HOKKAIDO UNIVERSITY

Title	Understanding Indonesian Natural Diversity : Insect-Collecting Methods Taught to Parataxonomists During DIWPA-IBOY Training Courses
Author(s)	Darnaedi, Dedy; Noerdjito, Woro A.
Citation	Edited by Hisatake Okada, Shunsuke F. Mawatari, Noriyuki Suzuki, Pitambar Gautam. ISBN: 978-4-9903990-0-9, 245-250
Issue Date	2008
Doc URL	http://hdl.handle.net/2115/38473
Type	proceedings
Note	International Symposium, "The Origin and Evolution of Natural Diversity". 1–5 October 2007. Sapporo, Japan.
File Information	p245-250-origin08.pdf

Instructions for use

Hokkaido University Collection of Scholarly and Academic Papers : HUSCAP

Understanding Indonesian Natural Diversity: Insect-Collecting Methods Taught to Parataxonomists During DIWPA-IBOY Training Courses

Dedy Darnaedi* and Woro A. Noerdjito

Research Center for Biology, Indonesian Institute of Sciences, Jl. Juanda 18, Bogor, Indonesia

ABSTRACT

In order to reach the goals of DIVERSITAS in West Pacific and Asia - International Biodiversity Observation Year (DIWPA-IBOY), it is necessary to build capacity in the region by the participating institutions. A series of Parataxonomist Training Courses on the key major orders of insects have been organized during the years 2004–2006. A total of 49 participants from 27 Institutions in Indonesia have been trained. These courses have been hosted by Museum Zoologicum Bogoriense and Research Center for Biology, Indonesian Institute of Sciences (RC Biology-LIPI), and financial and technical support came through several Japanese Center of Excellence programs supporting the DIWPA-IBOY activities. These courses emphasize field biology through a range of activities, from basic lectures and practical exercises or field works, required for independent research in the highly diverse natural environments of the region. During these trainings, focus was on insect specimens collected by entomological staffs of Bogor Zoological Museum during IBOY sampling activities at Gunung Halimun National Park (a core site) in 2002–2003. The insect collection section at the Bogor Zoological Museum benefitted significantly from the processing of these specimens by the course participants during the courses. Thus the courses contribute not only from the point of capacity building, but also in term of collections and identification of the Indonesian insect diversity. Such parataxonomist training courses now need to be extended both into different group of organisms and into different regions throughout the country. Parataxonomists graduating from such courses will be organized into a Parataxonomist Association through which they will be able to contribute to the Indonesian Global Taxonomy Initiative (GTI-CBD).

Keywords: Capacity building, Parataxonomist, Indonesian biodiversity

INTRODUCTION

Indonesia is an archipelago state, with thousands of islands scattered in the tropical belt between the Pacific and Indian Oceans, and between the Asian and Australian continents. Indonesia is endowed with rich and unique biodiversity. Indonesia's development activities have often relied on the existence and potential of its natural resources, including biodiversity. Biodiversity is a national asset for development and the prosperity of the nation. It also has been regarded as a resource that can be exploited easily with little regard for its sustainability.

Indonesia has an important position in terms of global biodiversity, since it is one of the ten countries with the highest biodiversity, often known as mega-diversity countries [1]. If marine resources are also taken into account, Indonesia could well be on

*Corresponding author, e-mail: dedyd@indo.net.id

Information for use in citing this article: Okada, H., Mawatari, S.F., Suzuki, N. and Gautam, P. (eds.), *Origin and Evolution of Natural Diversity*, Proceedings of International Symposium "The Origin and Evolution of Natural Diversity", 1–5 October 2007, Sapporo, pp. 245–250.

the top of the list in terms of biodiversity richness. Biogeographically, the country is also the center of origin for many groups with very high endemism. However, existing figures regarding the Indonesian biodiversity are often based on quick estimates and rapid assessments, and they still need to be supported by scientific data, based on the real numbers of species and authentic reference collections.

In the last decades, Indonesia has intensively exploited its natural resources, including biodiversity. Some government forest harvest policies were well designed, but their implementation in the field was not controlled. Consequently many places in Indonesia now are seriously degraded and land use management is the main problem on many islands. Forest destruction and extensive plant exploitation is still going on at a high rate. Lately, illegal logging is an issue which has attracted the attention of the international support and donor countries. Lowland forest has been intensively opened for many purposes, such as new agricultural land, plantation, housing and any others. According to the World Bank estimation (2001), lowland forest in Sumatra would have gone by 2005, where as those in Kalimantan in 2010 and in Sulawesi in 2000 [2].

Meanwhile, the scientific community dealing with biodiversity still has no firm knowledge on the living organisms around us. We have little chance to collect, identify, give names and utilize them. Many plant and animal organisms may become extinct before we will be able to record them. We have to hurry up to record and then conserve them from extinction. Biological inventory is one activity which has to be given a top priority. Training parataxonomists through organized courses is one of the ways to speed up progress in identifying our biodiversity. Insects are one of the most diverse groups of organisms and so courses focused on them are highly recommended.

