

Insect Diversity on Mount Mansfield

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Abstract

Insect surveys for 1995 were done at three elevations. Two lower elevation sites, Proctor Maple Research Center at 400 m (PMRC), and Underhill State Park at 640 m (USP640) were the same as for 1990-1994. The high elevation site at 1160 m was discontinued, and an additional site at 715 m was chosen in Underhill State Park (USP715) to examine the Lepidoptera fauna immediately below the spruce/fir zone. Ground beetle (Carabidae) surveys were continued at the two lower elevation sites as for earlier years. Patterns of overall abundance, and abundance of selected species (including current or potential pests) in relation to elevation are presented here for the Lepidoptera, and new species records for the Mt Mansfield survey are listed.

Introduction

This report concludes the fifth consecutive year of insect surveys on Mount Mansfield. The purpose of this program is to develop information on taxonomic diversity and species abundance of selected insect groups in the forest ecosystem at different elevations. This information will contribute a taxonomic foundation for future work on the ecological relationships between invertebrate biodiversity and forest management.

The first three years of the insect survey included Hymenoptera and Diptera from canopy malaise traps, ground beetles (Carabidae) from pitfall traps and Lepidoptera from light traps. The canopy study was discontinued after the first three years, and the data from this and ground surveys are being analyzed for statistical comparisons of diversity variation among the three study sites.

Comparisons are presented in this report for general between-site diversity, individual pest species, and examples of elevation differences for individual species. The potential ecological significance of these patterns for forest management is briefly discussed.

Methods

In 1995 the Lepidoptera and ground beetle surveys continued at established sampling plots in a sugar maple forest (Proctor Maple Research Center, 400 m), and a mixed hardwood forest (Underhill State Park, 640 m). A new Lepidoptera sampling site was established in a birch-mixed-hardwood forest at 715 m in Underhill State Park.

The established survey sites comprise five permanent 20 m diameter plots with six

pitfall traps located around each plot at 60° intervals. In previous years a single light trap was located in the center plot, but in 1995 two additional light traps were included and located outside the permanent plot no less than 30 m apart. At Proctor Maple Research Center and Underhill State Park traps two and three correspond to the single trap used in previous years. Three traps were also established at the 715 m site.

The 1995 Lepidoptera survey was limited to Noctuidae, Geometridae, Notodontidae, Arctiidae, Saturniidae, Lasiocampidae, Drepanidae, Sesiidae, and Limacodidae. These groups were selected because it was possible to provide accurate identifications for most specimens within the time constraints of the study, with the exception of Limacodidae which turned out to be impractical because of similarities among some species.

