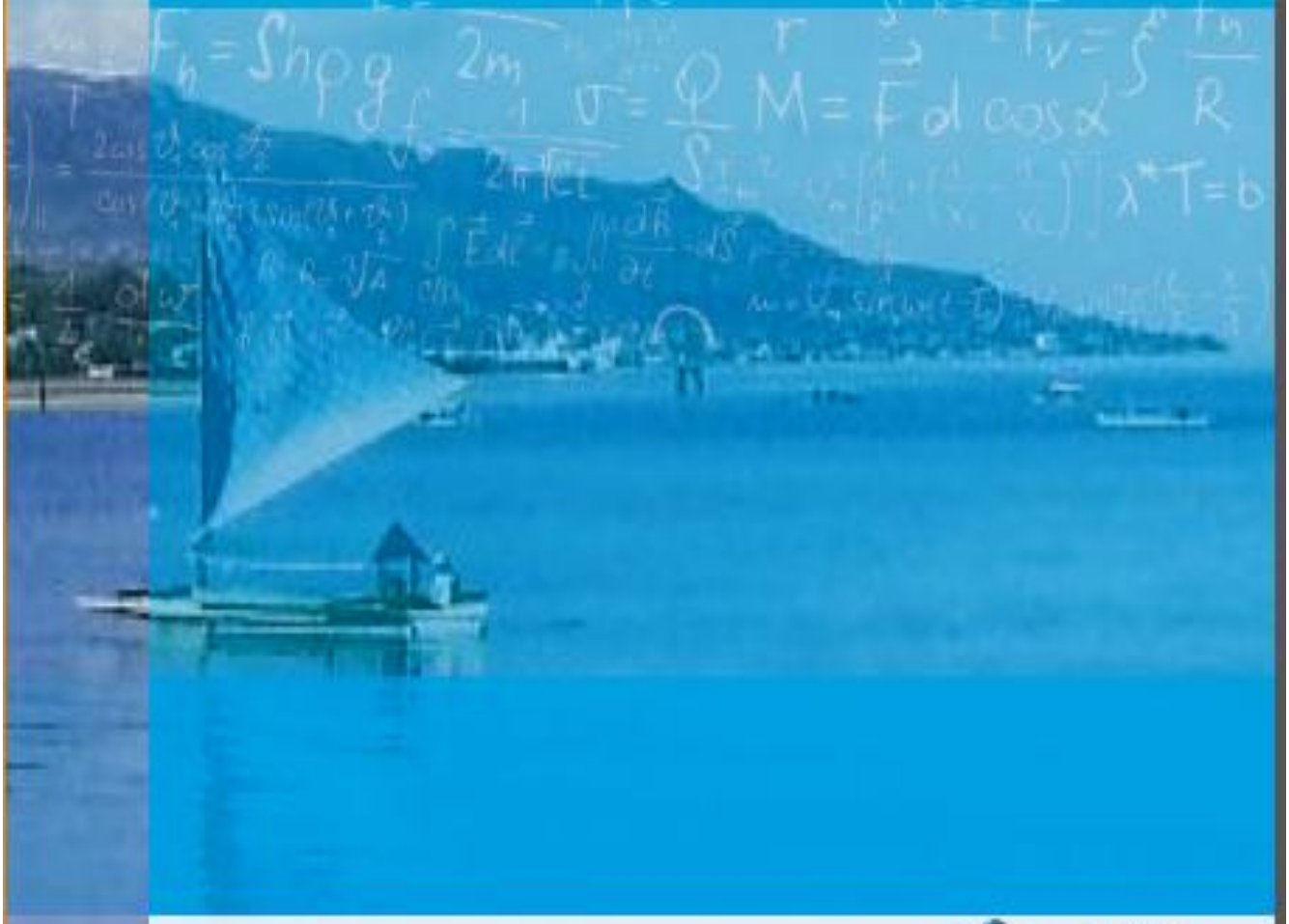
Basic Science
for Sustainable Marine Development

PROCEEDING
INTERNATIONAL SEMINAR 2015

Ambon, 3-4 June 2015



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Welcoming Address by The Organizing Committee

The honorable, the rector of Pattimura University

The honorable, the vice rector of academic affair, Pattimura University

The honorable, the vice rector of administration and financial affair, Pattimura University

The honorable, the vice rector of planning, cooperation and information affair, Pattimura University

The honorable, all the deans in Pattimura University

The honorable, the key note speakers and other guests.

