Hypsipyla grandella and *Hypsipyla robusta*

***Hypsipyla grandella* Zeller, 1848**
Order and Family: Lepidoptera: Pyralidae
Common names: mahogany shoot borer

***Hypsipyla robusta* Moore, 1886**
Other scientific names: *Epicrocis terebrans* Oliff, 1890; *Magiria robusta* Moore, 1886; *Hypsipyla scabrusculella* Ragonot, 1893; *Hypsipyla pagodella* Ragonot, 1888
Order and Family: Lepidoptera: Pyralidae
Common names: mahogany shoot borer; cedar tip moth; toon shoot fruit borer

Hypsipyla shoot borers are a significant threat to many high value timber species belonging to the Meliaceae and Verbenaceae, including species of *Swietenia*, *Khaya*, *Toona, Tectona* and *Cedrela*. The two most important *Hypsipyla* species are *H. grandella* in the Americas, and *H. robusta* in areas of Africa and Asia and the Pacific.

DISTRIBUTION

Hypsipyla grandella

Native: Latin America and the Caribbean: Central America, the Caribbean, Mexico, South America (except Chile)
North America: United States (southern Florida)
Introduced: The introduced range is not verified, but it is known from Mauritius (Africa).

Hypsipyla robusta

Native: Africa (West and East); Asia and the Pacific
Introduced: The introduced range is not verified.

IDENTIFICATION

Adults are brown to greyish-brown in colour with a wingspan of approximately 23 to 45 mm (Howard and Merida, 2005). The forewings are grey to brown with shades of rusty red on the lower portion and whitish scales with black dots toward the wing tips (Howard and Merida, 2005). Wing veins are distinctively overlaid with black. Hind wings are white to translucent with dark-coloured margins.

Larvae are tan to white in colour, turning bluish in later instars, with a brown head capsule (Howard and Merida, 2005). Mature larvae are approximately 25 mm long.

Pupae are brownish-black and enclosed in a silken cocoon (Howard and Merida, 2005).

Eggs are oval, dorsoventrally flattened, and measure 0.5 to 1.0 mm by 0.5 to 0.98 mm (Griffiths, 2001; Howard and Merida, 2005). When first laid they are white in colour and if fertilized, they develop distinct red and white banding within 24 hours.

HOSTS

Hypsipyla grandella

Meliaceae and Verbenaceae: *Swietenia* spp. (*S. macrophylla*, *S. mahagoni*); *Cedrela* spp.; *Tectona* spp.; *Toona* spp. *(T. australis*, *T. ciliata*); *Chukrasia tabularis*

Hypsipyla robusta

Meliaceae and Verbenaceae: *Swietenia* spp. (*S. macrophylla*, *S. mahagoni*); *Cedrella* spp. (*C. toona*); *Tectona* spp. (*T. grandis*); *Toona* spp. (*T. australis*, *T. ciliata*); *Chukrasia tabularis*; *Khaya* spp.; *Carapa procera*; *Entandrophragma* spp.; *Lovoa trichiliodes*

BIOLOGY

Females mate only once and lay 200 to 450 eggs over a period of five to eight days. On young trees, eggs are deposited singly or occasionally in clusters of 3 to 4 on the shoots, stems and leaves, particularly the upper leaf surface. Concentrated around the growing shoots, eggs may occur at all heights on the host tree and are often placed in concealed locations such as leaf axils, leaf scars, veins, lenticels and fissures in the bark (Griffiths, 2001). Eggs laid on fruit are initially deposited singly on the fruit surface but are later laid in clumps of up to 12 among the frass and webbing associated with existing damage to the fruit (Griffiths, 2001).

After three to five days, the eggs hatch and the larvae tunnel in the developing shoots of young trees and sometimes also feed upon the flowers, fruit and bark of host trees (Griffiths, 2001). They pupate either in the twigs, shoots or the soil.

A generation usually takes 1 to 2 months but may extend to five months if larvae enter diapause, which has been reported from areas of low temperature or rainfall, and occurs immediately after fruit-feeding despite apparently suitable climatic conditions (Griffiths, 2001). Adults are typically nocturnal and mate within six days of emergence.

SYMPTOMS AND DAMAGE

Hypsipyla caterpillars attack seed and fruit capsules and bore into the tips, shoots and twigs of several high quality timber species killing the first few centimeters. The caterpillars destroy the terminal shoot causing the tree to form many side branches and frequently a deformed trunk thereby significantly reducing the economic value of the timber (Griffiths, 2001). Growth rate is reduced and heavy and repeated attacks can result in tree death.

This species mainly attacks trees in areas with high light, hence the biggest effects are observed in young planted forests, particularly those planted with a single species (Nair, 2001). Young understorey trees in naturally regenerated forests suffer far less damage. The borer is a problem to both nursery and planted stock; trees from three months to fourteen years in age and between 50 cm and 15 m in height have shown symptoms of *Hypsipyla* attacks (Griffiths, 2001). It has been one of the main factors preventing the ready establishment of mahogany plantations in many areas.

DISPERSAL AND INTRODUCTION PATHWAYS

Adults are strong fliers and can travel considerable distances to locate suitable host material.

CONTROL MEASURES

Hypsipyla grandella and *H. robusta* have proven difficult to control. While some methods can significantly reduce populations, this pest can cause significant damage even at low population levels and it is therefore considered a major destructive forest pest. Three main control methods are considered to control *Hypsipyla* species: silvicultural, chemical and biological.

Silvicultural techniques applied to control *Hypsipyla* species include mixed or enrichment plantings, varying tree density, provision of shade, promoting vigourous tree growth in nurseries and plantations, and the selection of resistant or tolerant host trees.

In a review of research on the chemical control of *Hypsipyla* spp., Wylie (2001) noted that there is no single reliable, cost-effective, and environmentally sound chemical pesticide available to control these insects and suggested that chemical control of these pests might be most applicable in nursery situations or as part of an integrated pest management programme by temporarily reducing populations in limited areas.

Though *H. robusta* and *H. grandella* are attacked by a range of natural enemies, they have not been shown to reduce the larval abundance and subsequent damage to acceptable levels (Sands and Murphy, 2001). Previous attempts at biological control of *Hypsipyla* species have not been successful although research into possible agents continues.

The most promising strategies for management of *Hypsipyla* species are integrated pest management programmes involving a combination of these techniques such as the use of pest tolerant host trees, planting of mixed stands and providing shade.