UNIVERSITI PUTRA MALAYSIA

POPULATION DYNAMICS AND LIFE CYCLE OF TEAK DEFOLIATOR HYBLAEA PUERA CRAMER., (LEPIDOPTERA: HYBLAEIDAE) IN LAO PEOPLE'S DEMOCRATIC REPUBLIC

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By

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Thesis Submitted in Fulfilment of the Requirement for the Degree of Master of Science in Faculty of Forestry Universiti Putra Malaysia

May 2001

DEDICATED TO MY BELOVED

PARENTS AND WIFE

Abstract of thesis submitted to the Senate of Universiti Putra Malaysia
In fulfilment of the requirements for the degree of Master of Science

POPULATION DYNAMICS AND LIFE CYCLE OF TEAK DEFOLIATOR *HYBLAEA PUERA* CRAMER., (LEPIDOPTERA: HYBLAEIDAE) IN LAO PPEOPLE'S DEMOCRATIC REPUBLIC

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Chairman: Associate Professor. Ahmad Said Sajap, Ph.D.

Faculty: Forestry

Forest lands in Lao People's Democratic Republic (Lao P.D.R) are largely owned and administered by the government. Teak (*Tectona grandis*) is one of the important hardwood species planted extensively in plantation in the northern part of Lao P.D.R for commercial purposes, but teak tree has numerous diseases, and insect pests which cause damage to the teak plantation. Teak defoliator *Hyblaea puera* is an important pest of teak in Lao P.D.R. It occurs every year during May to July when the tree flushes leaves. This study was conducted in the natural teak forest and teak plantations within two provinces i.e. Xayabury and Luang Prabang. This study investigated the population dynamics and distribution of the insect in different teak plantations, and its life cycle.

During a two-year period covering 1999 and 2000, the outbreak season for teak defoliator *H. puera* occurred in early May when the teak developed new leaves,

and the warm temperatures enabled the insect to complete its life cycle by late July. The result of the analysis indicated that the teak defoliator *H. puera* preferred to attack young teak plantations. Population density of the insects larvae was highest on the top stratum of the tree, though after feeding on the leaves the larvae descended to the lower stratum and the ground for more feeding and pupation. Its life cycle occur approximately 15 to 20 days. Male moths lived longer than the female moths; the mean longevity of adult male was 13.3 ± 2.50 days and that of the female was 8.8 ± 1.83 days. The adult female usually died after oviposition. The insect population recurred when no heavy rainfall. During periods of heavy rainfall, the insect completed its life cycle quickly, and subsequently disappeared from the teak forest.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

POPILASI DINAMIK DAN KITAR HIDUP PEROSAK JATI *HYBLAEA PUERA* CRAMER.,)LEPIDOPTERA: HYBLAEIDAE) DI REPUBLIK DEMOKRATIK RAKYAT LAOS.

Oleh

THANSAMAY VONGXOMPHOU

April 2001

Pengerusi: Profesor Madya Dr. Ahmad Said Sajap

Fakulti: Perhutanan

Tanah Hutan di Republik Demokratik Rakyat Laos (D. R. L) sebahagian besarnya dimiliki dan diurus oleh kerajaan. Kayu jati (*Tectona grandis*) adalah species kayu keras yang ditanam secara besar-besaran di bahagian utara Laos untuk tujuan komorsial tetapi kayu jati berkenaan diserang oleh pelbagai penyakit, dan serangga perosak yang merosakkan ladang kayu jati. *Hyblaea. puera* ialah perosak kayu jati yang penting di Laos, ia selalu menyerang setiap tahun ketika pokok jati mengeluarkan duan muda yang baru. Kajian ini telah dijalankan di kawasan hutan jati semulajadi dan di kawasan ladang jati di bahagian Xayabury dan Luang Prabang kajian yang dijalankan ialah penentuan dinamik populasi dan taburan serangga tersebut di kawasan ladang jati. Serta meneliti kitar hidup *H. puera* selama dua tahun kajian iaitu pada 1999 dan 2000 musim berlakunya "outbreak" perosak kayu jati *H. puera* ialah pada anval bulan Mai ketika pokok jati mengeluarkan daun yang masih

baru dan dipengaruhi oleh suhu yang agak tinggi serta melengkapi kitar hidupnya pada akhir bulan Julai Hasil anlisis kajian menunjukkan larva *H. puera* lebik gemar menyerang ladang kayu jati yang masih muda. Bilangan larva didapati lebih tinggi di bahagian atas pokok jati dan akan berpindah ke bahagian bawah apabila daun di bahagian atas habis dimakan untuk mendapatkan makanan serta menjadi pupa. Kitar hidup *H. puera* ialah sekitar 15 ke 20 hari, jika Selalunya kitar hindup seragga ini lebih singkat dan menjadi lenyap dari hutan jati ketika bulan musim hujan lebat.

