

# RECORD OF SEED INSECT PESTS OF *DIPTEROCARPUS RETUSUS* IN HOLLONGAPAR RESERVE FORESTS, ASSAM

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**SENTHILKUMAR N, BARTHAKUR ND & SINGH AN. 2009. Record of seed insect pests of *Dipterocarpus retusus* in Hollongapar Reserve Forests, Assam.** *Dipterocarpus retusus* is facing a serious problem of poor regeneration due to various insects and diseases. The planting stock target has many times been upset because of heavy mortality of seed due to pests and diseases. No information is available on the insects that infest seed of *D. retusus*, their periodicity, population density, damage caused and loss, hindering suitable control strategies. The present study provides information on the seed insect pests of *D. retusus* in the natural stands at Hollongapar Reserve Forests, Assam and the damage they caused. The database obtained can be used for designing appropriate strategies to procure viable seeds and to increase the planting stock of *D. retusus*.

Keywords: Stock target, diseases, poor regeneration, control strategies

**SENTHILKUMAR N, BARTHAKUR ND & SINGH AN. 2009. Rekod serangga perosak biji benih *Dipterocarpus retusus* di Hutan Simpan Hollongapar, Assam.** *Dipterocarpus retusus* menghadapi masalah besar dalam penanaan semula kerana ancaman serangga perosak dan penyakit. Sasaran stok tanaman sering tidak tercapai kerana jumlah kematian yang tinggi akibat serangga dan penyakit. Tidak terdapat maklumat tentang serangga yang menyerang *D. retusus*, keberkasaan dan ketumpatan populasinya, kerosakan serta kerugian yang dialami dan ini menghalang strategi kawalan yang sesuai. Kajian ini menyediakan maklumat tentang serangga perosak *D. retusus* di dirian asli Hutan Simpan Hollongapar, Assam dan kerosakan yang diakibatkannya. Pangkalan data yang dibina dapat diguna untuk mereka bentuk strategi yang sesuai bagi memperoleh biji benih dan seterusnya meningkatkan stok tanaman *D. retusus*.

## INTRODUCTION

*Dipterocarpus retusus* (syn. *Dipterocarpus macrocarpus*), popularly known as Hollong in India, is one of the important tree species of north-east Indian tropical rain forests. It is distributed in the alluvial deposits of Brahmaputra valley in the states of Assam, Arunachal Pradesh and Nagaland. It can produce up to 40 m clear commercial bole and is the most suitable species for plywood industry (Rajput et al. 1996). However, the area for *D. retusus* in the north-east India has been shrinking due to irregular management practices, industrialization, population growth and influx of people. In addition, *D. retusus* is facing problem in regeneration due to various insect pests and diseases. There is about 70–90% mortality of *D. retusus* seedlings in nurseries and regeneration areas in Assam due to various insects and diseases (AN Singh, personal observation). Only a paucity

of information is available on insect pests of dipterocarps in north-east India. Therefore, this study was conducted to gather information on the seed insect pests of *D. retusus*. This will be useful for our future work since it will provide deep insight into the complex of factors affecting the seed of *D. retusus*, and the interaction between abiotic and biotic agents which play an important role in the healthy maintenance of *Dipterocarpus* forest ecosystem.

## MATERIALS AND METHODS

The study was carried out in a natural forest of *D. retusus* at Hollongapar Reserve Forests located between 26° 40'–26° 45' N and 94° 20'–94° 25' E. The area is 19.5 km<sup>2</sup> of tropical semi-evergreen forest situated on the flat plains

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of Brahmaputra River, Assam. The altitudinal range is 100–120 m above sea level. Annual average temperature ranges from 18.9 to 27.9 °C and annual average humidity ranges between 64.5 and 94.5%. Annual rainfall of the study site is 249 cm. The Hollongapar Reserve Forests are rich in floral composition including trees like *D. retusus*, *Terminalia myriocarpa*, *Michelia champaca*, *Canarium resiniferum* and *Castanopsis* sp. The Reserve also has plantations of highly valued plants, namely, *D. retusus* and *Aquilaria agallocha*. The diverse life forms of the forest includes the world famous only Indian ape, hoolock gibbon (*Hylobates hoolock*), stumped tailed macaque (*Macaca arctoides*), pig-tailed macaque (*M. nemestrina*) and capped langur (*Trachypithecus pileatus*), along with elephants, leopards, reptiles such as pythons and numerous birds.