We have to thank The Almighty God for the blessings that allow this International seminar can be held today. This is the first seminar about MIPA Science in which the Faculty of MIPA Pattimura University becomes the host. The seminar under the title Basic Science for Sustainable Marine Development will be carried out on 3 June 2015 at Rectorate Building, the second floor. There are 250 participants from lecturers, research institute, students, and also there are 34 papers will be presented.

This International seminar is supported by the amazing people who always give financial as well as moral supports. My special thanks refer to the rector of Pattimura University, Prof. Dr. Thomas Pentury, M.Si, and the Dean of MIPA Faculty, Prof. Dr. Pieter Kakissina, M. Si. I also would like to express my deepest gratitude to Dr. Kotaro Ichikawa, the director of CSEAS Kyoto University, Prof. Bohari M. Yamin, University of Kebangsaan Malaysia, Prof. Dr. Budi Nurani Ruchjana (Prisident of Indonesian Mathematical Society/Indo-MS), Dr. Ir. A. Syailatua, M.Sc (Director of LIPI Ambon), and Hendry Ishak Elim, PhD as the key note speakers. We expect that this international seminar can give valuable information and contribution especially in developing basic science for sustainable marine development in the future.

Last but not least, we realize that as human we have weaknesses in holding this seminar, but personally I believe that there are pearls behind this seminar. Thank you very much.

Chairman

Dr. Netty Siahaya, M.Si.

Opening Remarks
By Dean of Mathematic and Natural Science Faculty

I express my deepest gratitude to The Almighty God for every single blessing He provides us especially in the process of holding the seminar until publishing the proceeding of International Seminar in celebrating the 17th anniversary of MIPA Faculty, Pattimura University. The theme of the anniversary is under the title Basic Science for Sustainable Marine Development. The reason of choosing this theme is that Maluku is one of five areas in Techno Park Marine in Indonesia. Furthermore, it is expected that this development can be means where the process of innovation, it is the conversion of science and technology into economic value can be worthwhile for public welfare especially coastal communities.

Having the second big variety of biological resources in the world, Indonesia is rich of its marine flora and fauna. These potential resources can be treated as high value products that demand by international market. Basic science of MIPA plays important role in developing the management of sustainable marine biological resources.

The scientific articles in this proceeding are the results of research and they are analyzed scientifically. It is expected that this proceeding can be valuable information in terms of developing science and technology for public welfare, especially people in Maluku.

My special thanks refer to all researchers and reviewers for your brilliant ideas in completing and publishing this proceeding. I also would like to express my gratefulness to the dies committee-anniversary of MIPA Faculty for your creativity and hard working in finishing this proceeding, God Bless you all.

Dean of Mathematic and Natural Science Faculty

Prof. Dr. Pieter Kakisina, M.Si.

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THE STUDY OF BEE STINGLESS (Trigona spp) at NUSANIWE DISTRICT, AMBON ISLAND

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Abstract

This research aims to know the variety and colony of stingless bees (*Trigona* spp) at Nusaniwe district, Ambon island .This research was held on May until June 2014 by using quantitative descriptive method. Taking ten bees (population) was from each nest. The result shows that there were three kinds of Trigona spp at Nusaniwe district based on color morphology, they are white, brown, and black. Trigona spp was the majority with the black color (92 species), and the rests were white Trigona (16 species). 1.The nests of these three species were found at foundation store of home. 2.This size of bees workers white Trigona was longer than brown Trigona and the black Trigona. 3.The eggs of Trigona were puting by beesqueen in the bamboo, 4.while bee breads were putting by the bee workers in the middle until edge of bamboo and they were nearby the eggs.

