

AFT Summary Report

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Lepidoptera are the most abundant group of insects that feed on the fruit and foliage of apples, cherries and peaches. Over 50 species of Lepidoptera have been reported to inhabit Michigan apple orchards (Strickler and Whalon 1985, Howitt 1993). The most abundant and widely distributed species are in the family Tortricidae. These include leafrollers, budworms and a group of species that feed within the fruit (e.g., codling moth, Oriental fruit moth and lesser apple worm). Some tortricids are residents of the orchards and others move in annually from non-orchard habitats, thus the kinds and abundance of species present varies depending on the orchard setting. Tortricid diversity also is impacted by horticultural and pest management practices.

Pheromone monitoring technology is a common means of assessing the presence and activity of some key tortricids in MI orchards. Pheromone traps are quick, economical and grower-friendly measurement tools. The sex pheromones of most tortricids collected in Michigan fruit orchards have been identified (Mayer and McLaughlin 1991). Although each species uses a unique blend of attractant chemicals, many species share the same major component.

Pheromone-baited sticky traps were used to assess the diversity of tortricid moths in 21 apple, peach and cherry orchards in 2004 and 2006. They included blocks that were managed organically, using an integrated approach, conventionally, or had not been commercially managed for several years. Tortricid diversity was assessed in May, June, July, August, and September/October. On each occasion, a total of 17 traps, each baited with a different lure, were hung in trees near the center of each block. The sticky liners containing captured moths were collected after 14 days in the field and were removed from the orchards.

Over 9,000 moths were captured in the 21 monitored orchards. A taxonomist specializing in microlepidoptera identified specimens from 7 families. The greatest diversity of representative (genera) captured were in the Tortricidae (16)(tbls 1 & 2), the Noctuidae (5)(tbls 3 & 4), and the Pyralidae (3)(tbls 5 & 6). Overall, thirty one non-target species were captured. The total sum of non-target species captured in baited traps was lower than the targeted species. However, four traps collected a fairly broad diversity of non-target species. Traps baited with *Choristoneura rosaceana* (obliquebanded leafroller) pheromone or *Choristoneura fumiferana* (eastern spruce budworm) pheromone captured moths from 4 genera each. *Rhopabota naevana* (blackheaded fireworm) and *Platynota idaeusalis* (tufted apple budmoth) pheromone baited traps captured moths from 3 and 2 genera each. *Ptycholoma peritana* ("strawberry" garden tortrix) was the most abundantly captured moth followed by the *Nedra ramosula* (gray half-spot moth) (tbl 7).

Table 1: Diversity of Tortricidae Captured in MI Orchards

Genus	species	Proportion of Catch		
		apple	cherry	peach
Acleris	Schalleriana	2.1	0.0	0.0
	Sp.	4.3	1.1	0.0
Ancyliis	burgessiana	1.1	0.0	0.0
	semiovana	1.1	0.0	0.0
Archips	argyrospila	0.0	3.3	0.0
Choristoneura	fractivittana	1.1	6.7	34.8
Cydia	pomonella	1.1	0.0	0.0
Ecdytolopha	insiticiiana	1.1	0.0	0.0
Epiblema	scudderiana	0.0	2.2	0.0
Grapholita	interstinctana	0.0	1.1	0.0
Hedya	chionosema	0.0	2.2	0.0
	separatana	4.3	2.2	0.0
Notocelia	illotana	1.1	1.1	0.0
Olethreutes	sp.	1.1	0.0	0.0
Platynota	idaeusalis	2.1	0.0	0.0
Proteoteras	aesculana	1.1	0.0	0.0
Ptycholoma	peritana	76.6	78.9	65.2
Sparganothis	niveana	0.0	1.1	0.0
	sulfereana	1.1	0.0	0.0
Syndemis	afflictana	1.1	0.0	0.0

Table 2: Diversity and Overall Abundance of Tortricidae in MI Orchards Using Four Attractive Pheromone Lures

Trap Lure (pheromone)	Genus species	apple	cherry	peach
Blackheaded Fireworm	Proteoteras aesculana	1		
	Ancyliis burgessiana	1		
	Choristoneura fractivittana	1	5	8
	Sparganothis niveana		1	
	Ancyliis semiovana	1		
Eastern spruce budworm	Grapholita interstinctana		1	
	Ptycholoma peritana			1
	Cydia pomonella	1		
	Acleris schalleriana	2		
	sp.		1	
Obliquebanded leafroller	Ptycholoma peritana	8	23	7
Tufted apple budmoth	Ptycholoma peritana	55	26	5

Table 3: Diversity of Noctuidae captures in MI Orchards

Genus	species	Proportion of Catch		
		apple	cherry	Peach
Autographa	bimaculata	1.1	0.0	0.0
Charadra	deridens	12.0	12.0	0.0
Nedra	ramosula	83.7	76.2	100.0
Pseudeustr otia	carneola	1.1	12.0	0.0
Pseudaletia	unipuncta	2.2	0.0	0.0

Table 4: Diversity and Overall Abundance of Noctuidae in MI Orchards Using Four Attractive Pheromone Lures

