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INSECT FAUNA SURVEYS ON RAMBUTAN, DURIAN AND MANGOSTEEN IN NORTH QUEENSLAND

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Abstract

Insect fauna surveys have been carried out on rambutan (*Nephelium lappaceum* L.), durian (*Durio zibethinus* Murr.) and mangosteen (*Garcinia mangostana* L.) in the coastal wet tropics of north Queensland. Preliminary fauna lists are presented of pest and beneficial arthropods for each crop. A brief description is also given of major pest damage and seasonal abundance.

Introduction

The three most common exotic fruits commercially grown in north Queensland are rambutan, durian and mangosteen. These are evergreen trees, with dense foliage, which have their origins in Southeast Asia. Production is expanding to meet increased market opportunities both locally and overseas. The exotic fruit industries of north Queensland have clear objectives to develop sustainable pest management practices. Unfortunately, very little is known about the insect fauna associated with these crops. The information gained from these surveys will identify major pests and beneficial insects associated with each crop. The aims of this project were to identify major and minor pests and associated beneficial species for all three fruit crops and to determine seasonal and crop phenology impacts on pest abundance. Future research will target individual insects responsible for causing economic damage with the aim to develop an integrated approach to pest control. The purpose of this paper is to give an overview of arthropods encountered thus far in the surveys and provide a brief description of damage symptoms and the seasonal abundance of major pests.

Materials and Methods

Five commercial orchards, which included all three crops, were monitored along the coast of north Queensland. Monitoring sites were located south west of Mission Beach (146°: 00'E, 17°: 55'S), South Johnstone (146°: 00'E, 17°: 37'S), Babinda, (145°: 55'E, 17°: 20'S), Deeral (145°: 57'E, 17°: 12'S) and north east of Mossman (145°: 56'E, 16°: 17'S). Monitoring started on 20 July 1997 and was carried out monthly. Insects were collected using several methods that included sweep nets, beating trays, manual collection, fogging and light traps using a stratified random sample of 30 trees per crop at each location. Each tree was visually assessed for obvious plant damage to the leaves, stems, flowers, fruit and trunk. Ten branches with new leaf flush were randomly checked for insect activity and plant damage. All specimens were recorded and unknown insects causing plant damage were collected for identification. Insects were identified with reference collections at the Centre for Wet Tropics Agriculture at South Johnstone or sent to taxonomists for identification.

Results

Major and minor pests have been assessed by visual field observations throughout the year. Minor insects were considered sporadic and rarely influenced yield decline or fruit quality. The major and minor insect pests of rambutan, durian and mangosteen are presented in tables 1, 2 and 3, respectively. Beneficial arthropods are presented in table 4.

Table 1. Major and Minor Pests of Rambutan grown in north Queensland

ORDER	FAMILY	GENUS	SPECIES	LOCATION* **	FEEDING SITE
Major Pests					
Hemiptera	Pseudococcidae	<i>Planococcus</i>	<i>citri</i>	T, I, B, D, M	fruit/stems/ flowers
Hymenoptera	Formicidae	<i>Oecophylla</i>	<i>smaragdina</i>	T, I, B, D, M	farms mealy bug
Lepidoptera	Noctuidae	<i>Othreis</i>	<i>sp.</i>	T, I, B, D	Fruit piercing
Lepidoptera	Noctuidae	<i>Eudocima</i>	<i>salaminia</i>	T, I, B, D	Fruit piercing
Lepidoptera	Pyalidae	<i>Conogethes</i>	<i>punctiferalis</i>	T, I, B, D, M	Fruit boring
Lepidoptera	Tortricidae	*	*	T, I, B, D	Fruit boring
Minor Pests					
Acarina	Tenuipalpidae	<i>Brevipalpus</i>	<i>sp</i>	T, I, B, D, M	fruit/stems/flowers
Coleoptera	Bostrichidae	<i>Sinoxylon</i>	<i>sp</i>	T, I, B, D, M	branches/stem
Coleoptera	Chrysomelidae	<i>Monolepta</i>	<i>australis</i>	T, I, B, D, M	flush leaves
Coleoptera	Chrysomelidae	<i>Rhyparida</i>	<i>discopunctulata</i>	T, I, B, D, M	flush leaves
Coleoptera	Chrysomelidae	<i>Rhyparida</i>	<i>spp</i>	T, I, B, D	flush leaves
Coleoptera	Curculionidae	<i>Mylocerus</i>	<i>sp</i>	T, I, B, D, M	branches/stem
Hemiptera	Coccidae	<i>Icerya</i>	<i>sp</i>	T, I, B, D, M	fruit/stems
Hemiptera	Coccidae	<i>Pulvinaria</i>	<i>psidii</i>	T, I, B, D, M	fruit/stems
Hemiptera	Coreidae	<i>Amblypelta</i>	<i>lutescens lutescens</i>	T, I, B, D	fruit/stems/flowers
Hemiptera	Flatidae	<i>Colgaroides</i>	<i>acuminata</i>	T, I, B, D, M	stems/shoots/ fruit
Hemiptera	Pentatomidae	<i>Plautia</i>	<i>affinis</i>	T, I, B, D	stems/shoots
Hemiptera	Tessaratomidae	<i>Lynamorpha</i>	<i>parens</i>	B, D	sap sucking stems
Hymenoptera	Formicidae	<i>Tetramorium</i>	<i>bicarinatum</i>	T, I, B, D, M	Farms mealybug
Hymenoptera	Formicidae	<i>Pheidole</i>	<i>megacephala</i>	T, I, B, D, M	Farms mealybug
Hymenoptera	Formicidae	*	*	T, I, B, D, M	Farms mealybug
Lepidoptera	Noctuidae	*	*	T, I, B, D, M	leaves
Lepidoptera	Tortricidae	*	*	T, I, B, D	leaves
Lepidoptera	Noctuidae	<i>Achaea</i>	<i>janata</i>	T, I, B	leaves
Lepidoptera	Noctuidae	<i>Oxyodes</i>	<i>tricolor</i>	T, I, B	leaves
Thysaneoptera	Thripidae	<i>Selenothrips</i>	<i>rubrocinctus</i>	I, D	shoots/flowers/fruit

