



A Preliminary Survey of Insect Pests at the Community Forests of Khon Kaen Province, Thailand

DUANGRAT THONGPHAK*

*Faculty of Agriculture, Khon Kaen University, Khon Kaen, Thailand
E-mail: duathg@kku.ac.th*

SIRIPORN KHONGTHAWIE

Faculty of Agriculture, Khon Kaen University, Khon Kaen, Thailand

Received 19 November 2013 Accepted 1 April 2014 (*Corresponding Author)

Abstract A survey of insect pest from community forests including Kok Soke Hin (Ban Fang district) and Phu Wat (Mancha khiri district) community forests, Khon Kaen province, were carried out from May to September 2013. Insect samples were collected by manual collecting and light trap. Fifty eight species were identified representing 34 families relating to 9 insect orders. The diversity of insects in Kok Soke Hin community forest consisted of Coleopterans (3.63%), Lepidopterans (3.63%), Hemipterans (0.52%), Homopterans (3.63%), Orthopterans (0.36%) and Hymenopterans (3.63%). The diversity of insects in Phu Wat community forest consisted of seven orders of insect including Orthopterans (29.49%), Coleopterans (24.36%), Lepidopterans (24.36%), Hemipterans (3.85%), Homopterans (16.67%), Dipterans (3.63%) and Hymenopterans (1.28%). Among the insects identified, insect pests were about 61.54 percent. The community forests of this study are considered to have a low diverse and numerous insect fauna in the area. Order Coleoptera was found abundant and dominant among other orders.

Keywords survey, insect pest, community forest

INTRODUCTION

The community forest area of Kok Soke Hin (Ban Fang district) and Phu Wat (Mancha khiri district) are lowland semi-deciduous forests as the community forest in the northeastern Thailand (Zhu T. et al., 2011) in a central agricultural production area in Khon Kaen Province. Kok Soke Hin (Ban Fang district). Kok Soke Hin was declared as a community forest in 2005 and the forest covered about 440 ha. The Phu Wat forest area covers about 560 ha, and it has been managed as a community forest since the 1970s. Over 1 million species of insects have been described, but current estimates of total insect diversity vary from 5-80 million species of insects. Beetles (Coleoptera) make up 40% of described insect species. Five orders of insects stand out in their levels of species richness such as the Hymenopterans, Dipterans, Coleopterans, Lepidopterans, and Hemipterans. In ecosystems, biodiversity is instrumentally important not only for the production of food, but for other ecological services, including the recycling of nutrients, regulation of microclimate and local hydrological processes, suppression of undesirable organisms and detoxification of noxious chemicals. However, some of them become pests in forest (Triplehorn and Johnson, 2005). These areas have been chosen because of the less known diversity and abundance of insects in these forests. Therefore, identification of insects around the area will give more insight on the species richness of insect diversity in forest ecosystems, the structure of their populations, their interrelationships and interaction with their habitats. The objective of this study was to determine the diversity and abundance of the insect fauna at the Kok Soke Hin and Phu Wat community forests.

METHODOLOGY

Insect specimens were collected around the community forests (Fig.1) including Kok Soke Hin (Ban Fang district) and Phu Wat (Mancha khiri district) community forests, Khon Kaen province.

Sampling was conducted during May to September 2013 in the wet season. Sampling methods in this study were based on Triplehorn and Johnson (2005), Insect specimens were collected using light trap and manual collecting. In each area, light trap were set up from 7.00 pm until 11.00 pm and manual collecting were done for 3 h during the day time. All of the collected specimens were preserved in 70% ethyl alcohol in the multipurpose containers, and were brought back to the laboratory for pinning and identification. Identification of insects to order, family, genus and species was based on the keys by Triplehorn and Johnson (2005). However, the detailed identification was based on comparison with specimens in the Insect Museum in the Entomological section, Faculty of Agriculture, Khon Kaen University and several taxonomic references. The percentage of insect samples was used by combination two sampling methods.

The Shannon-Wiener’s diversity index (Krebs, 1999), was used to calculate the diversity of insect collected. The formula of the Shannon-Wiener’s diversity index used is presented below

$$H' = \sum_{i=1}^s (pi)(\ln pi) \tag{1}$$

Where H' = Species diversity index, s = Number of species, pi = Proportion of the total sample belonging to i th species.