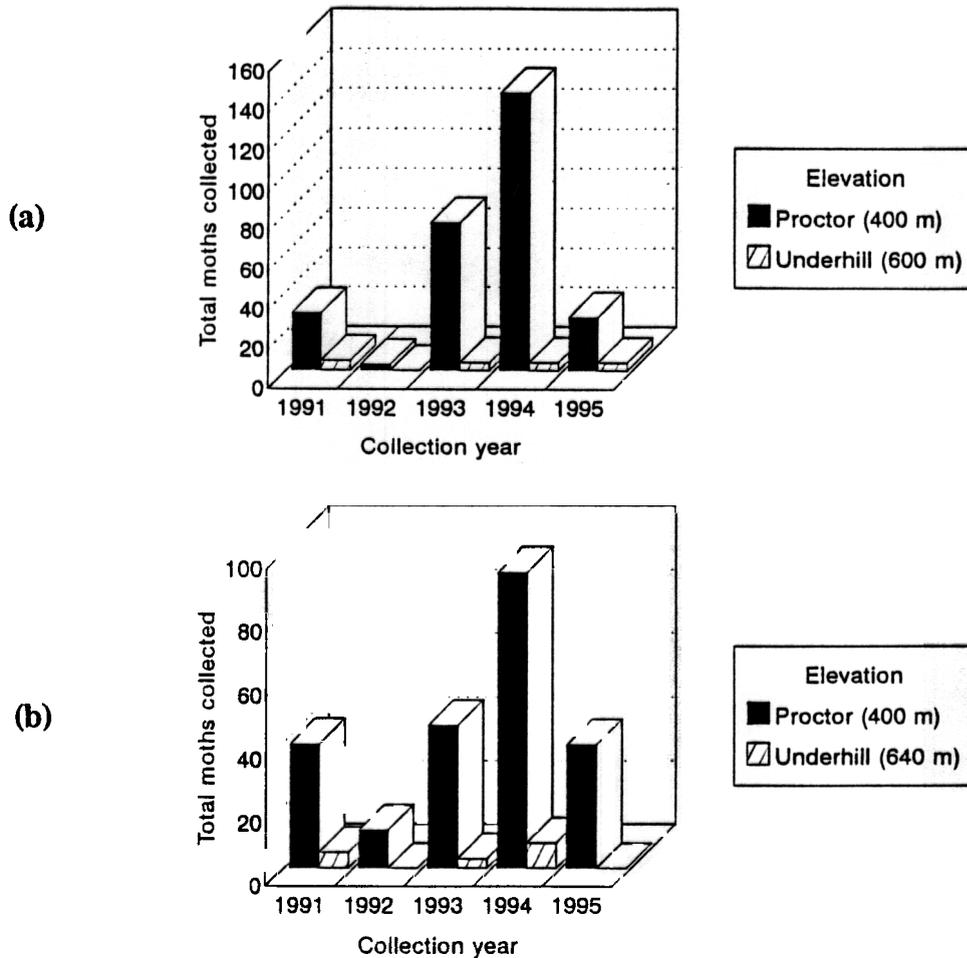
Results

(A) Pest species

A few specimens of the gypsy moth (*Lymantria dispar*) were recorded for the first time in this survey (Table 1). The survey area is not prime gypsy moth habitat, so its low level of occurrence is anticipated.

A considerable increase in numbers of forest tent caterpillar *Malacosoma disstria* and eastern tent caterpillar *M. americanum*, were observed in 1994, but numbers collected for both species in 1995 were no higher than for any of the first three years of collecting (Fig. 1). The highest numbers of both species continued to be collected at PMRC. Neither species was collected from the new USP715, and no specimens of the eastern tent caterpillar were collected from USP640.