* = To be identified. ** Codes for locations; Tully = T; Innisfail = I; Babinda = B; Deeral = D; Mossman = M.

Table 2. Major and Minor Pests of Durian grown in north Queensland

ORDER	FAMILY	GENUS	SPECIES	LOCATION* **	FEEDING SITE
Major Pests					
Hemiptera	Coreidae	<i>Amblypelta</i>	<i>lutescens lutescens</i>	T, I, B, D	fruit
Hemiptera	Pseudococcidae	<i>Planococcus</i>	<i>citri</i>	T, I, B, D, M	fruit/stems/flower
Hymenoptera	Formicidae	<i>Oecophylla</i>	<i>smaragdina</i>	T, I, B, D, M	farms mealy bug
Coleoptera	Chrysomelidae	<i>Rhyparida</i>	<i>discopunctulata</i>	T, I, B, D, M	flush leaves
Lepidoptera	Pyalidae	<i>Conogethes</i>	<i>punctiferalis</i>	T, I, B	fruit borer
Lepidoptera	Tortricidae	*	*	T, I, B	fruit borer
Minor Pests					
Coleoptera	Cerambycidae	* <i>Prosoplus</i>	<i>Sp.</i>	T, D	Trunk girdler
Coleoptera	Chrysomelidae	<i>Monolepta</i>	<i>australis</i>	T, I, B, D, M	flush leaves
Hemiptera	Flatidae	<i>Colgaroides</i>	<i>acuminata</i>	T, I, B, D, M	stems/shoots/fruit
Hemiptera	Pentatomidae	<i>Ancanthidiellum</i>	<i>souefi</i>	T, I, B, D	stems/shoots/ fruit
Hemiptera	Pentatomidae	<i>Accarana</i>	<i>australis</i>	T, I, B, D	stems/shoots/ fruit
Hymenoptera	Formicidae	<i>Tetramorium</i>	<i>bicarinatum</i>	T, I, B, D, M	Farms mealybug
Hymenoptera	Formicidae	<i>Pheidole</i>	<i>megacephala</i>	T, I, B, D, M	Farms mealybug
Hymenoptera	Formicidae	*	*	T, I, B, D, M	Farms mealybug
Lepidoptera	Noctuidae	<i>Autoba</i>	<i>versicolor</i>	T, I, B, D, M	leaves/flowers
Lepidoptera	Noctuidae	*	*	T, I, B, D, M	leaves
Lepidoptera	Tortricidae	*	*	T, I, B, D, M	leaves

* = To be identified. ** Codes for locations; Tully = T; Innisfail = I; Babinda = B; Deeral = D; Mossman = M.

