

Responding to a Potential Disaster: Moths in the Ethnographic Collections at the American Museum of Natural History

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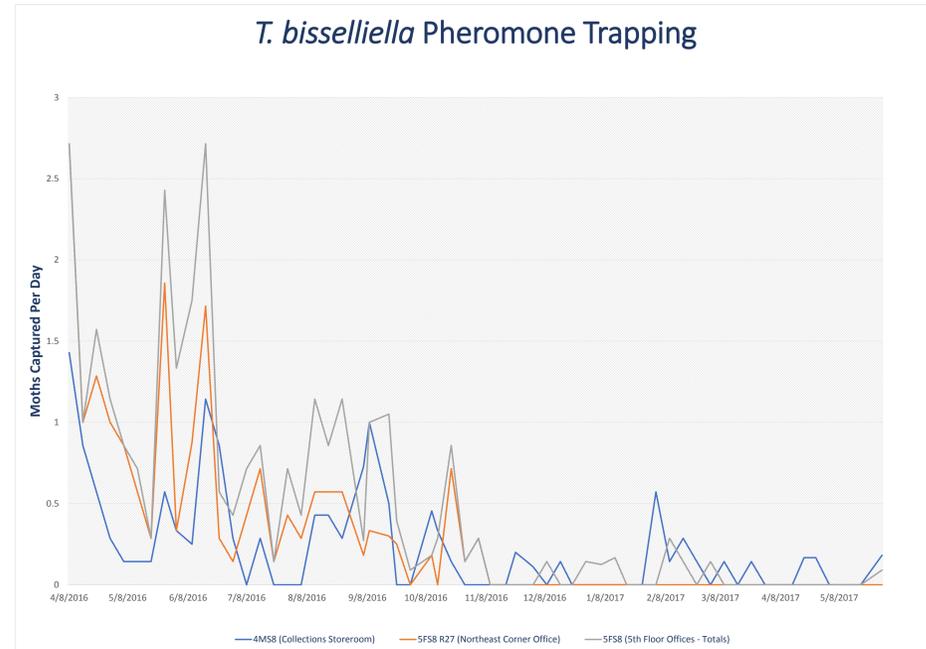
On the evening of **December 23, 2015**, while securing storage for the holidays, Collections Management staff noticed two webbing clothes moths, *Tineola bisselliella*, fluttering down the main aisle of one of the Division of Anthropology's largest ethnographic storage rooms. Despite a preexisting integrated pest management strategy, it was obvious that the collections had been compromised. 2016 and beyond would have to be largely devoted to mounting an emergency response.



"Philippine Islands exhibit, 1909," AMNH Digital Special Collections, accessed June 7, 2017. <http://libry-web-007.amnh.org/digital/items/show/22306>.



Building 8, 4th floor mezzanine ethnographic storage



Building 8, 5th floor office, showing damaged rug and phone line leading into the floor (Photo by Gabrielle Teus)



Building 8, 4th floor mezzanine, showing removed light fixture and phone line leading into the ceiling

AMNH's eighth building was constructed in **1908**. Originally, the building's first through fourth floors were conceived as exhibition spaces, the fifth floor became the Anthropology Division's curatorial offices, and the sixth floor/attic was used as ethnographic storage space. The fourth floor held the Philippines Hall from 1911 until the 1960's, then Margaret Mead's Hall of Peoples of the Pacific from 1971 until 1977. That exhibit was relocated to the third floor in 1984, and the fourth floor finally became a designated anthropology storage space. The addition of a mezzanine level that same year divided the room in two, and the installation of an HVAC unit made this the division's first climate controlled storage area. In 1985, compact storage was installed on the mezzanine, vastly increasing storage capacity. The 9,577-square foot building 8, 4th floor mezzanine storeroom currently houses 63,890 ethnographic and 5,983 archaeological objects from Africa, Asia, and North America.

On **March 3, 2016**, Collections Management was informed that a large wool rug in an office in the Northeast corner of building 8's 5th floor was severely infested with webbing clothes moths. Upon closer inspection, Collections Management discovered a small hole in the floor beneath the rug leading directly into fourth floor mezzanine storage. The hole had apparently been drilled many years prior for a phone line. It was immediately obvious that this was the moths' point of entry into the collections.

