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FIELD TESTING WEBBING CLOTHES MOTH PHEROMONE TRAPS: METHODS AND RESULTS

Christine Del Re and David Mueller

A Brief History of Moth Activity and Problems in the Field Museum of Natural History

The Field Museum of Natural History has had a long history of moth infestations throughout the building . This serious and chronic problem has largely been due to the fact that in 1977, when the building was extensively re-carpeted, it was re-carpeted with a wool carpet. This carpet, which according to the Head of Facilities Planning and Operations was chosen primarily for its wear and fire-retardant characteristics, was installed mostly on the first and ground floors of the museum. Because this carpet is used so extensively, and is located throughout many public areas of the museum, i.e., hallways and galleries in addition to many offices, complete removal of the carpet - the ideal situation - would be both very expensive and very disruptive.

The alternative approach that has been taken has been to remove and replace the wool carpet with a synthetic as carpet wear, gallery renovations and other museum circumstances allow. However, this gradual program of carpet replacement has not enabled the Museum to keep ahead of the thriving moth population supported by the wool carpet.

A variety of moth infestations have been dealt with by the Conservation Division over the last 5-7 years; however, most can be attributed to that fact that although eradication and triage was done locally where and when an immediate problem was found, there still remained a resident population in the building due to the presence of the wool carpeting.

As best our collective memory serves us, problems first started in the wool carpeting in a basement corridor in the northeast section of the building a number of years ago. This corridor also happened to be very close to the Museum shop storage area, which had also had problems with moths in their textile hangings. We could never figure out if the moths came into the building via the Museum shop items, or vice versa.

In this area, that is the basement corridor in the northeast section of the building, the moth eradication procedure was to remove the carpeting, treat the area with insecticide (I was not involved with this particular problem, and do not know which chemicals were used) and put down a replacement synthetic carpeting.

Within 6-8 months of this problem, an infestation was discovered in wool textiles on exhibit in a gallery directly upstairs from this prior carpet infestation. An open stairwell separated the two areas. Since this infestation involved Anthropology Department artifacts, the Conservation Division was called in to deal with the problem. Cap Sease, the Division Head, spent some time identifying and collecting insect samples in various stages of development; then freezing and vacuuming all of the textiles. The treated textiles were then returned to the exhibition cases.

Over the past 5-6 years infestations have been found on a somewhat cyclical basis in various areas of the museum. These include:

- a recently mounted deer and fawn specimen (not treated with any chemicals during mounting)
- Bolivian textiles in the Collections of the Education Department;
- the wool carpeting throughout the entire Education Department offices;
- the wool carpeting in an old exhibition hall that had been converted to a storage room for the Housekeeping Department, known as Hall J;
- the wool carpeting and dried fish specimens in one of the Fish Storage areas;
- the Harris Extension School Loan offices, workrooms and loan boxes;
- an ethnographic loom strung with cotton fibers, but with wool fibers holding the vertical members of the reed.

Rationale and Procedures for Testing the Pheromone Traps at the FMNH

In the Spring of 1992, the Anthropology Department of the FMNH attempted an anoxic CO_2 purge of one of its ground floor storerooms to kill a suspected moth infestation. This attempted purge was done by a company named Fumigation Services and Supply based in Indianapolis. In conversations with John Mueller of Fumigation Services and Supply, who knew the history of moth problems at the FMNH, I discovered that Dave Mueller of Insects, Ltd., also in Indianapolis, was developing a pheromone trap for the ubiquitous Webbing Clothes Moth. I told John Mueller that as soon as such a pheromone trap was developed, I would be interested in purchasing them for the Museum.

The Development of the Webbing Clothes Moth Pheromone Traps

Dave Mueller of Insects, Ltd. in Indianapolis, Indiana, did the research and development for the Webbing Clothes Moth pheromone trap. Gas chromatography done by an independent analytical lab in Japan revealed the pheromone to be composed of two parts: an active and an inactive part. However, the qualitative pheromone analysis did not reveal the ratio at which these two parts are present in the pheromone.