The study was conducted between February 2005 and May 2006. Seed production of *D. macrocarpus* in upper Assam occurs in late February till first half of May (Choudhry 1980). Data was recorded on the insects associated with the seed of *D. retusus*, their periodicity, population density and damage. Investigation was also made on the germination per cent of seed of *D. retusus* both in *in situ* and *ex situ* conditions. Ten trees were randomly selected for the inventory of insects associated with seeds of *D. retusus*. The insects were collected by search-out method (simple dissection of seed) and identified up to species level. Earlier studies have shown that this method provided the best sampling for insects of *D. retusus* (AN Singh, personal observation). Data collection was made at 15-days interval during the entire study period giving a total of 16 samplings with three replications each. Population density of selected species of insects was studied following the same procedure as mentioned earlier. Data were analysed separately for each survey trip. Weight loss due to infestation of insects on seed of *D. retusus* collected from forest floor as well as using nylon net before falling to the floor was also estimated. Relative density, per cent frequency and the relative abundance of the insect species were calculated as follows:

$$\text{Relative density} = \frac{\text{No. of individuals of a particular species}}{\text{No. of individuals of all species}} \times 100$$

$$\text{Frequency (\%)} = \frac{\text{No. of sampling units in which the species occurred}}{\text{Total no. of sampling units studied}} \times 100$$

$$\text{Relative abundance} = \frac{\text{No. of individuals of a species in a sampling unit}}{\text{No. of individuals of the species in a sampling unit}} \times 100$$

All statistical analyses were done using statistical software (SPSS, Version 10) at the Rain Forest Research Institute, Jorhat.

## RESULTS AND DISCUSSION

The occurrence of various insect species on the seed of *D. retusus* is shown in Table 1. A total of nine species comprising seven genera belonging to the orders Coleoptera and Lepidoptera was recorded. Dipterocarp seeds were preyed on by 51 insect species (11 families), which were roughly classified as smaller moths (Tortricidae, Pyralidae, Crambidae, Immidae, Sesiidae and Cosmopterigidae), scolytids (Scolytidae) and weevils (Curculionidae, Apionidae, Anthribidae, and Attelabidae) (Nakagawa *et al.* 2003). In this study, *Thamnurgides monoceros* (Coleoptera: Scolytidae) and *Enarmonia pulverula* (Lepidoptera: Tortricidae) were recorded with 100% frequency, while the highest relative density (number of individuals in each seed) was high for *E. pulverula* (38.7) followed by *T. monoceros* (25.8). High abundance of beetles and moths was also reported to totally damage seeds of *Dipterocarpus intricatus* in Thailand (Hutacharern & Tubtim 1995).

We separated highly aggressive insect species from the less aggressive using cluster analysis and the results are shown in Figure 1. The highly aggressive species, *E. pulverula* and *T. monoceros*, fell under one group with high frequency and density under 15 linkage distance followed by *Alcidodes crassus*, *Thamnurgides dipterocarpi* and *Dioryctria abietella* under 20 linkage distance. The less aggressive species namely, *Thamnurgides masoni*, *Dichocrocis evaxalis*, *Zygaenodes ferrealis* and *Herdonia osacesalis* fell under one group with about 35 linkage distance.

