Soil insect diversity comparison between dry dipterocarp forest and mixed deciduous forest of northeastern Thailand

Wanichaya Charoonphong[1*] and Pongthep Suwanwaree[2]

ABSTRACT: Study of abundance and diversity of soil insects in plant genetic protection area of RSPG, Nampung dam EGAT, Phu Phan district, Sakon Nakhon province was manipulated between December 2011 and August 2012. The aims of this project are to study conserving plant genetic diversity in plant genetic diversity in protected areas following the project undertaken through the initiative of her Royal Highness Princess Maha Chakri Sirindhorn (RSPG) in Plant Genetic Protection Area of RSPG, Nampung Dam EGAT and to check and list insects in soil. The sampling areas were conducted by survey in dry deciduous forest (DDF) and mixed deciduous forest (MDF) for 4 times. The result observed that there were 6 orders and 20 families of soil insects found during survey. There was totally 1,804 soil insects observed in DDF areas (934 individuals) and MDF areas (870 individuals). The Formicidae family was the most abundant (1,411 individuals) followed by the Termitidae family (256 individuals) and the Blaberidae (41 individuals), respectively. The biodiversity index of DDF areas is 0.7975, which is less than MDF areas (1.545). It can be concluded that DDF areas have more abundance than MDF areas but diversity of soil insects in MDF areas was higher than DDF areas.

Keywords: soil insects, Nampung dam EGAT, Dry Dipterocarp Forest, Mixed deciduous forest

Introduction

Plant Genetic Conservation Project under the Royal Initiation of Her Royal Highness Princess Maha Chakri Sirindhorn, Nampung dam EGAT is located on Phu Phan Mountain. It is a large forest of the Northeast that has a wide variety of terrain with an evergreen forest, deciduous forest, limestone, mountains, streams and reservoir. There is an abundance of plants and wildlife species, including insects in the soil. The insects are major group of organisms in the ecosystem. They are mainly responsible for decaying the litter to help soil micro fauna and to decay other things, respectively (Kladivko, 2001). It is also an engineer of ecosystems (ecosystem engineering) to change the structure, physical characteristics and soil chemical. These can give nutrients to soil and the better exchange of air, water with the environment (Lavelle, 1997). It also helps to control the spread of pests in agriculture by controlling the balance of the ratio between insect predators on insect herbivores (Tillman et al., 2004).

Study of abundance and diversity of soil insects in plant genetic protection area of RSPG, Nampung dam EGAT, Sakon Nakhon. The aims of this project are to study conserving plant genetic diversity in plant genetic diversity in protected areas following the project undertaken

[1] Department of Environmental Science, Faculty of Science, Udon Thani Rajabhat University, 41000 Thailand
[2] School of Biology, Institute of Science, Suranaree University of Technology, Nakhon Ratchasima, 30000, Thailand
* Corresponding author: Wani383@hotmail.com

through the initiative of her Royal Highness Princess Maha Chakri Sirindhorn (RSPG) in Plant Genetic Protection Area of RSPG, Nampung Dam EGAT and to check and list insects in soil. The information from this study will contribute to our current knowledge and understanding of ecological changes, and is expected to be useful for the management and conservation of terrestrial ecosystems.

Materials and Methods

Two study types of forest at Plant Genetic Protection Area of RSPG, Nampung Dam EGAT were selected: Dry dipterocarp forest and Mixed deciduous forest. Samples were collected in 4 times contained with November 2011, February, May and August 2012, respectively. Soil insect sampling method was modified from Suriyapong (2003).

Soil sample was randomly dug at 10-15 centimeters depth in each plance. The soil insect samples were collected by hand (hand sorting) and transferred to the laboratory, at Udon Thani Rajabhat University. Macroinsects in soil were hand-picked and soils were left at 30 °C temperature for one hour in a modified Berlese funnel and kept into 70% ethanol (Kaczmarek, M. 1993). The identification and characterization were followed by Triplehorn and Johnson (2005). All of insects were classified by Forest Entomology Research Center 2, Chumpae district, Khon Kaen province. The diversity indexes were followed by the Shannon-Wiener index (Suriyapong, 2003).

Results and discussion

Study of abundance and diversity of soil insects in Plant Genetic Protection Area of RSPG, Nampung Dam EGAT, Sakon Nakon has conducted two days during 14-15 November 2011, 28-29 Febuary, 14-15 May and 9-10 August 2012, respectively by randomized in two types of forest. There are dry dipterocarp forest and mixed deciduous forest. Insects found in the top 18 families, a total of 6 orders,154 individuals found in the soil in dry dipterocarp forest 77 individuals and found in mixed deciduous forest 77 individuals in **Table 1** and **2**.

Insects found in the soil of 5 orders, 12 families with a total of 669 individuals. Dry dipterocarp forest and mixed deciduous forest found 363 to 306 individuals. The Shannon-Wiener Index was 0.561 in **Table 2**.

Insects found in the soil are 5 orders, 9 families, with a total of 677 individuals found in the soil in the deciduous forest 341, and 336 insects found in the soil by the forest. The index of biodiversity was 0.159 in **Table 1**.

Insects found in the soil of 5 orders, 11 families with a total of 304 individuals in the soil by insects found in the soil in dry deciduous forest 153, and insects found in mixed deciduous forest 151 **Table 1** and **2**.