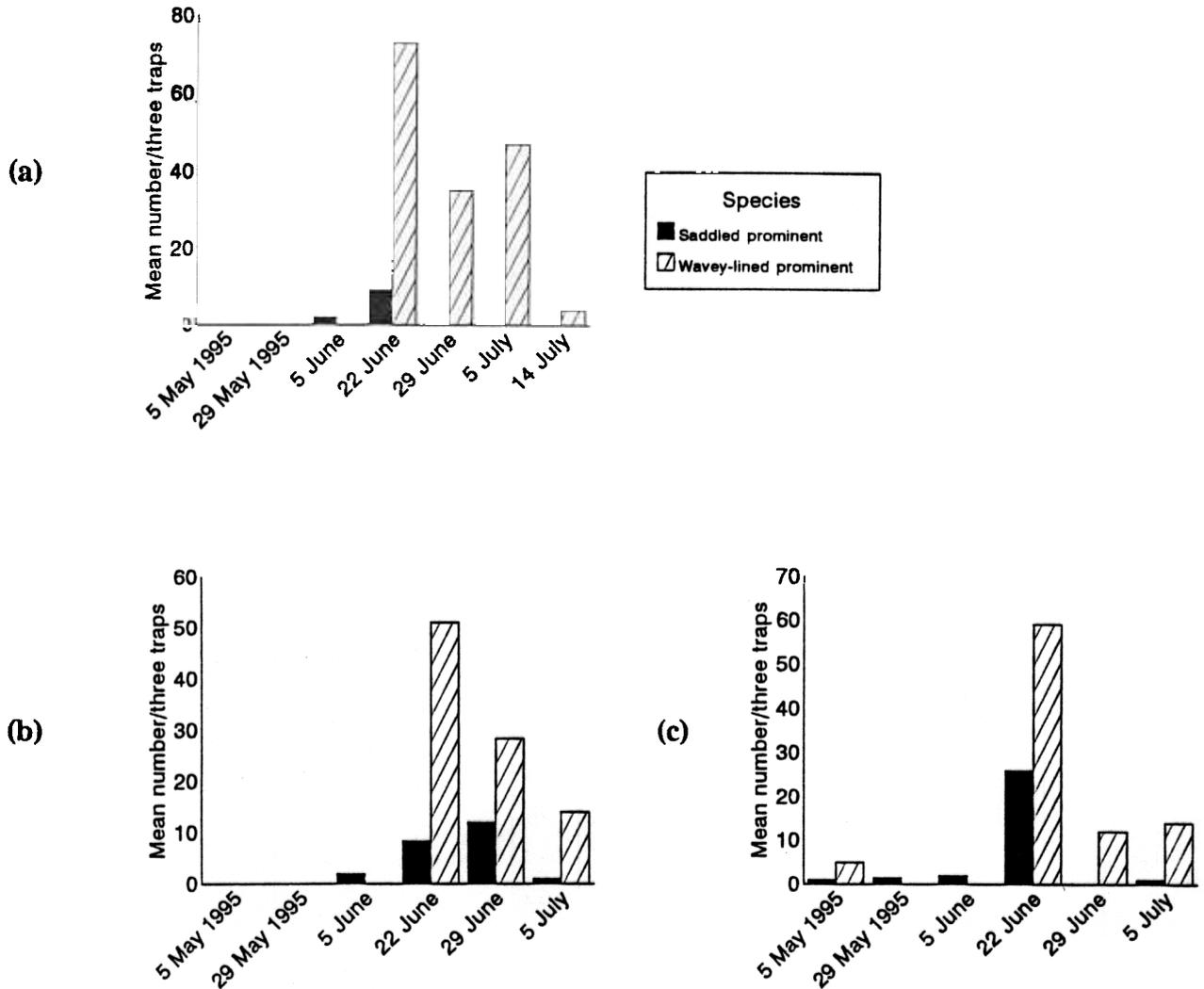
Figure 1. Annual total number of adults of (a) forest tent caterpillar, *Malacosoma disstria* and (b) eastern tent caterpillar, *M. americanum*, collected over a five-year period on Mount Mansfield at Proctor Maple Research Center and Underhill State Park (640 m).



Specimens of saddled prominent, *Heterocampa guttivita* (Notodontidae) were noted during the 1990-1994 survey, but were not counted because they could not be easily distinguished from the wavy-lined prominent, *H. biundata*. This problem was overcome in 1995 by removing scales from the terminal portion of the ventral abdominal surface and comparing the size of sensory pits for males in the two species (relatively few females were collected). Numbers of wavy-lined prominents greatly exceeded

those of saddled prominents at all sites, with emergence of saddled prominent beginning earlier in the season (Fig. 2). The results indicate that saddled prominent abundance is not cause for concern on Mt Mansfield. If larval feeding by wavy-lined prominents is also destructive to host trees, its greater abundance may suggest that its population trends should also be monitored on a regular basis. The last major outbreak of saddled prominent in Vermont occurred in the early 1980's (Parker et al. 1989).