Key words : Study, Trigona spp, Nusaniwe subdistrict in Ambon island

INTRODUCTION

Indonesia is known internationally as a country that is rich in honey bees (*Apis sp*). Bee is an insect that lives in groups despite the fact that not all bees are so. Entry in the family Apidae bees (Hymenoptera order: clear winged insects). The types of bees native to Indonesia namely Apis dorsata (forest bee), Apis cerana (local bee), Apis andreniformis (dwarf bee), Apis nigrocinta (Sulawesi local bee), Apis koschevnikovi (red bee), Apis nuluensis (mountain bee) and Trigona spp (bee klanceng). Bees make their nests on top of a hill, in trees and on rooftops. Nest is built from propolis (adhesive from the sap of the tree) and evening (beeswax) produced by the glands of worker bees strata contained in the abdomen (Hadisoesilo, 2001).

Stingless bee Trigona spp is one of the social insects that live in groups to form colonies. This bee included in the family Melliponidae that act as pollinators in addition to the various types of plants is also a producer of propolis (adhesive), bee bread (bee bread), and honey. Along with the deteriorating environment then this type of bee colonies increasingly depressed and will become extinct (Morgan, 2007). The characteristics of stingless bee, black, body length of 3-5 mm, 8mm wing span. Worker bees black, big head, and a sharp jaw. Queen bee brown, big-bellied, measuring 3-4 times the worker bees, moths similar but shorter wings. One of the social insects that live in colonies formed under the arrangement queen bee Trigona. Honey bee Trigona spp in the local language of Ambon called "Mai-mai toher" (Lamerkabel, 2005). This kind of bees originally less demand by the people on the island of Ambon since left the wild life, but now the potential cultivated to produce propolis (adhesive), bee bread (bee bread) and honey in addition to nutritious for health is also of high economic value (Lamerkabel, 2007).

Deployment of stingless bee (Trigona spp) in Indonesia is very diverse. Sumatra Island there are about 31 species, 40 species of Borneo island, Java 14 species, and the island of Sulawesi three types (Schwarz 1937 & Guntoro, 2013). Some of them are kind of Minangkabau and Trigona Trigona fimbriata (Sumatra), Trigona Trigona apicalis and Incisa (Borneo), Trigona Trigona terminata and incision (Sulawesi), Trigona Trigona laeviceps and moorei (Java), (Sakagami et al. 1990). While in West Nusa Tenggara identified two types namely clypearis and Trigona Trigona sapiens (BPTHHBK, 2012).

Habitat and media hive is one of the important factors for the growth, proliferation and production of bee Trigona spp. The natural habitat and media hive bee Trigona spp namely: in the cavities of the trunk or branches of trees, the bamboo sections, cracks door and window frames, cracks the foundation stone home, in a metal pipe, the cracks of the window frame glass louvre , in plastic pipes and electric meter box (Lamerkabel, 2009).

Nusaniwe sub-district is one of the districts on the island of Ambon, which has a variety of vegetation such as; Ketapang (*Terminalia catappa*), bintangur (*Calophyllum inophyllum*), coconut (*Cocos nucisfera*) and jackfruit (*Artocarpus*

heterophyllus) as a bee forage plants Trigona spp. The objective of this research was conducted with the aim, among others, to determine the types and number of colonies, tembat nesting, morphology (size and color abdomen strata of workers) and the location of the eggs and products - products in natural nests stingless bee (*Trigona spp*) in Nusaniwe districts of the island of Ambon.