INDONESIAN REFERENCE COLLECTIONS

Although the island archipelago covers only 1.3 percent of the Earth's land surface, it includes 12 percent of all the world's mammals, 16 percent of the reptile and amphibian species, 17 percent of the world's birds and 25 percent or more of the world's fresh water and marine fishes [2]. Zoological specimens in Bogor Zoological Museum represent an important national reference collection and a primary source in estimating Indonesian animal diversity. The zoological collection comprises more than 2 million identified specimens, preserved in dry and wet or fluid collections (Table 1) [3].

In the last five years additional collections of zoological specimens have been made by the museum staffs and foreign researchers. Some of them are important type collections. More than 500,000 insect specimens have been collected from different places, including those collected during International Biodiversity Observation Year (IBOY) sampling activities at Gunung Halimun National Park (IBOY core site) in 2002–2003 by entomological staff of the museum. The records show that about 14,000 specimens of Lepidoptera, 34,500 specimens of Hymenoptera, 25,500 specimens of Coleoptera and 20,000 specimens of Diptera were deposited in the Museum. Some of these were used as a working collection for the parataxonomist training courses and others will be selected as museum reference collections.

SHORT FIELD VISITS BY A LARGE NUMBER OF COLLECTORS

General surveys and rapid assessments conducted in many places in Indonesia often result in new records, and or even discovery of new species. For example, in only 22 days of exploration (27th of

Table 1 Collections of the Bogor Zoological Museum [3].

Taxon	Number of Specimens	Species	Type specimens
Mammals	22,300	450	88
Birds	30,000	1,200	800
Insects	2,000,000	10,000	3,200
Molluscs	12,000	2,400	26
Amphibians	4,000	150	60
Reptiles	4,700	340	25
Freshwater fishes	11,000	1,200	239
Crustaceans	1,500	700	24
Other invertebrates	25,000	700	?

April to 18th May 2007) in the Foya mountains (Mamberamo, Papua) carried out by Research Center for Biology, Indonesian Institute of Sciences (RC Biology-LIPI) in collaboration with Conservation International, scientists discovered new species of bird, frog, and big palm. A total of 30 palm species, consisting of 17 genera, have been identified from the trip. Several palm species from the genera *Licuala, Linospadix* and *Ptyshosperma* are expected to be new species (Mogea, 2007 pers. comm.). Other collections, such as reptiles and amphibians, birds, ants, fishes and mammals are still under intensive examination by scientists, but some are likely to be new records or new species. Amongst the species collected, many species are new for the collection at our museum. At least six New Guinea endemic mammals were newly recorded. Some other taxa have broad variations in many characters, and further study is going on. These collections and findings are a great contribution to our understanding of the living organisms in the area concerned. General collecting in certain places by many different taxonomic experts seems more efficient compared to collecting selected groups of plant or animal over their broad distribution range. Of course, involvement of many experts in closely-related groups of animals (e.g., a group of entomologist specializing in different families) will be even more efficient. Such an optimal situation has been demonstrated by the entomological teams under the DIWPA-IBOY project (DIVERSITAS in West Pacific and Asia-International Biodiversity Observation Year).

NEW TOOLS FOR INSECT COLLECTION

As a very large group of living organisms, insects have different kinds of life cycles and live in different habitats. Some groups live on the ground, some under the forest floor, in the soil, and some in the forest canopy. They are active by day or by night. Therefore, insect collectors need to plan carefully before they go to the field for collection activities. Equipment needed and methods of collecting are very different from one group of insects to the others. Therefore, DIWPA-IBOY activities that introduce different kinds of insect trapping methodology to participants during a training course are very important. The participants not only learn how to trap the insects, but also develop skills on how to organize samples and correctly manage the collections.

During the training courses, six methods of insect collections were introduced and demonstrated in the field, followed by sorting specimens from each trap. The following collection traps/methods were adapted following the guidelines for biodiversity research methods of IBOY in Western Pacific and Asia [4]:

Light trap

This method uses "Pennsylvania style light trap" modified for rain forest areas, as designed by Frost in 1957 [4]. Three sets of two traps, one at the ground level and other in the canopy, are operated simultaneously at three randomly determined points within a one-hectare permanent plot. The light trap points are selected so that no set of traps is visible

Fig. 1 Light traps, set up on canopy (LTC) and ground level (LTG).

from any other set (Fig. 1). During the courses, the light traps attracted numerous insects. Hence, participants at first concentrated on sorting the Lepidoptera and Coleoptera specimens/species?