The evenness index (Krebs, 1999) was calculated to determine the equal abundance of ants in each study site as follows:

$$E' = \frac{H'}{H'_{MAX'}} \tag{2}$$

Where H' = Observed index of species diversity, $H'_{MAX'}$ = Maximum possible index of diversity.

The diversity values for Shannon-Weiner were classified based on scale developed by Fernando (1998) and is presented in Table 1.

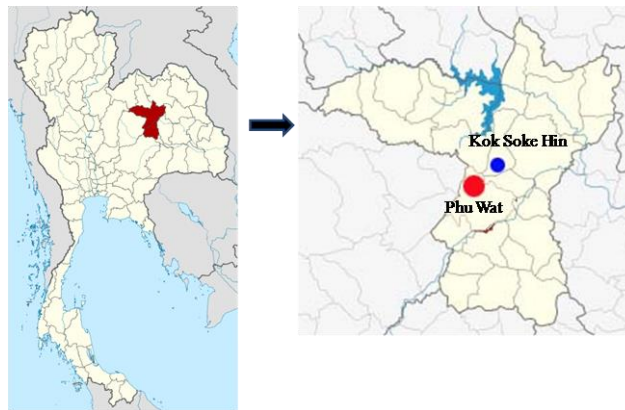


Fig. 1 Study area at the Kok Soke Hin (blue dot) and Phu Wat (red dot) community forest in Khon Kaen Province in Northeastern Thailand

Table 1 Classification of species richness indices (adopted from Fernando 1998)

Relative values	Species diversity	Evenness
Very high	>3.50	>0.75
High	3.00 – 3.49	0.50 – 0.74
Moderate	2.50 – 2.99	0.25 – 0.49
Low	2.00 – 2.49	0.15 – 0.24
Very low	<1.99	< 0.14

Table 2 Classification of insects surveyed at the Kok Soke Hin (Ban Fang district) and Phu Wat (Mancha Khiri district) community forests, Khon Kaen province