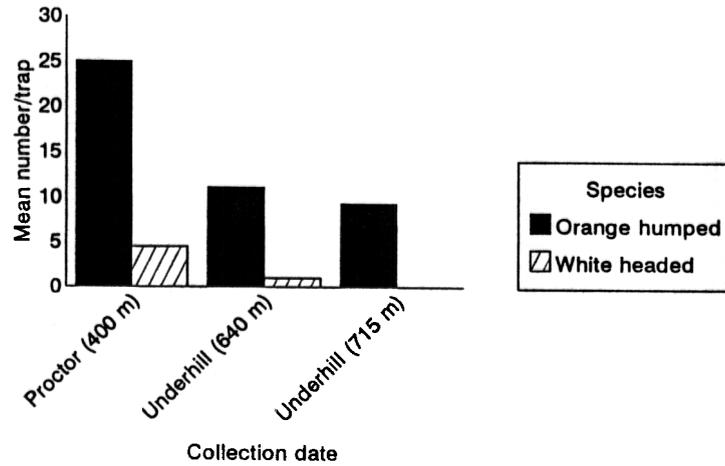
Figure 2. Seasonal abundance of saddled prominent, *Heterocampa guttivita*, and wavy-lined prominent, *H. biundata*, at (a) Underhill State Park (715m), (b) Underhill State Park (640 m), and Proctor Maple Research Center (400 m) in 1995.



Orange-humped mapleworm (*Symmerista leucitys*) is a minor pest in most parts of its range although it is also responsible for local severe defoliations (Allen 1979, Houston et al. 1990) including Vermont (Teillon et al. 1978). External features do not separate the different species of *Symmerista* so systematic counts were not

included in earlier years of the survey. For the 1995 samples species were identified by examination of male genitalia following descriptions provided by Franclemont (1946). The orange-humped maple-worm was more common than the white-headed maple-worm (*S. albifrons*) (Fig. 3), but both were present in relatively low numbers.

Figure 3. Abundance of adults of orange-humped mapleworm, *Symmerista leucitys*, and white-headed mapleworm (*S. albifrons*) on Mt Mansfield, 1995.

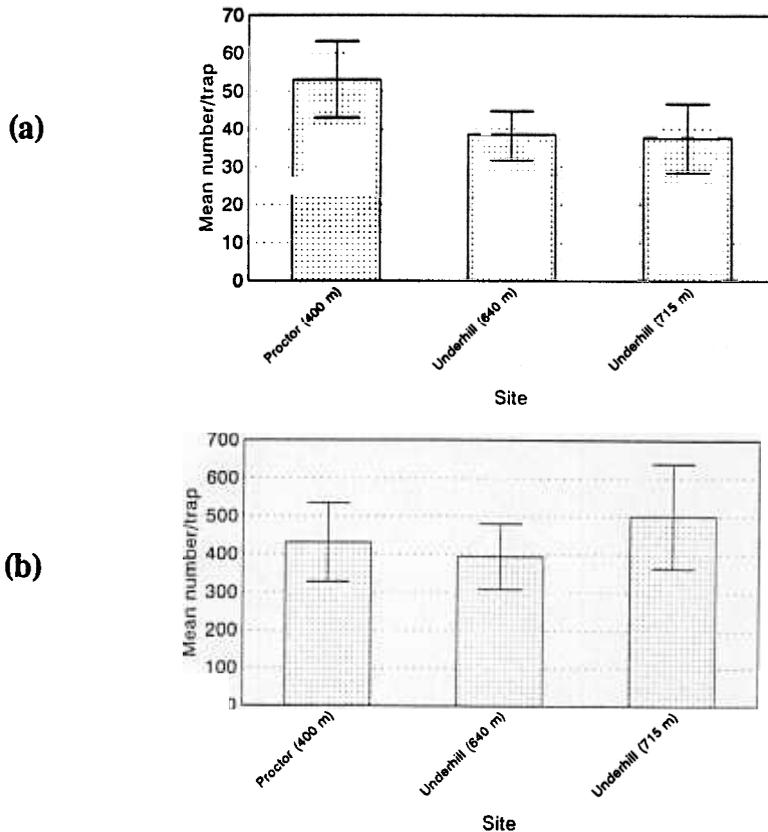


(B) Elevation Patterns

Average numbers of moth individuals and species did not show a large amount of variation between sites. PMRC supported slightly higher numbers of species than the

higher elevations (Fig. 4), but was similar to USP640, both of which were lower than USP715.