Malaise trap

The tent trap known as Malaise trap was first described by Malaise in 1937 [4]. IBOY methods use commercially manufactured Malaise traps that have a collector at only one end of the trap (Fig. 2). This is filled with water mixed with a little bit of detergent, as a killing agent. The specimens collected are preserved in 70% ethanol. Three sets, each comprising two Malaise Traps, were also set up, one at ground level and the other one hauled into the canopy on rope, at three points randomly determined within the one-hectare permanent plot.

Window trap

It works on the principle of flight interception, like Malaise trap, and visual attraction. Such traps sample a wide range of flying insects, particularly stronger flying insects such as Diptera, that collide with transparent vanes (the "windows") and drop into collecting bucket, and attract some groups of insects such as bees and Homoptera by the color of the bucket or the reflection of the vanes. Window traps with a yellow bucket also work as yellow pan-traps and can be set at given layers of forest. A window trap comprises a roof, two transparent vanes

Fig. 2 Malaise traps, set up on canopy (MTC) and ground level (MTG).

Fig. 3 Window traps, set up on canopy (WTC) and ground level (WTG).

Fig. 4 Canopy knockdown. *Left*: "Backpack sprayer", and *right*: "Collecting hoops".

Fig. 5 Bark Spraying. *Left*: Spraying on bark with household insecticide, and *right*: brushing after 30 minutes.

that intersect vertically and a yellow plastic collecting bucket (Fig. 3). The collecting bucket contains water to which a little detergent has been added. The specimens collected are preserved in 70% ethanol. Two traps, one in the canopy and the other at ground level, were set up at each of three points randomly determined within the one hectare plot.

Canopy knockdown

This method is for sampling free-living arthropod fauna, including insects of the forest canopy, using a cloud of short-lived, quick-acting pyrethrum (or pyrethroid) insecticide. In this method, a modified backpack sprayer is used to produce an insecticidal cloud of slightly higher droplet size. The spraying event takes place far from the one hectare permanent plot. A stout horizontal branch is needed to

Fig. 6 Pit Fall traps: Standard 57 mm plastic tubes used as traps.

bear the considerable weight of the spraying machine. Twenty 0.5 m^2 collecting hoops are hung within a 10 x 10 m plot under the selected target collecting tree. Collecting hoops are funnels of white plastic fabric. An elasticized sleeve is sewn into the bottom of the funnel. An ethanol-filled collecting vial is fitted into the system (Fig. 4). After 30 minutes spraying, any arthropods that have fallen into the funnels are collected and preserved in 70% ethanol.

Bark spraying

This method uses a simple technique that involves suspending a collecting hoop (Fig. 5), against a segment of tree bark at about chest height. The hoop is pinned tightly to the bark, then the corners of a vertically-oriented segment of bark (1 m x 0.5 m) above the edge of collecting hoop are marked. The segment of bark is sprayed using an aerosol can of proprietary household insecticide, again based on simple pyrethrums with pyperonyl butoxide as a carrier. Each half square meter is sprayed with insecticides for about 20 seconds from a distance of about 1 meter. Over the next 30 minutes, the bark is brushed down gently using a camel-hair paintbrush into the plastic screw-top container placed at the base of the collecting hoop. Specimens are preserved in 70% ethanol.

Pitfall trap

Standard 57 mm diameter plastic tubes are used as traps (Fig. 6). Each has perfectly smooth sides preventing escape of animals once caught. One sampling unit has 5 tubes, set up as a cross with arms 1 m from the center point. Each tube is filled one-third full with a detergent-water mixture as a killing agent, and specimens collected are then preserved in 70% ethanol.

CONCLUSIONS

Selected collecting methods adapted for tropical region were introduced to the participants of the DIWPA-IBOY training courses on insects. Their adaption resulted in effective learning and development of skills in collecting insects and the management. of the insect collections. As the insects live in many kinds of habitats (on the ground, under soil, flying), these methods had to be implemented simultaneously to be able to sample a complete set of insects in their natural habitats. Besides, managing these huge samples also required special efforts.

Methods for collecting other groups of animals and plant are naturally quite different from those applied in collecting insects. But the concerted collecting methods introduced by entomologists should inspire experts in other groups of organisms to create efficient field sampling methods, which are suitable for deployment in the field within a short time. It is desirable that such courses for training parataxonomists specialized in insect collections get replicated in different parts of Indonesia.

REFERENCES

1. Primack, R.B., Supriatna, J., Indrawan, M. and Kramadibrata, K., 1998. Biologi Konservasi. Yayasan Obor Indonesia. Jakarta. (In Indonesian)
2. National Development Planning Agency (BAPPENAS). 2003. Indonesian Biodiversity Strategy and Action Plan 2003–2020. 140pp.
3. Priyono, S.N., 2000. Reference Collection of the Bogor Zoological Museum, Cibinong, Indonesia. Nat. Sci. Mus. Monogr., 18, 25–32.
4. IBOY-DIWPA, 2002. Biodiversity Research Methods. IBOY in Western Pacific and Asia. Kyoto University Press, Japan.