Table 3. Major and Minor Pests of Mangosteen grown in north Queensland

ORDER	FAMILY	GENUS	SPECIES	LOCATION**	FEEDING SITE
Major Pests					
Hemiptera	Coreiidae	<i>Amblypelta</i>	<i>lutescens lutescens</i>	T, I, B, D	fruit
Hemiptera	Pseudococcidae	<i>Planococcus</i>	<i>citri</i>	T, I, B, D, M	fruit/stems/ flowers
Hymenoptera	Formicidae	<i>Oecophylla</i>	<i>smaragdina</i>	T, I, B, D, M	farms mealy bug
Thysanoptera	Thripidae	<i>Selenothrips</i>	<i>rubrocinctus</i>	T, I, B, D, M	fruit/shoots
Minor Pests					
Acarina	Tenuipalpidae	<i>Brevipalpus</i>	<i>spp</i>	T, I, B, D, M	stems/shoots
Coleoptera	Chrysomelidae	<i>Geloptera</i>	<i>miracula</i>	T, I, B, D, M	leaves/shoots
Coleoptera	Chrysomelidae	<i>Monolepta</i>	<i>australis</i>	T, I, B, D, M	leaves/shoots
Coleoptera	Chrysomelidae	<i>Rhyparida</i>	<i>caeruleipennis</i>	T, I	leaves/shoots
Coleoptera	Chrysomelidae	<i>Rhyparida</i>	<i>clypeata</i>	T, I, B	leaves/shoots
Hemiptera	Coreiidae	<i>Amblypelta</i>	<i>nitida</i>	T, I, B,	fruit
Hemiptera	Flatidae	<i>Colgaroides</i>	<i>acuminata</i>	T, I, B, D, M	stems/shoots/fruit
Hymenoptera	Formicidae	<i>Tetramorium</i>	<i>bicarinarum</i>	T, I, B, D, M	Farms mealybug
Hymenoptera	Formicidae	<i>Pheidole</i>	<i>megacephala</i>	T, I, B, D, M	Farms mealybug
Hymenoptera	Formicidae	*	*	T, I, B, D, M	Farms mealybug

** Codes for locations; Tully = T; Innisfail = I; Babinda = B; Deeral = D; Mossman = M.

Table 4. Combined Beneficial Insects and Spiders of Rambutan, Durian and Mangosteen grown in north Queensland

ORDER	FAMILY	GENUS	SPECIES	LOCATION*	HOST
Araneida	Lycosidae	<i>Lycosa</i>	<i>spp.</i>	T, I, B, D, M	General predator
Araneida	Oxyopidae	<i>Oxyopes</i>	<i>spp.</i>	T, I, B, D, M	General predator
Araneida	Heteropidae	<i>Holconia</i>	<i>spp.</i>	T, I, B, D, M	General predator
Araneida	Salticidae	<i>Opisthoncus</i>	<i>spp.</i>	T, I, B, D, M	General predator
Araneida	Araneidae	<i>Gasteracantha</i>	<i>sp.</i>	T, I, B, D, M	General predator
Coleoptera	Coccinellidae	<i>Amidellus</i>	<i>ementitor</i>	T, I, B, D, M	?
Coleoptera	Coccinellidae	<i>Coelophora</i>	<i>inoequalis</i>	T, I, B, D, M	?
Coleoptera	Coccinellidae	<i>Coccinella</i>	<i>transversalis</i>	T, I, B, D, M	moth eggs, thrips, scale
Coleoptera	Coccinellidae	<i>Cryptolaemus</i>	<i>montrouzieri</i>	T, I, B, D, M	mealy bug
Coleoptera	Coccinellidae	<i>Illeis</i>	<i>galbula</i>	T, I, B	?
Coleoptera	Coccinellidae	<i>Micraspis</i>	<i>lineola</i>	T, I, B	?
Coleoptera	Coccinellidae	<i>Micraspis</i>	<i>frenata</i>	T, I	?
Coleoptera	Coccinellidae	<i>Rodolia</i>	<i>sp</i>	T, I, B, D	Icerya spp. (scale)
Coleoptera	Staphylinidae	<i>several</i> *	<i>several</i> *	T, I, B, D, M	General predator
Diptera	Dolichopodidae	<i>Psilopus</i>	<i>sp.</i>	T, I, B, D, M	moth eggs
Hemiptera	Pentatomidae	<i>Oechalia</i>	<i>schellebergii</i>	T, I, B, D, M	General predator
Hemiptera	Reduviidae	<i>Pristhesancus</i>	<i>plagipennis</i>	T, I, B, D, M	General predator
Mantodea	<i>several</i> *	<i>several</i> *	<i>several</i> *	T, I, B, D, M	General predator
Neuroptera	Chrysopidae	<i>Mallada</i>	<i>sp.</i>	T, I, B, D, M	General predator
Odonata	Coenagrionidae	<i>Ischnura</i>	<i>fragilis</i>	T, I, B, D	General predator
Odonata	Coenagrionidae	<i>Agrionocnemis</i>	<i>argentea</i>	T, I,	General predator
Odonata	Coenagrionidae	<i>Agrionocnemis</i>	<i>dobsoni</i>	T, I, B	General predator
Odonata	Isostictidae	<i>Austrostricta</i>	<i>fieldi</i>	T, I, B, D, M	General predator
Odonata	Isostictidae	<i>Isosticta</i>	<i>simplex</i>	T, I, B, D, M	General predator
Odonata	Protoneuridae	<i>Alloneura</i>	<i>coelestina</i>	T, I,	General predator
Odonata	Lestidae	<i>Austrolestes</i>	<i>insularis</i>	T, I, B, D, M	General predator
Odonata	Megapodagrionidae	<i>Austroargiolestes</i>	<i>aureus</i>	T, I, B, D, M	General predator

* = To be identified. ** Codes for locations; Tully = T; Innisfail = I; Babinda = B; Deeral = D; Mossman = M.