**Table 1** Occurrence of insect fauna on seeds of *Dipterocarpus retusus* in Hollongapar Reserve Forests

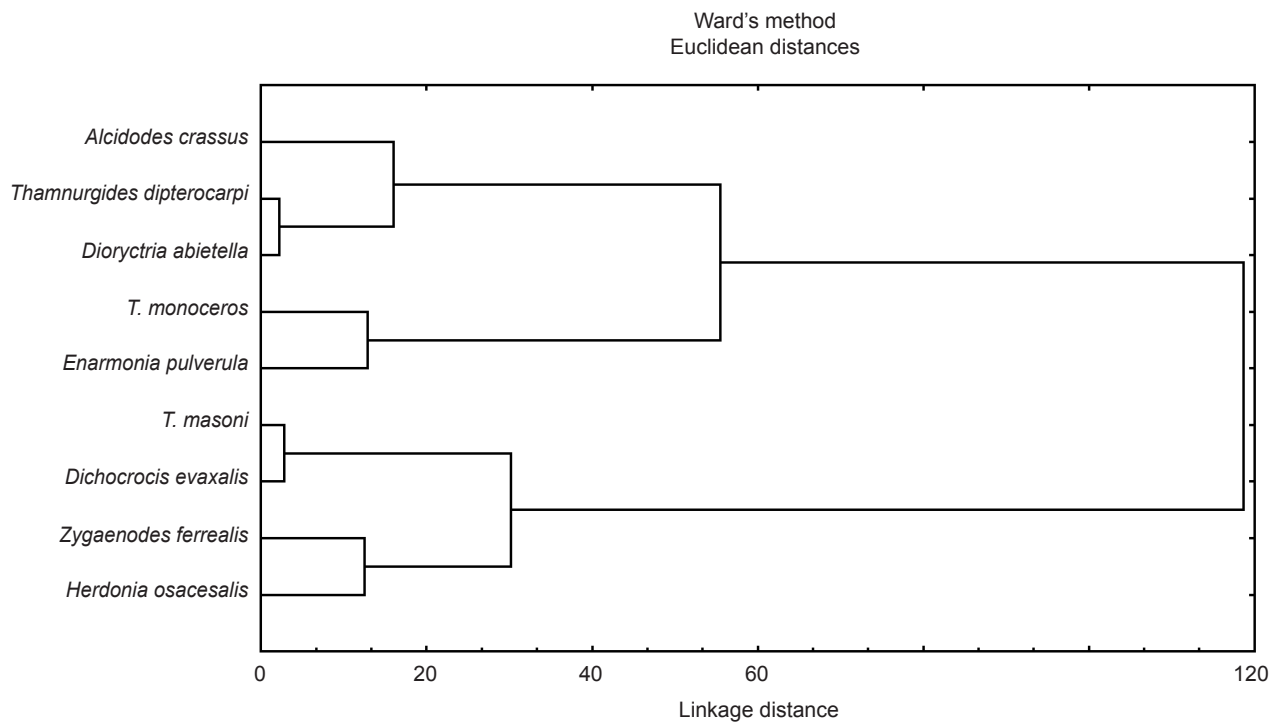
Insect species	Order	Family	Occurrence												% Frequency	Relative density
			2005						2006							
			February	March	April	May	June	July	February	March	April	May	June	July		
<i>Alcidodes crassus</i>	Coleoptera	Curculionidae	14.3	10.4	11.1	0	14.3	11.1	11.7	0	75	9.1				
<i>Thamnungides monaceros</i>	Coleoptera	Scolytidae	28.6	29.2	18.5	26.7	23.8	18.5	31.7	32.4	100	25.8				
<i>T. dipterocarpi</i>	Coleoptera	Scolytidae	0	4.2	7.4	6.7	9.5	9.3	8.3	10.8	87.5	7.6				
<i>T. masoni</i>	Coleoptera	Scolytidae	0	6.3	1.9	0	0	13.0	5.0	2.7	62.5	4.7				
<i>Zygaenodes ferrealis</i>	Coleoptera	Anthribidae	0	2.1	0	0	4.8	1.9	0	0	37.5	0.9				
<i>Dioryctria abietella</i>	Lepidoptera	Pyralidae	14.3	12.5	9.3	10	0	16.7	6.7	5.4	87.5	9.8				
<i>Dichocrocis evaxalis</i>	Lepidoptera	Pyralidae	0	2.1	3.7	0	4.8	1.9	1.7	0	62.5	1.9				
<i>Enarmonia pulverula</i>	Lepidoptera	Tortricidae	42.9	33.3	46.3	50	42.8	27.8	33.3	46.0	100	38.7				
<i>Hendonita osacesalis</i>	Lepidoptera	Thyrididae	0	0	1.9	6.7	0	0	1.7	2.7	50	1.6				