Table 1 Types of soil insects were collected in Dry Dipterocarp Forest during November 2011, February, May and August 2012

Order	Family	1st	2nd	3rd	4th	Total
Order Coleoptera	Carabidae	0	0	0	1	1
	Staphylinidae	1	0	0	1	2
	Tenebrionidae	0	0	0	1	1
Order Hemiptera	Coreidae	4	0	0	0	4
	Nabidae	5	0	0	0	5
	Reduviidae	7	2	0	0	9
Order Hymenoptera	Formicidae	35	337	335	131	838
		3	3	0	0	6
		1	0	0	0	1
Order Isoptera	Termitidae	13	17	0	5	35
Order Orthoptera	Acrididae	1	0	1	0	2
	Blaberidae	0	1	3	12	16
	Blattidea	2	0	0	0	2
	Gryllidae	1	1	1	0	3
	Mantidae	0	1	0	1	2
	Phasmatidae	3	0	1	1	5
	Tettigoniidae	1	1	0	0	2
	15	77	363	341	153	934
	Shannon-Wiener Index	2.651	0.498	0.159	0.878	0.7975

Table 2 Types of soil insects were collected in Mixed deciduous Forest during November 2011, February, May and August 2012

Order	Family	1st	2nd	3rd	4th	Total
Order Coleoptera	Carabidae	2	1	9	3	15
	Searabaeidae	0	0	2	0	2
Order Hemiptera	Flattidae	1	0	0	0	1
	Reduviidae	8	1	1	2	12
Order Hymenoptera	Apidae	0	3	0	0	3
	Formicidae	32	282	187	63	564
		2	0	0	0	2
Order Isoptera	Termitidae	17	0	135	69	221
Order Neuroptera	Myrmeleontidae	4	0	0	0	4
Order Orthoptera	Acrididae	2	3	0	0	5
	Blaberidae	0	13	0	12	25
	Blattidea	2	0	0	1	3
	Gryllidae	5	0	1	0	6
	Liturgusidae	2	0	0	0	2
	Phasmatidae	0	2	1	0	3
	Tettigoniidae	0	1	0	1	2
	15	77	306	336	151	870
	Shannon-Wiener Index	2.59	0.561	1.257	1.624	1.545

Study of abundance and diversity of soil insects in plant genetic protection area of RSPG, Nampung dam EGAT found that there were 6 orders and 20 families of soil insects found during survey. There was totally 1,804 soil insects observed in DDF areas (934 individuals) and MDF areas (870 individuals). The Formicidae family was the most abundant (1,411 individuals) followed by the Termitidae family (256 individuals) and the Blaberidae (41 individuals), respectively. The biodiversity index of DDF areas is 0.7975, which is less than MDF areas (1.545). It can be concluded that DDF areas have more abundance than MDF areas but diversity of soil insects in MDF areas was higher than DDF areas because of the physical environment, such as temperature, rainfall and light factors.

In addition, the study found the biodiversity of insects, both wild-type as well. Sample No. 1 was during the winter. Thus, it reveals that the diversity index over time is 2.828, followed by sampling in the 4th and 3rd in the rainy season is 1.492 and 0.972, respectively. Sample No. 2 was during the summer. The soil is dry. Because the diversity index was 0.587, less than the time shown in **Table 3**.

Table 3 Types of soil insects were collected in Dry Dipterocarp Forest and Mixed deciduous Forest during November 2011, February, May and August 2012

Order	Family	1st	2nd	3rd	4th	Total
Order Coleoptera	Carabidae	2	1	9	4	16
	Searabaeidae	0	0	2	0	2
	Staphylinidae	1	0	0	1	2
	Tenebrionidae	0	0	0	1	1
Order Diptera	Culicidae	2	0	0	0	2
Order Hemiptera	Flattidae	1	0	0	0	1
	Reduviidae	15	3	1	2	21
	Coreidae	4	0	0	0	4
	Nabidae	5	0	0	0	5
Order Hymenoptera	Apidae	0	3	0	0	3
	Formicidae	67	619	522	194	1,402
		2	0	0	0	2
		3	3	0	0	6
		1	0	0	0	1
Order Isoptera	Termitidae	30	17	135	74	256
Order Neuroptera	Myrmeleontidae	4	0	0	0	4
Order Orthoptera	Acrididae	3	3	1	0	7
	Blaberidae	0	14	3	24	41
	Blattidea	4	0	0	1	5
	Gryllidae	6	1	2	0	9
	Liturgusidae	2	0	0	0	2
	Phasmatidae	3	2	2	1	8
	Tettigoniidae	1	2	0	1	4
	Mantidae	0	1	0	1	2
	20	154	669	677	304	1,804
	Shannon-Wiener Index	2.828	0.587	0.972	1.492	1.267

Acknowledgements

This research was supported by the project plant genetic conservation project under the royal initiative of Her Royal Highness Princess Maha Chakri Sirindhorn-Suranaree University of Technology (RSPG-SUT). The authors would like to thank Nampung Dam EGAT and Forest Entomology Research Center 2 for their kind cooperation. We also would like to thank Udon Thani Rajabhat University for supporting laboratory.

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