Discussion

Citrus mealy bug (*Planococcus citri* Risso) and the green tree ant (*Oecophylla smaragdina* Fabricius) are common pests to all three crops. Although green tree ants have been reported as being beneficial in some fruit crops in drier climates (Peng *et al.* 1995), this has not been the experience of fruit growers in the coastal wet tropics of north Queensland. Favourable conditions along with the abundance of food and shelter favour the build up of large populations of green tree ants. These insects are active farmers of the citrus mealy bug and encourage high populations and subsequent sooty mould growth on fruit and leaves. In rambutans, green tree

ants web or tie fruit together making it difficult to clean. The territorial behaviour of the green tree ant makes them aggressive if disturbed and large populations can pose difficulties for efficient harvesting by attacking fruit pickers.

If green tree ant populations were managed by injecting nests with a suitable chemical they may act as biological control agents of other insect pests. Alternatively, selective insecticides could be used to control citrus mealy bug. The ladybird, (*Cryptolaemus montrouzieri* Mulsant) was an effective predator of the citrus mealy bug. Its juvenile stages mimic the citrus mealy bug and move freely within green tree ant populations without being attacked. This predator has the potential to play an important part in the biological control of the citrus mealy bug in north Queensland as does the parasitoid, *Leptomastix dactylopii* (Howard) (Ceballo *et al.* 1998).

Other minor pests in common with all three crops include swarming leaf beetles (*Rhyparida sp.*, *Monolepta (Monolepta sp.)* and plant hoppers (*Colgaroides acuminata* Walker). A number of other beneficials have been previously recorded from many of the major pests mentioned for rambutans, durian and mangosteen (Ceballo *et al.* 1998 and Smith *et al.* 1997). The efficacy of biological control with these beneficials need to be quantified before consideration can be given to their use in developing integrated pest management programs.

Plant Damage Descriptions and Seasonal Abundance for Major Pests of Rambutan

Yellow peach moth (*Conogethes punctiferalis* Guenee.), an unidentified fruit borer and fruit piercing moths (*Eudocima salaminia* Cramer and *Othreis spp.*), cause damage to the fruit. The first two pests feed externally on green and mature fruit from December to March. On green, developing fruit the larvae also feed on pedicels causing premature fruit drop. As the fruit matures the larvae bore into fruit making it unmarketable. Fruit piercing moth adults feed on the fruit juices of maturing fruit and by damaging the skin allow the entry of secondary rots. These pests are most active from February to April. Citrus mealy bugs and green tree ants are active throughout the year with peak numbers occurring between December and April.

Plant Damage Descriptions and Seasonal Abundance for Major Pests of Durian

The Banana spotting bug (*Amblypelta lutescens lutescens* Distant) is most active in durians between October and January causing large numbers of fruit to drop prematurely as a result of bugs feeding on pedicels. On fruit, feeding causes cracked sunken areas as the surrounding tissue dies and the fruit continues to grow. The yellow peach moth and an unidentified fruit borer larva cause damage to the fruit as it matures between February and April. The larvae feed on the fruit surface between the spines covering themselves with frass. Black swarming leaf beetles (*Rhyparida sp.*) are active throughout the year with peak periods occurring between October and April. Under high populations, black swarming leaf beetles can severely set back tree development. Green tree ants and citrus mealy bugs are present on durian between November and March.

Plant Damage Descriptions and Seasonal Abundance for Major Pests of Mangosteen

Red-banded thrips (*Selenothrips rubrocinctus* Giard.) develop high populations during hot dry conditions between September and January. Thrips are very active in mangosteens from flowering and will continue feeding on developing fruit up to harvest. Most of the damage occurs as thrips feed on the fruit surface causing a russetting blemish, which results in downgrading or rejection of the fruit from the market. Fruit-spotting bugs cause damage to young developing fruit. Feeding sites develop into sunken lesions, which eventually crack as the fruit grows. Citrus mealy bugs and the green tree ants are a minor problem in mangosteens, possibly due to the thicker and more ridged leaves making them unsuitable for nest construction.

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