Therefore, the initial traps that were designed for testing by Insects, Ltd. were made of varying ratios of the two component parts of the pheromone. Two types of pheromone mixes were initially developed: a 2:1 active to inactive component mix; and a 4:1 active to inactive component mix.

After detailed discussions with Dave Mueller, I volunteered the FMNH as a field testing station for the pheromone traps to help him determine which of the various ratios of the pheromone

mixes was more effective. Given the history of moth infestations in the museum, and its thriving moth population, the FMNH seemed like an ideal test site.

Objectives of the Program

The trapping program was set up to help us determine:

- the best ratio between the two components in the pheromone trap;
- Whether any previous eradication methods, such as the Dursban treatment of the carpeting in the Education staff offices, had been effective;
- where exactly the moths were, in what quantity, and whether the populations were stabilizing, increasing or diminishing.

Design, Location and Spacing of Traps

Eight areas of the building were set up with Webbing Clothes Moth pheromone traps:

- the Harris School Loan offices
- the Education Department
- the War Room (the Security staff's break and lunch room)
- Hall J
- Classroom 3
- the Webber Resource Center
- Fishes
- the southwestern Loom

All of these areas had previously been known to have had a moth infestation.

The traps were hung with pieces of plastic coated twisted wire at about eye level, which is the optimum flying height of the moths. They were placed roughly about 20 feet apart. (The traps draw from a 20-25 ft. radius.) Webbing clothes moths tend to stay close to their feeding sites and seldom fly for very long distances. Also, it is important to note that the higher the temperature and the relative humidity, the more active the moths. A reduction of RH below 70% will slow both reproduction and feeding. There is generally a spring hatching, from around mid-March onwards in my experience, and a Fall hatching, although the Fall population is generally lower.

Control traps were also hung in all testing areas in a ratio of 8 baited to 1 unbaited, to help determine the real effectiveness of the traps. A few other kinds of sticky traps were also tested at the request of other colleagues.

Preliminary Results

The use of the Webbing Clothes Moth pheromone traps at the FMNH was one of the most successful preventive conservation measures I have ever been involved with. We were able to achieve all of the goals that we had set, and obtained concrete evidence about the effectiveness of the various pheromone mixes.

The 2:1 pheromone trap was approximately four times more effective at catching moths than the 4:1 pheromone mix.

We found that the residual chemical treatment of the carpet in the Education Department offices had been highly effective: the area stayed moth free for at least one year following treatment.

The traps also allowed us to locate many areas of serious moth infestation where we never would have thought to look.

One of the most interesting challenges for all of us involved in this trap monitoring program was learning to use the traps to locate the locus of a moth infestation based on the number of moths that were present in the traps. There would be moths in a trap, and the count would go up week after week, but sometimes it proved to be very difficult to actually locate the infestation itself. In one case, everything in the 20-25' radius was dismantled before the source of the infestation was located. This particular batch of moths were in a box of polyurethane foam. Because there were no traditional food materials in the foam box (which was directly under the trap), it was not originally examined. We learned from this that the moths will cocoon almost anywhere, and in anything.

Steps Taken to Reduce Moth Problems

This moth monitoring program allowed us to develop and take many steps to control and eradicate the moths throughout the ground and first floor areas of building. These steps were based on the concrete evidence of the moth populations found in the traps, and included the following:

Museum-wide:

- continued gradual removal of wool carpeting in non-public areas

Education Dept:

- removal of all infested materials
- spraying the entire area and carpet with a knock-down pyrethrum, and the carpeting with Dursban (a residual insecticide).

Harris School Loan Office:

- removal of wool carpeting from all non-public areas
- isolating the Education boxes with plastic bags
- purchase and use of freezer
- regular and careful inspection of all items that return from outside loans

Loom:

- disassembly, cleaning and freezing of the reed

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