MATERIALS AND METHODS

TIME AND PLACE OF RESEARCH

The research activities carried out in May to June 2014 in the district Nusaniwe (hamlet Eri, Airlouw hamlet, village and village Latuhalat Series) island of Ambon and laboratory identification stage in the laboratory Department of Biology, Faculty of Mathematics, University of Pattimura.

TOOLS AND MATERIALS

The tools used in this study are: stationery, digital camera, plastic bags, Millimeter blocks, rubber bands, collection bottles, paper labels, sterio microscope, petri dish, tweezers, glass objects, pengaris. The materials used in this study are cigarettes, alcohol 70%, specimens stingless bee (Trigona spp).

WORK PROCEDURES

Preparation Phase

Determining the locations of the presence of stingless bee Trigona spp on the island of Ambon Nusaniwe districts namely Seri village, village Latuhalat. Airlouw village, hamlet Eri. Preparing the tools used during the study.

Implementation Phase

Steps are in this phase are:

1. Conduct a survey on the location of forest and settlements in the district Nusaniwe (hamlet Eri, Airlouw hamlet, village and village Latuhalat Series) to detect stingless bee (*Trigona spp*).

2. Once found the stingless bee Trigona spp then carried out the arrest of ten people (population) of each nest to be identified.
3. Catching bee done in a way, put a plastic bag that had contained cigarette smoke in front of the hive entrance funnel.
4. The bees are placed on paper millimeter block for subsequent measurement of the bee's body and then inserted into the collection bottles which had contained 70% alcohol.
5. documentation on the outside of the nest construction (doors funnel) and the construction of the inside of the nest (eggs, bee bread, propolis and honey) stingless bee Trigona spp found.
6. Bees strata of workers who were arrested were identified in the laboratory using a microscope sterio to determine the color.

Data Collection Methods

The method used in this research is the survey method to determine the location of potential bee by the information society.

Data Analysis Techniques

Analysis technique used is descriptive qualitative data analysis that presents data in the form of tables, images and descriptions description of the type (Court, 2002).

RESULTS AND DISCUSSION

RESULTS

Types of Bees *Trigona spp*

Research conducted in the districts Nusaniwe (village Series, Latuhahalat village, hamlet and village Airlouw ERI) found three types of bees Trigona spp based morphology funnel door color (white funnel, funnel funnel brown and black). The types of bees *Trigona spp* spread on each villages and hamlets in the district Nusaniwe (Table 1 and Figure 4). In the villages and hamlets Airlouw Series there are three (3) types of Trigona spp, namely *Trigona white funnel*, *funnel Trigona Trigona brown and black funnel while* on Latuhalat village, 2 (two) types of Trigona

spp, which funnel Trigona Trigona brown and black funnel and hamlets Eri only have one (1) type of *Trigona spp,* namely Trigona black funnel. *Trigona spp* types found in the study sites mentioned kind by color funnel door namely: Trigona white funnel, funnel *Trigona Trigona brown* and black funnel.

Table 1. Types Trigona spp By Color Funnels

Subdistrict Nusaniwe	Types Trigona spp		
	Trigona white funnel	Trigona brown funnel	Trigona black funnel
Village Series	+	+	+
Latuhalat village	-	+	+
Hamlet Airlouw	+	+	+
Eri hamlets	-	-	+

Description: + (there) and - (none)

Source: Research Data, 2014.