Order	Family	Genus/species
Coleoptera	Scarabaeidae	<i>Copris nevinsoni</i>
Coleoptera	Scarabaeidae	<i>Xylotrupes gideon</i>
Coleoptera	Scarabaeidae	<i>Amomala grandis</i>
Coleoptera	Scarabaeidae	<i>Anomala</i> sp.
Coleoptera	Scarabaeidae	<i>Catharsius molossus</i>
Coleoptera	Scarabaeidae	<i>Copris magicus</i>
Coleoptera	Scarabaeidae	<i>Gymnopleurus aethiops</i>
Coleoptera	Scarabaeidae	<i>Lepidiota stigma</i>
Coleoptera	Scarabaeidae	<i>Orcytes rhinoceros</i>
Coleoptera	Hydrophilidae	<i>Hydrous cavistanum</i>
Coleoptera	Lucanidae	<i>Aegus amplus</i>
Coleoptera	Cerambycidae	<i>Batocera rufomaculata</i>
Coleoptera	Cerambycidae	<i>Batocera rubus</i>
Coleoptera	Cerambycidae	<i>Celosterna pollinosa sulphurea</i>
Coleoptera	Cerambycidae	<i>Cyriopatus wallacei</i>
Coleoptera	Cerambycidae	<i>Aristobia approximator</i>
Coleoptera	Cerambycidae	<i>Plocaederus ruficornis</i>
Coleoptera	Cerambycidae	<i>Xyrocera globosa</i>
Coleoptera	Cerambycidae	<i>Xoanodera striata</i>
Coleoptera	Cerambycidae	<i>Rhaphuma mutabilis</i>
Coleoptera	Cerambycidae	<i>Dorysthenes granulatus</i>
Coleoptera	Cerambycidae	<i>Dorysthenes buquet</i>
Coleoptera	Meloidae	<i>Electica castanea</i>
Coleoptera	Staphylinidae	<i>Paederus</i> sp.
Coleoptera	Passalidae	<i>Tiberioides</i> sp.
Coleoptera	Cicindelidae	<i>Calochroa flavomaculata</i>
Coleoptera	Curculionidae	<i>Sepiomus</i> sp.
Coleoptera	Lampyridae	<i>Luciola brahmia Bourgeois</i>
Coleoptera	Tenebrionidae	<i>Tribolium</i> sp.
Coleoptera	Buprestidae	<i>Sternocera ruficornis</i>
Orthoptera	Gryllotalpidae	<i>Gryllotalpa orientalis</i>
Orthoptera	Gryllidae	<i>Gryllus bimaculatus</i>
Orthoptera	Gryllidae	<i>Gryllus testaceus</i>
Orthoptera	Gryllidae	<i>Acheta domesticus</i>
Orthoptera	Acrididae	<i>Cyrtacanthacris tatarica</i>
Orthoptera	Acrididae	<i>Oxya japonica</i>
Orthoptera	Mantidae	<i>Tenodera sinensis</i>
Orthoptera	Blattellidae	<i>Pycnoscelus indicus</i>
Orthoptera	Tetrigidae	<i>Paratettix</i> sp.
Orthoptera	Tettigoniidae	<i>Holochlora nigrotympana</i>
Orthoptera	Tettigoniidae	<i>Conocephalus longipennis</i>
Orthoptera	Plasmatidae	unknown
Hymenoptera	Xylocopidae	<i>Xylocopa</i> sp.
Hymenoptera	Formicidae	<i>Pheidole</i> sp.
Hymenoptera	Formicidae	<i>Solenopsis saevissima wagneri</i>
Hymenoptera	Formicidae	<i>Camponotus</i> sp.
Hymenoptera	Vespidae	<i>Vespa</i> sp.
Hemiptera	Notonectidae	<i>Anisops</i> sp.
Hemiptera	Cydnidae	<i>Stibaropus molginus</i>
Hemiptera	Pentaomidae	<i>Nezara viridula</i>
Hemiptera	Pentaomidae	<i>Tessarotoma papillosa</i>
Hemiptera	Coreidae	<i>Anoplocnemis plasiata</i>
Hemiptera	Cicadellidae	<i>Nephotettix</i> sp.
Homoptera	Cicadidae	<i>Meimuna opalifera</i>
Homoptera	Coccidae	<i>Pseudococcus</i> sp.
Odonata	Libellulidae	<i>Crocothemis servilia (Drury)</i>
Lepidoptera	Noctuidae	unknown
Lepidoptera	Arctiidae	<i>Creatonotos</i> sp.
Isoptera	unknown	unknown
Diptera	Chiromomus	<i>Chiromomus</i> sp.

RESULT AND DISCUSSION

In this study, fifty-eight insect species were identified as shown in Table 2. A total of 914 individuals of insects from nine orders and thirty-four different families were collected. They are from the orders of Orthoptera, Coleoptera, Hemiptera, Homoptera Hymenoptera, Diptera, Isoptera, Lepidoptera, Odonata, and Diptera (Table 3). The order Hymenoptera had nine species of five different families. The Coleopterans had thirty species of eleven families, while the order Orthoptera had eleven species of nine families. The order Hemiptera had six species of four families, while the order Hymenoptera had five species identified in three families. The orders Homoptera and Lepidoptera had two species belonging to two families. The specimens from the order Isoptera were not identified. The family Cerambycidae had the highest number of 11 insect species followed by the family Scarabaeidae (9 spp.). The results showed that Coleoptera (39.39%) had the most dominant insects in both forest communities, followed by Hemiptera (29.54%), Orthoptera (11.38%) Hymenoptera (7.98%) and Isoptera (5.69%), the following insect orders got lower than 2% (Table 3), Isoptera, Odonata and Diptera. The generally low species diversity observed is due to the very few species recorded in the present study.