Collections Management, Conservation, Curatorial, and Custodial staff carefully discarded the rug, thoroughly cleaned the office and furniture, and treated all suspect personal property by freezing. The Museum Exterminator treated the room with Tempo and sealed the hole in the floor. On the other end, the hole in the ceiling of the 4th floor mezzanine was hidden by a light fixture. Museum Electricians removed the light fixture and the Museum Exterminator sealed the hole again from below. Cocoons were found in the floor/ceiling debris that had collected on the top of the light fixture.

Efforts were made to seal off other obvious entrances/exits to the moths in the storeroom. Facilities staff installed sweeps and astragals on all doors. Given the building's age and the room's history however, innumerable small gaps remain in the ceiling, walls, and floor.



Collections Management staff inspecting ethnographic collections



T. bisselliella cocoon inside polyethylene foam tray liner

After treating the obviously affected objects, Collections Management and Conservation staff devised and implemented a **long-term process** to prophylactically treat all proteinaceous material stored in the room.

All objects containing proteinaceous material are removed from storage, inspected, and individually placed inside polyethylene bags. Bags are twist-tied closed on objects deemed safe for cold treatment or folded closed on objects deemed unsafe for cold treatment. Objects are then re-shelved.

As freezer space becomes available, objects which have been bagged with twist-ties are removed from storage again, grouped with objects of similar size and shape, double bagged, and treated at -40 degrees for at least 48 hours. They are then left in their bags for at least 24 hours at room temperature.

After treatment, outer bags are removed and twist-ties are removed from inner bags. Objects are re-shelved in a single bag folded closed.

We expect to complete treatment of all proteinaceous material in the building 8, 4th floor mezzanine storeroom **by the end of 2017**, and we are currently making plans to prophylactically treat objects stored in the 4th floor storeroom directly below in the coming year.



T. bisselliella pheromone trap

On **Monday, January 4, 2016**, the Division of Anthropology's five person Collections Management team commenced a thorough inspection of all collections in this space and on the same day found a nexus of infestation in the Northeast corner of the room. About a dozen objects were directly affected, found with frass, webbing, cocoons, and live and dead webbing clothes moth adults and larvae. Hides with fur, lying flat in ethafoam lined steel trays were the most commonly affected objects. The moths had also built cocoons in the corners of the trays, inside ethafoam liners, and along the edges of the storage unit's rubber gasketing. The obviously affected objects were immediately treated by freezing and the storage surfaces thoroughly cleaned, treated, or discarded.

Collections Management began experimenting with pheromone traps in March 2016, and initiated a consistent pheromone trap monitoring regimen on **April 1, 2016**. We currently have 14 traps deployed in 8 rooms. We inspect the traps, record data, and email an update to relevant museum staff weekly. Since April, 2016, we have seen a significant overall drop in moth captures. This is especially true of the 5th floor offices where the infestation originated. However, we continue to see consistent, if low level, moth activity in the collections storage space below.



Hall of Biodiversity

In **late winter, 2016**, Collections Management began to hear from other scientific departments about new moth infestations cropping up in several collections and exhibition spaces throughout the museum. AMNH's Natural Sciences Conservation staff took the lead in investigating these outbreaks and coordinating a response. They discovered a significant correlation between rodent and moth activity throughout the museum, executed large scale exhibition treatments, and brought on board a diverse collection of AMNH staff to address the problem.



Collections Management staff placing objects in freezer



Building 8, 4th floor mezzanine compact storage

In retrospect, we were lucky to have caught the collections stage of the infestation relatively early. Though we first noticed the moths in mid-flight, we did begin to capture them in the room's five strategically placed blunder traps soon after. So our basic preexisting IPM monitoring program would have eventually sounded the alarm. Nevertheless, given webbing clothes moths' potential to rapidly multiply, their devastating effects on museum collections, and the costs of mounting an adequate response, adding pheromone traps to a standard monitoring regimen before noticing a problem would provide a significant and overall cost-effective advantage. Likewise, expending more effort in sealing a storage space to whatever extent possible before an infestation hits might prevent it from reaching collections altogether. It is also noteworthy that while the situation began with a massive office infestation which then spread to collections storage, the office was quickly eradicated of the pests whereas the nature of a legacy storeroom makes complete eradication there extremely difficult if not impossible. Thus non-collections staff IPM education should be considered a priority.