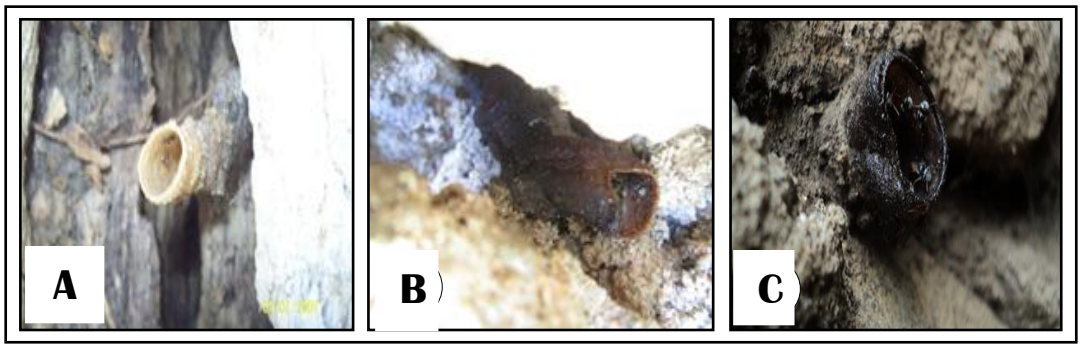

Figure 4. Types of Bees Trigona spp Morphology Based Color funnel.

Notes: a) Trigona white funnel, b) Trigona brown funnel and Trigona black funnel

Source: Documentation Research, 2014

Colonies on each type Trigona spp

The results showed that the amount and average colony on each type of Trigona spp (Trigona white funnel, funnel Trigona Trigona brown and black funnel) and the respective villages and hamlets in the district Nusaniwe also different (Table 2).

Table 2. Number and Average Colonies on each type Trigona spp in each village and hamlet in the district Nusaniwe

Subdistrict Nusaniwe	Types Trigona spp		
	Trigona white funnel	Trigona brown funnel	Trigona black funnel
village Series	14	23	47
Latuhalat village	-	3	7
hamlet Airlouw	2	18	36
Eri hamlets	-	-	2
Number	16	44	92
Average	4	10	23

And the average number of the largest colonies of Trigona is a type of black funnel that 92 colonies and 23 colonies followed Trigona brown funnel 44 colonies and 10 colonies and Trigona white funnel 16 colonies and 4 colonies. At Nusaniwe districts, the number of colonies found in the village of Seri is 84 colonies, 10 colonies were Latuhalat villages, hamlets Airlouw is 56 colonies and hamlets Eri are two colonies. The number of colonies of bees Trigona spp Nusaniwe is the highest in the district in the village of Seri ie 84 colonies fewest on Eri village is 2 colonies.

Nesting place of each type Trigona spp

The results showed that the nesting place of each type Trigona white funnel, funnel Trigona Trigona brown and black funnel on Nusaniwe districts also different,

namely the slit stone house foundation, sections of bamboo, glass louvre frame slit, slit wallboard house, home pole gap, gap in the wall and a crack house wall trees (Table 3 and Figure 5).

Table 3. Nesting Place of Each Type Trigona spp

Nested place	Types Trigona spp			Number
	Trigona white funnel	Trigona brown funnel	Trigona black funnel	
Cracks Foundation Home	9	14	29	52
Cracks Wall Board	-	2	5	7
In Ruas Bamboo	1	11	23	35
Cracks Pole Houses	-	1	3	4
Wall Cracks Wall	-	6	5	11
Frame gap Nako	-	9	18	27
Cracks Trees	6	1	9	16
Number	16	44	92	
Totals				152

Source: Research Data, 2014

Trigona spp nesting sites were found in a crack house foundation is 52 nests with the type Trigona Trigona spp found that white funnel 9 types, chocolate funnel Trigona Trigona 14 species and 29 species of black funnel. Cracks wall board is 7 nest with type Trigona Trigona spp found that two types of chocolate funnel, funnel black Trigona 5 types. In the section of bamboo is 35 nests with the type Trigona Trigona spp found that one type of white funnel, funnel Trigona brown 11 species, 23 species Trigona black funnel. Home pole gap is 4 nest with type Trigona Trigona spp found that one type of chocolate funnel, funnel black Trigona 3 types. Slit walls are

11 nests with the type Trigona Trigona spp found that chocolate funnel 6 types, Trigona black funnel 5 types. Nako frame gap at 27 nests with the type Trigona Trigona spp found that chocolate funnel 9 species, 18 species Trigona black funnel. Cracks tree that is 16 nests with the type Trigona Trigona spp found that white funnel 6 types, one type of chocolate funnel Trigona, Trigona black funnel 9 types.