The highest per cent of insect infestation of *D. retusus* seed was observed in April (Table 1). Infested seed collected from forest floor ranged between 42.9 and 77.4% while that from aerial collection was 37.5 to 58.2% (Table 2). Microlepidoptera larvae caused 45 to 67% mortality to seed of *Neobalanocarpus heimii*, mostly from the ground (Elouard et al. 1996).

The weevil *Alcidodes crassus* (Coleoptera: Curculionidae) was found infesting seeds of *D. retusus* from February to April. Weevils belonging to the genera *Alcidodes* and *Nanophyes* have been collected from seeds of dipterocarps in Malaysia (Daljeet-Singh 1974). In Thailand about 27 species of beetle dipterocarp-seed predators have been found. As many as five species of beetles

were found in the seed of *D. retusus* collected from the forest floor of Hollongapar Reserve Forests. Generally, insects are the principal seed predators of four species of *Dipterocarpus* in Malaysia, namely, *D. globosus*, *D. tempehes*, *Dryobalanops aromatica*, and *D. lanceolata* (Nakagawa et al. 2005). The lepidopteran species found at our study sites were *E. pulverula* and *D. albietella*. Eggs and larvae of *Poecilips gedeanus* (Lepidoptera) are found largely in fruits and seeds of *Dipterocarpus* (Beaver 1979).

The loss due to *T. monoceros* on seeds of *D. retusus* collected from the forest floor as well as from the nylon net was estimated and presented in Table 3. For the ground collection, weight loss ranged between 22.0 and 44.9%. In aerial



**Figure 1** Dendrogram for clustering of insect species in relation to frequency and population density of *Dipterocarpus retusus* seed

**Table 2** Infestation of insects on seed of *D. retusus* at Hollongapar Reserve Forest

Month	Insect infestation*	
	Ground collected seed (%)	Aerial collected seed (%)
February	42.9	37.5
March	68.7	56.6
April	77.4	58.2
May	55.0	40.9

\*Average of 2005 and 2006

**Table 3** *Dipterocarpus retusus* seed loss due to *Thamnurgides monoceros* at Hollongapar Reserve Forest

	Infestation			
	Healthy	Heavy	Moderate	Less
Ground collection				
Mean seed weight in (g)	12.2	6.7	7.3	9.5
SD	3.1	1.7	1.5	2.3
Weight of total seeds (g)	1100.6	390.9	662.8	753.3
Number of seeds	90	58	91	79
Weight loss (%)		44.9	40.4	22.0
Aerial collection				
Mean seed weight (g)	7.4	5.0	5.9	6.7
SD	1.0	0.4	0.5	1.1
Weight of total seeds (g)	251.3	59.5	117.9	93.3
Number of seeds	34	12	20	14
Weight loss (%)		32.6	20.3	9.9
Difference in weight loss (%)		12.3	20.1	12.1

SD = standard deviation

collection, the loss was from 9.9 to 32.6%. The difference in weight loss between both collection methods was 12.1–20.1%. Our study shows that as much as 20% of seed loss due to *T. monoceros* can be reduced if seeds are collected before falling to the forest floor. This should be followed by suitable nursery technology to increase the planting stock.

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