Figure 4. Mean numbers of (a) species, and (b) individual moths collected at each site on Mt. Mansfield in 1995.



Large numbers of the lesser maple spanworm (*Itame pustularia*, Geometridae) were noticed at all sites, including around lights on buildings at PMRC. As the common name implies, the lesser maple spanworm is a maple feeder of several species and it is also sometimes a pest (Covell 1984). It is no surprise to see its highest abundance at PMRC, with less than half as many at the higher elevations (Fig.

5). The opposite pattern is found for the Welsh wave (*Venusia cambrica*, Geometridae) which is recorded from a range of trees, including alders, birch, mountain ash, and willow. The higher numbers present at the higher elevation sites (Fig. 6) may reflect these host-plant associations, particularly for USP715 where birch and ash are common.

Figure 5. Mean abundance of lesser maple spanworm, *Itame pustularia* (Geometridae), on Mt Mansfield in 1995.

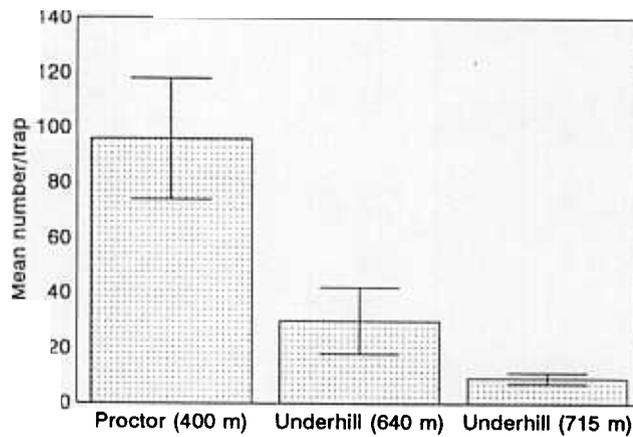
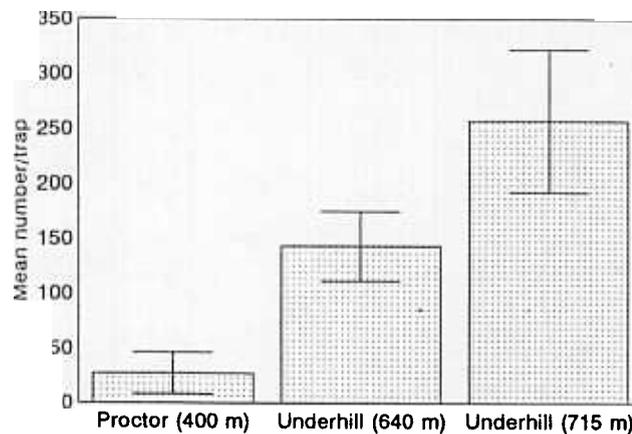


Figure 6. Mean abundance of welsh wave, *Venusia cambrica* (Geometridae), on Mt Mansfield in 1995.



project is to relate the taxonomic biodiversity of Mt Mansfield Lepidoptera to its ecological and management significance. The first step, already initiated, is the development of a general host-plant list for representative groups of Mt Mansfield Lepidoptera. This project could also be complemented by a targeted program to rear Lepidoptera larvae from trees, shrubs and herbs as host-plant relationships may vary with geography and elevation.

Host-plant documentation will allow general predictions about the ecological and potential forest management significance of the Lepidoptera biodiversity structure on Mt Mansfield. It will be important to identify and understand the range of host-plant relationships present on the Mountain and how these may vary over elevation and between habitats. Questions concerning the relative significance of rare and common moths in relation to the distribution and abundance of trees and other plants may be assessed. These relationships, once identified, will provide an ecological context against which testable predictions may be made about the ecological impact of different forest management practices on insect biodiversity in mixed northern hardwoods characteristic of Mt Mansfield.