Trap Lure (pheromone)	Genus species	apple	cherry	peach
Blackheaded Fireworm	Nedra ramosula	68	64	1
Eastern spruce budworm	Charadra deridens	11	9	
Obliqueband ed leafroller	Nedra ramosula	3		
	Pseudeustrotia carneola	1	1	
Tufted apple budmoth	Charadra deridens		1	

Table 5: Diversity of Pyralidae Captured in MI Orchards

Genus	Species	Proportion of Catch		
		apple	cherry	peach
Hellula	aqualis	20.0	0.0	100.0
Ostrinia	nubulalis	20.0	15.4	0.0
Pyrausta	phoenicealis	60.0	84.6	0.0

Table 6: Diversity and Overall Abundance of Pyralidae in MI Orchards Using Four Attractive Pheromones

Trap Lure (pheromone)	Genus species	apple	cherry	peach
Blackheaded Fireworm	Hellula aqualis	3		2
Sparganothis fruitworm	Pyrausta phoenicealis	9	10	
Obliquebanded leafroller	Ostrinia nubulalis Pyrausta phoenicealis	2	1	
Nantucket pine tip moth	Ostrinia nubulalis	1		

Table 7: Traps with broad diversity of non-target species in MI apple orchards

Trap Lure (Pheromone)	Genus species	apple	cherry	peach
Obliquebanded leafroller	<i>Nedra ramosula</i>	3		
	<i>Ostrinia nubilalis</i>	2		1
	<i>Pseudeustrotia carneola</i>	1	1	
	<i>Ptycholoma peritana</i>	8	23	7
Eastern spruce budworm	<i>Acleris schalleriana</i>	2		
	<i>Acleris</i> sp.		1	
	<i>Charadra deridens</i>	11	9	
	<i>Crambus praefectellus</i>		3	
	<i>Ptycholoma peritana</i>			1
Blackheaded fireworm	<i>Choristoneura fractivittana</i>	1	5	8
	<i>Hellula aqualis</i>	2		2
	<i>Nedra ramosula</i>	68	64	1
Tufted apple budmoth	<i>Charadra deridens</i>		1	
	<i>Ptycholoma peritana</i>	55	26	5

The diversity of Lepidoptera varied by cropping system (tbls 8,9,10). Moths captured in apple, cherry, and peach represented 7 families and shared three of them; the Noctuidae, Pyralidae, and Tortricidae. Apple and cherry orchards contained the highest total numbers of moths captured and the most representative number of genera with 22 and 16 each respectively. The diversity of non-target Lepidoptera in peach orchards was much lower with only 6 genera and as many species represented. The two most common tortricids found in cherry and peach were *Ptycholoma peritana* and *Choristoneura fractivittana* (brokenbanded leafroller) while in apple it was *Ptycholoma peritana* and *Hedya separata* (pink washed leafroller).

Table 8: Lepidoptera Diversity in Apple

Family	Genera	
Arctiidae	Halysidota	
Noctuidae	Autographa Charadra Nedra Pseudaletia Pseudeustrotia	
Pyralidae	Hellula Ostrinia Pyrausta	
Tortricidae	Acleris Ancyliis Choristoneura Cydia Ecdytolopha Hedya Notocelia	Olethreutes Platynota Proteoteras Ptycholoma Sparganothis Syndemis

Table 9: Lepidoptera diversity in cherry

Family	Genera	
Crambidae	Crambus	
Noctuidae	Charadra Nedra Pseudeustrotia	
Pyralidae	Ostrinia Pyrausta	
Tortricidae	Acleris Archips Choristoneura Epiblema Grapholita	Hedya Notocelia Ptycholoma Sparganothis
Yponomeutidae	Yponomeuta	

Table 10: Lepidoptera Diversity in peach

Family	Genera
Noctuidae	Nedra
Oecophoridae	Antaeotricha
Pyralidae	Hellula Ostrinia
Tortricidae	Choristoneura Ptycholoma

The aim is to develop a method for assessing orchard health on a landscape scale. In addition, the technique must be user friendly so it will be adopted. Building upon our previous research, we propose assessing the diversity of moths in orchards using traps proven to capture the greatest diversity of moths. Six traps of each species, the obliquebanded leafroller and blackheaded fireworm will be deployed and spaced evenly in a linear transect extending from the center of the orchard toward the perimeter and into the surrounding native habitat. Four traps in each transect will be in the orchard while the remaining two will be situated outside of the orchard. OBLR traps will be monitored every other week throughout June and July and BHFV in July through August, when the greatest number and diversity of species are attracted to these pheromones. Moth captures will be identified and recorded in the field. Each trap will be given a unique identity and the location recorded by GPS. Seasonal trap data will be analyzed to determine the source sink effect for each species captured.

Howitt, A.H. 1993. Common tree fruit pests. North Central Regional Extension Publication #63. Michigan State University, E. Lansing, MI. 252p.

Strickler, K. and Whalon M., 1985. Microlepidoptera species composition in Michigan apple orchards. J. Econ. Entomol. 14: 486-495.