legs respectively. The members of Arthropoda generally has well clearly divided body comprising of head, body and abdomen as characteristics to define the class. The head with its components can be divided into more specific parts. The words "in" which means the body becomes and "seccio" means sections make they into Insecta. Suwignyo *et al* (2005) states insecta comes from the word *in* means becomes and *seccio* means sections. Each insect has sectional body with the main parts are cephal (head), thorax, and abdomen. Those are the basic characteristis to detemine the class for members of Insecta (Jumar, 2000).

The Body Parts As The Basic Determination of Lepidoptera Taxonomy

The body parts can be used as the media in determination Lepidoptera taxonomy as shown in Table 2.

Table 1. Lepidoptera in the area of LCI plant

No.	Species	Site I	C	Site II	C	Site III	C	Site IV	C
1.	<i>Papilio memnon</i>	2	0.20	3	0.14	1	0.03	1	0.10
2.	<i>Pieris napi</i>	3	0.30	9	0.43	2	0.06	2	0.20
3.	<i>Danaus plexippus</i>	0	0.00	0	0.00	3	0.09	0	0.00
4.	<i>Ornithoptera paradisea</i>	2	0.20	0	0.00	4	0.13	1	0.10
5.	<i>Danaus melanippus</i>	2	0.20	3	0.14	4	0.13	1	0.10
6.	<i>Zemeros flegias</i>	0	0.00	1	0.05	3	0.09	1	0.10
7.	<i>Ratinda amof</i>	0	0.00	2	0.10	2	0.06	1	0.10
8.	Lepidoptera sp1.	0	0.00	0	0.00	4	0.13	0	0.00
9.	<i>Junonia iphita</i>	0	0.00	0	0.00	2	0.06	0	0.00
10.	Lepidoptera sp2.	0	0.00	0	0.00	5	0.16	2	0.20
11.	Lepidoptera sp3.	0	0.00	0	0.00	2	0.06	0	0.00
12.	<i>Attachus atlas</i>	0	0.00	2	0.10	0	0.00	0	0.00
13.	<i>Hypolimnias bolina</i>	1	0.10	1	0.05	0	0.00	1	0.10
Total		10		21		32		10	

Table 2. The parts of body as the media to determine taxonomy of Lepidoptera

No.	Parts of body	Used for recognition of the structure	Explanation
1.	Antenna	Antenna Structure	
2.	Ptera (Wings)	Study of the components of wings used as characteristic in determination taxonomy of Lepidoptera at level of order.	To determine the order
3.	Podos (Legs)	Study of Legs (podos) used for grouping of Lepidoptera into phylum Arthropoda	To determine the phylum
4.	Abdomen	Study of the structure of abdomen and its internodes.	To determine the class
5.	Ocelli (Eye)	Determination of the structure of the eye.	
6.	Caput (Head)	Introduce the structure of the species to be grouped into insecta	To determine the class
7.	Oris (Mouth)	Study of the structure of the mouth to determine the type of food	

At level of order, the main component can be used as basic determination of the taxonomy is wings (ptera). The pair of wings has scales (lepi). Combination of the two words, ptera and lepi, becomes Lepidoptera means the scaly wings. The scales will detach or dissociate after being touched. Defining of phylum of Lepidoptera was done by concerning the characteristics of their legs. The legs of Lepdoptera and the other group at the same phylum have different structure of those of other phylum. The name of class was determined by sections of their body whereas the name of order defined by the components of the wings.

Conclusions

The dominances of Lepidoptera in the area of Lafarge Cement Indonesia plant Lhoknga Kabupaten Aceh Besar were not dominant and subdominant. Determination of taxonomy of Lepidoptera in the area of the study was relied on various morphological structures for each level of studied taxonomy.

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