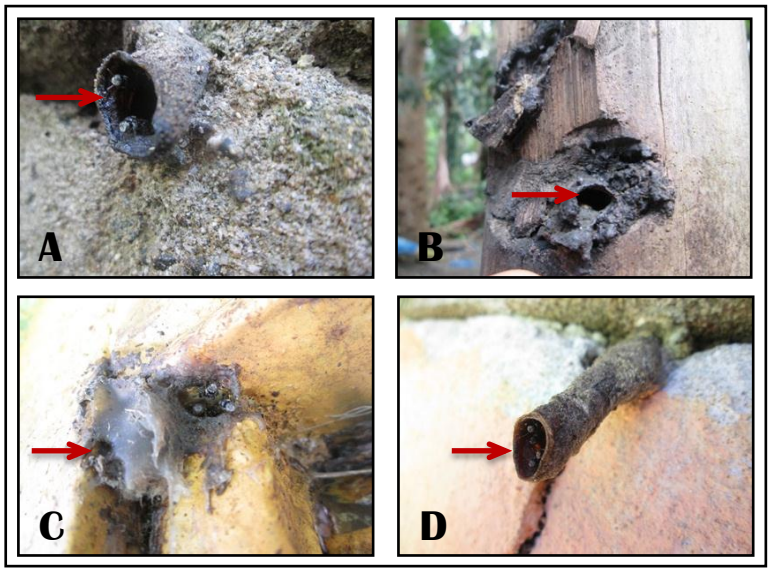

Figure 5. The nesting bees Trigona spp.

Notes: a) The foundation of the house, b) Segment bamboo, c) Frame Nako, d) Cracks wall

Source: Documentation Research, 2014

Workers Strata morphology of types of Bees *Trigona spp*

The results showed that body size and color of the abdomen, strata of workers of the types of white funnel Trigona bees, Trigona Trigona funnel funnel brown and black are also different (Table 4: Figure 6 and 7). Body length and color of the abdomen of worker strata of white funnel Trigona types, namely 5 mm, brown and white abdomen. Type Trigona brown funnel has a body length of 4 mm and abdomen brown and black colors. While the black funnel Trigona has a length of 4 mm and abdomen black. Based on the length of the body, it can be said that the strata worker bees Trigona types of white funnel has a longer body than the strata of workers Trigona black funnel.

Table 4. Morphology strata of workers from the kinds of bees Trigona spp

Type *Trigona* spp	Strata morphology Workers	
	Body length	color Abdomen
Trigona white funnel	5 mm	brown and white
Trigona brown funnel	4 mm	brown and white
Trigona black funnel	4 mm	black