References

- Allen, D. C. 1979. Observations on biology and natural control of the orangehumped mapleworm, *Symmerista leucitys* (Lepidoptera: Notodontidae), in New York. *The Canadian Entomologist* 111: 703-708.
- Covell, C. V. Jr. 1984. *Eastern Moths*. Houghton Mifflin Company, Boston.
- Franclemont, J. G. 1946. A revision of the species of *Symmerista* Hübner known to

occur north of the Mexican border (Lepidoptera, Notodontidae). *The Canadian Entomologist* 78:97-103.

- Houston, D. R., D. C. Allen, and D. Lachance. 1990. *Sugarbush management: a guide to maintaining tree health*. Northeastern Forest Experiment Station General Technical Report NE-129.
- Parker, B. L., K. E. McGrath, S. Moulton, and H. B. Teillon. 1989. *History of the major forest insect pests in Vermont*. A joint VT Agricultural Experiment Station and State of VT publication. RR 57. University of Vermont, Burlington.
- Rockburne, E. W., and J. D. Lafontaine. 1976. *The cutworm moths of Ontario and Quebec*. Canada Department of Agriculture Publication 1593.
- Teillon, H. B., R. S. Kelly, and E. E. Keenan. 1978. *Forest and insect disease conditions, 1977*. Department of Forests, Parks, and Recreation. Montpelier, Vermont.

(c) New records

Collecting during earlier years was confined to one trap per site with a total of three altogether. This limited sampling is likely to miss some species due to sampling error arising from factors such as abundance and distribution, or attraction to light. A total of 20 species were recorded for the first time in 1995, and all were in low numbers (Table 1). Some are likely to be the result of identification error between similar species, and some are probably non resident in the local habitat. Two of the new Mansfield species records were also new for the State (under the current State inventory, Grehan et al. 1995). One specimen of *Syngrapha selecta* (Noctuidae: Plusiinae) was collected from USP640, and another from South Burlington in 1995. The species feeds on spruce, balsam fir, and pines (Rockburne and Lafontaine 1976). The second new State record was the dagger moth *Acronicta funeralis* (Noctuidae: Acronictinae) regarded as a widespread, but uncommon species that feeds on a range of deciduous trees including birch and maple (Rockburne and Lafontaine 1976).

Table 1. New species records in 1995 of Mount Mansfield Lepidoptera.

Species	Number
Arctiidae	
<i>Lophocampa caryae</i>	1
<i>Haploa confusa</i>	3
Drepanidae	
<i>Oreta rosea</i>	3
Geometridae	
<i>Eulithis explanata</i>	5
<i>Lobophora nivigerata</i>	2
<i>Lomographa semicolorata</i>	5
<i>Semiothisa fissinotata</i>	10

Lasiocampidae

Tolyte laricis

Lymantriidae

Lymantria dispar 7

Noctuidae

Acronicta funeralis 1

Antiearsia gemmatalis 1

Baileya dormitana 2

Bomolocha maedefactalis 1

Caeargina erechtea 2

Chrysanympha formosa 1

Eudrya grata 1

Nola cilicoides 1

Papaipema ptersii 1

Syngrapha selecta 1

Notodontidae

Clostera apicalis

Sphingidae

Porcella gordius

Sphecodia abboti 2

Discussion: Relevance to Forest Management

We are now in a position to have a reasonably accurate picture of the macro-Lepidoptera biodiversity representative of mixed hardwood forest stands on Mount Mansfield, and some indication of how these species are distributed over elevation despite statistically inadequate replicated sampling. There will inevitably be some variation with sampling of rare species, and even common species with localized distributions. Inferences made about this biodiversity are referable only to that part of the biota attracted to black-lights, and those sampled through baiting (see 1994 Annual Report). Of those macro-lepidoptera not attracted to light, some common species are considered likely to be present and remain to be sampled.

The next key development in this