Table 3 Taxonomic distribution of insects at the Kok Soke Hin (Ban Fang district) and Phu Wat (Mancha Khiri district) community forests, Khon Kaen province

Order	Taxonomic distribution			Percentage of order
	Population	No. of families	No. of species	
Orthoptera	104	9	11	11.38
Coleoptera	360	11	30	39.39
Hemiptera	270	4	6	29.54
Homoptera	2	2	2	0.22
Hymenoptera	73	3	5	7.98
Lepidoptera	41	2	2	4.48
Isoptera	52	1	*	5.69
Odonata	2	1	1	0.21
Diptera	10	1	1	1.09
	914	34	58	100

*unidentified

Among the insects identified, forty- eight species of insects in 13 families and eight orders were found as insect in the community forests. The highest number of species was recorded in the Kok Soke Hin community forest (27 species) and the Phu Wat community forest found only fourteen species of insect pest (Table 4).

Table 4 Percentage of insect pest at the Kok Soke Hin (Ban Fang district) and Phu Wat (Mancha khiri district) community forests, Khon Kaen province

Insect Pest	Number of insect pest		Total	Percentage of insect pest (%)		Total
	KSH	PW		KSH	PW	
Order	5	3	8	38.46	23.08	61.54
Family	8	5	13	28.57	17.86	46.43
Species	27	14	41	42.86	22.22	65.08

Note: KSH= Kok Soke Hin community forest, PW = Phu Wat community forest.

The diversity of insect in this study is presented in Table 5. Overall, the results show that insect diversity value for the community forest was very low with $H' = 1.55$ while the species evenness values show that the community forest had the highest with $E' = 0.70$. The diversity of order Coleoptera is the higher than the others in this study with $H' = 0.37$, this is because of scarab beetles were commonly collected in the forest areas. Furthermore, majority of the timber trees were in the forest where the greatest number of cerambycid occurred. The survey revealed that, the insect species include insect pests, insect pollinators, saprophytic insects, parasitoids, and predators. Not many of the insect species identified are major pest to the forest pest in the area except scarab and cerambycid beetles that is a major pest. This implies that the trees in the forest

area could be conducted with less insect pest problem in the areas. However, lower diversity in study areas were influenced by the condition during the time of study. This is because samplings were conducted during raining season. Wardle and Barker (1997) indicate that rainfall leads to direct death to larvae and egg and causes the development of insect to shift. Furthermore, insects will seek protection by reducing foraging activity and finding shelter during this wet duration.

Table 5 Diversity index and Evenness index of the insect community at the Kok Soke Hin (Ban Fang district) and Phu Wat (Mancha Khiri district) community forests

Order	Diversity index (H')	Evenness index (E')
Orthoptera	0.25	0.11
Coleoptera	0.37	0.17
Hemiptera	0.36	0.16
Homoptera	0.01	0.01
Hymenoptera	0.20	0.09
Lepidoptera	0.14	0.06
Isoptera	0.16	0.07
Odonata	0.01	0.01
Diptera	0.05	0.02
Total	1.55	0.71

CONCLUSION

From this study, the community forests of Khon Kaen province including Kok Soke Hin and Phu Wat are considered to have a low diverse and numerous insect fauna in the area. Order Coleoptera was found abundant and dominant among other orders. However, the results which were being presented in this paper might be the first comprehensive list of insects in the community forest. It is therefore recommended that, similar survey should be conducted during dry season of the year to have a list of insect occurring at every particular season of the year and the economic importance of insects surveyed should also be investigated.

ACKNOWLEDGEMENTS

This research was supported by the Khon Kaen University funding 2013. The authors thank to the Plant Genetics Conservation Project under The Royal Initiative of Her Royal Highness Princess Maha Chakri Sirindhorn for permission of conducting the research.

REFERENCES

- Fernando, E.S. 1998. Forest formations and flora of the Philippines: Handout in FBS 21. (Unpublished).
 Krebs, C.J. 1999. Ecological methodology, Addison-Educationall Publishers, California, 581. USA.
 Triplehorn, C.A. and Johnson, N.F. 2005. Borror and delong's introduction to the study of insects. 7th ed. Brooks/Cole. 864.
 Wardle, D.A. and Barker, G.M. 1997. Competition and herbivory in establishing grassland communities: Implications for plant biomass, species diversity and soil microbial activity. *Oikos*, 80, 470-480.
 Zhu, T., Chen, H., Ganesh, S., Roland C. and Kanokwan, H. 2011. Revisit to community forest in northeast of Thailand: changes in status and utilization. *Environ. Dev. Sustain.*, 13, 385-402.