Source: Research Data, 2014

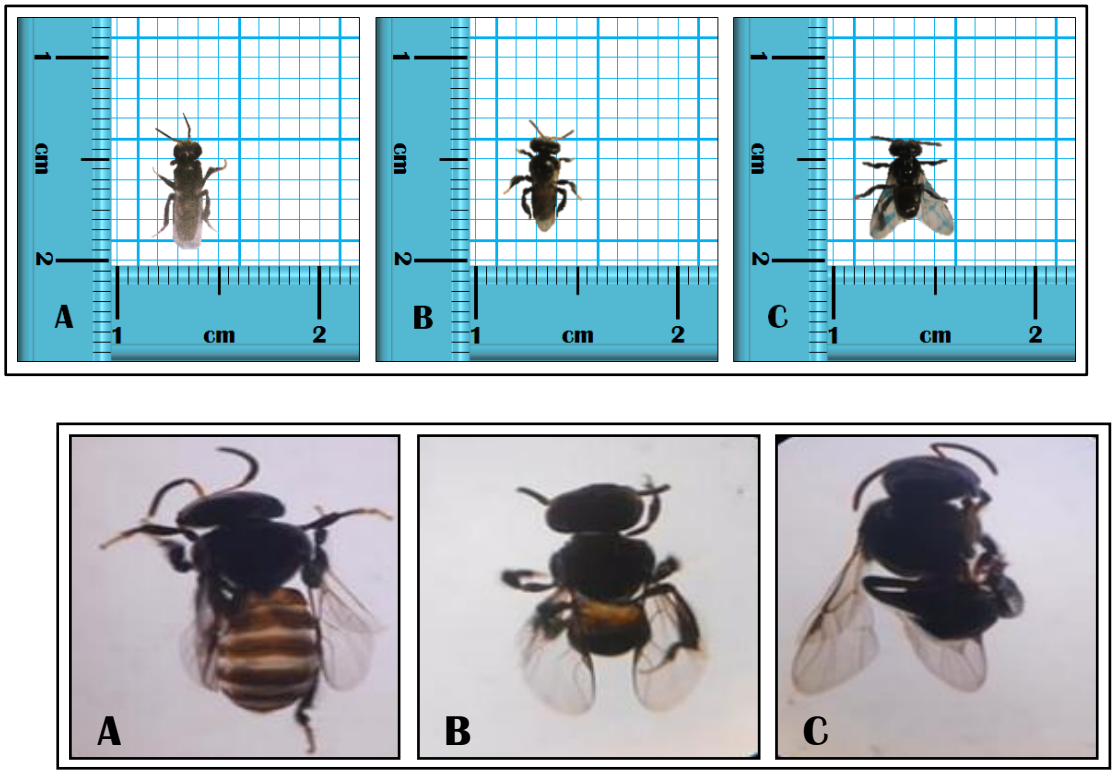

Figure 7. Color Abdomen Strata Workers Trigona sp
Notes: a) Trigona white funnel, b) and c Trigona brown funnel) Trigona black funnel
Source: Documentation Research, 2014

Layout eggs and products Bee Trigona spp

Research on the location of the eggs and products of bee Trigona spp, namely: propolis, bee bread and honey made on the type Trigona black funnel. The observation lies the eggs of black funnel Trigona is located in the central part of the area until the end of the bamboo nest As for the location of propolis is on the inside from the entrance, the middle part, wrapping parts honey, bee bread wrapping section and egg wrapping area. Location of bee bread that is in the middle of the nest and the area around the eggs, while the location of the honey that is in the tiddle and the end of the nests were placed randomly

DISCUSSION

The results of research in the District is in the village Nusaniwe Series, Latuhalat village, hamlet and village Eri Airlouw found three types of bees Trigona spp based on morphological color funnel door are: Trigona white funnel, funnel Trigona Trigona brown and black funnel. Funnel door (color, shape and size) of the stingless bee (Trigona spp) can be used as a determinant in identifying the types (species) bee Trigona spp are found in the district Nusaniwe. Wide and narrow distribution area as well as lots and the small number of types of Trigona spp influenced by the availability of forage plants that provide nectar, pollen and resin as feed bees and the environment that supports a breeding place (Sihombing, 2005).

Noting the research data in Table 1, then allegedly villages and hamlets Airlouw Series has a feed plant and a better environment than the Latuhalat villages and hamlets Eri. In the villages and hamlets Series Airlouw found feed plants containing nectar, pollen and resin as feed bee Trigona spp, such as: Ketapang (Terminalia catappa), bintangur (Calophyllum inophyllum), coconut (Cocos nucisfera), jackfruit (Artocarpus heterophyllus), mango (Mangifera indica), Breadfruit (Artocarpus communis), Rambutan (Nephellium lappacium), guava (Eugenia sp) and roses (Rose sp).

Nested place and amount Bee colony Trigona spp. Based on the nesting site (Table 3) of each type of Trigona spp (Trigona white funnel, funnel Trigona Trigona brown and black funnel), the highest nesting site is at the foundation of the house and the fewest gap in the pole gap home.