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LIST OF ABBREVIATIONS

AACs	=	Annual Allowable cuts
Anon	=	Anonymous
Cr	=	Crown
dbh	=	Diameter at Breast Height
DD	=	Dry Dipterocarp
Dia	=	Diameter
GF	=	Gallery Forest
H	=	Height
LMD	=	Low Mixed Deciduous
LSFP	=	Lao-Swedish Forestry Program
M	=	Mixed
NE	=	Northeast
NSRM	=	New System Resources Management
NTF	=	Natural teak forest
NW	=	Northwest
PDR	=	People Democratic Republic
S	=	Coniferous
SE	=	Southeast
SW	=	Southwest
UMD	=	Upper Mixed Deciduous

CHAPTER 1

INTRODUCTION

Teak (*Tectona grandis* L.), one of the most valuable hardwood timber species in Laos is attacked by a number of insects. Among them, two defoliators, *Hyblaea puera* (Cramer) (Lepidoptera: Hyblacidae) and *Eutectona machaeralis* (Lepidoptera: Pyralidae) are most serious insect pest in Laos. The damage by these defoliators *H. puera* and *E. machaeralis* adversely affect the tree growth and vigor besides causing certain abnormalities resulting to qualitative loss to timber (Champion 1934: Beeson, 1941).

Hyblaea puera is a serious pest of teak, which passes through 14 generations a year (Beeson 1941). Eggs are laid on tender leaves and the larvae feed on the leaves from within leaf folds (Nair *et al* 1985). During outbreaks large populations of larvae of uniform ages are found extensively defoliating plantation. Generally mature caterpillars descend to the ground on silk threads and pupate in the soil. In rainy months, pupation occurs in the leaves of ground vegetation (Zacharias and Mohandas, 1990). During the year defoliation occurred only for a short period from late April to September when one or two population peaks. The insect survived the rest of the period, October - March, by the survival of low larval population and short-range moth migration (Pawar and Bhatnagar, 1990).

1.1 General background

Most insect defoliators belong to the order Lepidoptera, whose larval stages feed on leaves. These insects generally have very high reproductive potentials and short life cycles. Hence rapid population build-ups can be expected within a very short period of establishment of the insect pest. The majority of these insects favour young leaves and hence in teak the period when high populations of these pests occur would be the months when the trees put on new flushes of leaves. The feeding patterns of these insects vary. There are those that feed only on the epidermis and tissues, avoiding the veins, thus leaving skeletons of leaves behind. Others feed on all leaf tissues including the veins, either beginning at the edges and working their way inwards or by creating hole on the leaf surface and enlarging them. Some of these insects may eat away entire leaves whilst others may wander from leaf to leaf, feeding only on part of the leaves (Tho, 1981).

Two species of pests, well-known insect of teak tree *Tectona grandis,* in Laos are *Hyblaea puera* popularly known as teak defoliator, and *Eutectona machaeralis* syn. *Pyrausta machaeralis* Walker (Lepidoptera: Pyraustidae), also known as teak skeletonizer. Larvae of the *H. puera* feed on the entire leaf, leaving only the major veins, while those the larvae of *E. machaeralis* feed only on the green matter, leaving all the veins intact. Thus qualifying for the name skeletonizer. One of the two *H. puera* is the more serious because it feeds on young leaves during the early part of the growing season, compared with *E. machaeralis,* which feeds on old leaves not long before natural leaf fall (Nair, 1988).

Defoliation does not kill teak trees, but it reduces the tree growth. The studies have shown that natural defoliation by *H. puera* caused an average loss of 44 % of

the potential volume increment in 4 - 9 year old teak plantations, while *E. machaeralis* had no significant impact on growth. Although it was not possible to quantify the benefit in terms of volume gain over the entire rotation (60 years), research demonstrated that *H. puera* could have a substantial impact on wood production (Nair, 1988)

1.2 Problem statement

Teak is one of the major hardwood species grown extensively in plantation in Lao P.D.R. for commercial purposes, but there are many insect pests that can cause extensive defoliation on teak.

One of these insects frequently attacking is *H. puera.* This pest, which has been shown to affect growth by defoliation in the young teak trees and it has not been studied thoroughly in Laos. Mackenzie (1921) stated that teak suffered a loss of 1/12 of its annual increment, while Beeson (1941) had estimated the loss at 8.2 % of the annual increment. The loss estimated by Champion (1934) at 60 to 70 % of the basal area increment (Kadambi, 1972).

The larvae of *H. puera* consume the whole leaf including the midrib, they causes greater loss of increment on teak. They directly retard girth increment, loss of timber quality by forking, death of the leading shoot, formation of epicormic branches.

Now a days, study on damage control defoliation on teak plantation have not been taken up to protect the loss of annual growth of the trees. Such study on the distribution, biology and ecology life cycle of the teak defoliator will be conducted.