Lamerkabel (2009) states that, bee Trigona spp have the ability to choose the media where nesting. Based on the average number and the largest colony is on a kind of black funnel Trigona is 92 colonies and an average of 23 colonies followed Trigona brown funnel ie 44 colonies and an average of 10 colonies and white funnel Trigona is 16 colonies and an average of 4 colonies. The number of honey bee colonies Trigona Trigona spp highest and lowest black funnel is a funnel Trigona white. This is because the power of adaptation and deployment of these types of black funnel Trigona Trigona funnel is better than white, the highest number of colonies in the village of Series 84 colonies and the lowest in the hamlet of Eri 2 colonies. This is because the forage plants (producing nectar and pollen) contained in the settlement villagers Series more flowering when compared to forage plants contained in neighborhood Eri village, but it also environmental factors such as temperature and humidity also affect the development of the colony. Strata morphology Worker Bees Trigona spp.

In general, the honey bee Trigona spp commonly known by the people on the island of Ambon with the name "Mai-mai toher" (Lamerkabel, 2005). Specific characteristics of the stingless bee Trigona spp namely the front of the head of gray combined with black, black abdomen there is a ring of white and dark brown slightly hazy, white wings. Has three pairs of legs that are all jointed. On a body surface covered by worker bees fine hairs while the rear legs are feather and has small thorns smooth. Docile temperament, not stingless and do not like to change places.

The body length and color of the abdomen of a kind Trigona white funnel, funnel Trigona brown, and black funnel Trigona each is 5 mm and white chocolate; 4 mm and dark brown; 4 mm and black. Trigona worker's body size strata white funnel longer than Trigona Trigona funnel funnel brown and black. It is suspected that the white funnel Trigona is a different type or species of the Trigona Trigona funnel funnel brown and black. Similarly, the color of the abdomen on a type of white funnel Trigona is a combination of brown and white. Layout eggs and products Bee Trigona spp

Research on the location of the eggs and products of bee Trigona Trigona spp done on the type of black funnel in a bamboo nest consists of the construction of the nest is eggs, bee bread, honey and propolis. The location of the black funnel Trigona eggs in the nests of media bamboo is at the center. This is because the queen bee laying eggs with the goal of keeping the eggs are protected from predators. Lamberkabel (2013) states that the

honeycomb Trigona spp consists of eggs which are shaped like green beans are placed in the middle near the bee bread. While propolis and honey placed separately. Each nest is composed of several parts that are used to store honey, bee bread, bee propolis and eggs.

Cultivator stingless bee Trigona spp very easy, not depending on the season of flowering and honey prices are relatively expensive. Making process of the natural colony to colony into stup removal very easy, taking from nature taken from the trunk decayed wood, bamboo, and crevices of rocks. The transfer of colonies is done at night so that members of the colony had returned to the nest.

CONCLUSIONS AND SUGGESTIONS

Conclusion

The conclusion of this study, namely:

1. Found three types or species of bees Trigona spp in the district Nusaniwe Ambon island hopper door based on morphological color is white funnel, funnel brown and black funnel
2. The colony of bees Trigona Trigona spp most is the kind of black funnel (92), and fewest Trigona is a type of white funnel (16).
3. Place the nesting bee Trigona white funnel, funnel Trigona brown, black funnel Trigona is in a cleft stone house foundation.
4. Body size strata worker bees Trigona types of white funnel is longer than the type Trigona Trigona funnel funnel brown and black.
5. Eggs Trigona black funnel strata laid by the queen bee in a nest of bamboo that is in the middle. Bread (bee bread) placed by strata worker bees in the hive bamboo that is the middle to the end and always adjacent to the egg.

Suggestion

Based on the research results, it is necessary to do further research on the production of honey, propolis and bee bread on a variety of natural nests as well as the identification of the types of Trigona spp are found in the district Nusaniwe, the island of Ambon.

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