IPM successes and trials

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Abstract

Integrated Pest Management (IPM) at the Natural History Museum, London has made some enormously positive steps towards protecting its huge legacy of natural history collection against pests, notably introducing the Risk Zones concept. Possibly the biggest and most ambitious project has been the introduction of a purpose built quarantine facility at the South Kensington site, which is now working at full daily capacity. We also benefit from a sophisticated monitoring, recording, reporting and mapping system an IPM module within the KE-Emu museum's management software system that was developed by the Company KE software in cooperation with the Musuem's IPM team. These achievements have been reached by a dynamic, cross departmental and comprehensive IPM group with continued support from upper management whom recognized the pest risk as number one risk to our collections. Even with the best facilities and support the pest problem never goes away and basic IPM principles will always be fundamental to success. We are constantly learning and trying different ways to prevent and treat pest problems. As the traces of the now banned pesticide Dichlorvos come to the end of its active life period, museums and cultural institutions have reported numbers of webbing clothes moths, *Tineola bisselliella* increasing alarmingly over the last few years and the NHM, London is no exception. As we record infestations and responses and accumulate data that will serve us to understand the biology and behavior of this new pest treat we are also exploring new ways to combat invertebrate pest by using their own biological mechanisms against them, we are currently trailing a moth confusion system by UK Company Exosect® and looking to trial a biological control agent, *Trichogramma evanescens* as ways of controlling the increasing moth problem.

Keywords: IPM, museums, database, management, case studies

1. Introduction

The Natural History Museum, London (NHM) has had a comprehensive IPM programme and a dedicated team of about 20 reps from disciplines across the Museum for over 20 years; together with backing and financial support from higher management. It is evident that these efforts have paid off by dramatically reducing the numbers of rodents and beetles within our buildings. We have achieved by introducing risk zones, where we divided the Museum into zones depending on the vulnerability to pests. Signage and protocols were then put in place to ensure staff working habits in these areas were in accordance with the zone's protocols. We were then able to commission KE Emu to produce a pest module for our collections management system which has been key in alerting to workers to emerging infestations and to then allow us to visually present this information and target specific areas. KE software is the company that designed and implemented our collections management system. The NHM, London refer to this system as KE Emu.

Our latest and one of our biggest achievements to date is our new quarantine facility. The official launch took place in September 2013. This is a Museum facility not only for collections but also serves every department in the Museum. Any specimen/object or material

entering the Museum that could pose a risk of infestation must go through the quarantine facility. It has a large unpacking room to receive specimens and objects that leads in to the treatment room which contains a large capacity freezer, large enough to take our biggest specimen of Rhinoceros. It also has a few small upright and chest freezers for smaller items. It has three drying cabinets for botanical specimens and is also intended for use as part of our disaster plan to dry wet objects. The facility also holds a hot/cold chamber which gives us the flexibility to use it for heat treatments or freezing as needed and we also can use this area for anoxic treatments. The facility also includes an acclimatization room and the exhibitions conservation studio.

However we do have our problems and as with many other institutes in the UK we have seen an alarming increase in *Tineola bisselliella* the webbing clothes moth, mainly in our public galleries, over the past few years. The results from monitoring and some damage to specimens showed we had a moth problem in the Mammals Gallery. The first response was to freeze the mounted display of infested cats. This was done a few times until the curators in Zoology correctly stated that they were not prepared to let the specimens go back on display until something a little more long term was in place to deal with the moth problem. So for some time the big cats display cases in the mammal corridor remained empty.

The IPM Coordinator, with the help of the in-house Conservators responsible for the displays, who are also IPM representatives for the public galleries, carried out an assessment of the Mammals gallery, lifting floor grills, investigating the top of the old display cases and the underfloor ventilation ducts. Also obtaining the old plans of the Waterhouse building form Estates department and using those to identify points of entry and circulation for pests.

High level cleaning was organized and difficult-to-reach areas were targeted to reduce debris and dust in the Gallery. Pests trapping data used to pin point the origin of the month infestation that we discovered was linked to a rodent infestation all the way across the Museum's main building and connected by the under floor ducts. While this investigation was on going we decided to look at a moth prevention system called Exosect®. We were aware of this system as the Royal Opera house in Covent Garden had used it successfully to control moths in their costume stores and it had been discussed at the UK IPM group. So we invited a representative from Exosect® to assess and quote the areas we had in mind for the trial. Once we received the quote and discussed our options we decided to do trial of this system.

2. Materials and Methods

Exosect is a non-chemical mating confusion system for controlling clothes moths (*Tineola bisseiliella*). It works by deploying an Entostat powder, which is a natural food grade product, combined with a pheromone specific to the female cloth moths. The powder is placed inside a bespoke dispenser in a tablet form; these are located around the gallery at approximately 5 m intervals. The increased presence of pheromone attracts male moths out into the open. The males are attracted to either a monitoring trap where they provide an idea of overall infestation levels or to the Exosex cl tab where they pick up the powder and female pheromone. The male carrying the Entostat powder will form a mobile pheromone dispenser producing a false pheromone trail, which attracts more males into the open. As contact between the males continues the Entostat powder is passed on to more and more male moths. Thinking there are only females in the space this causes confusion and a disruption to the mating cycle, hence the number of moths being produced is reduced

The decision was made to trail three galleries for a period of at least three years. The galleries chosen were:

- The mammal corridor, as this was a problem we needed to find a new solution for.

- The bird gallery, not a gallery with the same history of moth problems with various infestations and a vulnerable collection and a very busy gallery.
- The Creepy crawlies gallery - This gallery had high numbers of moths. You could see them flying in front of your face as you walked through.

These three galleries are linked by underfloor ducting.

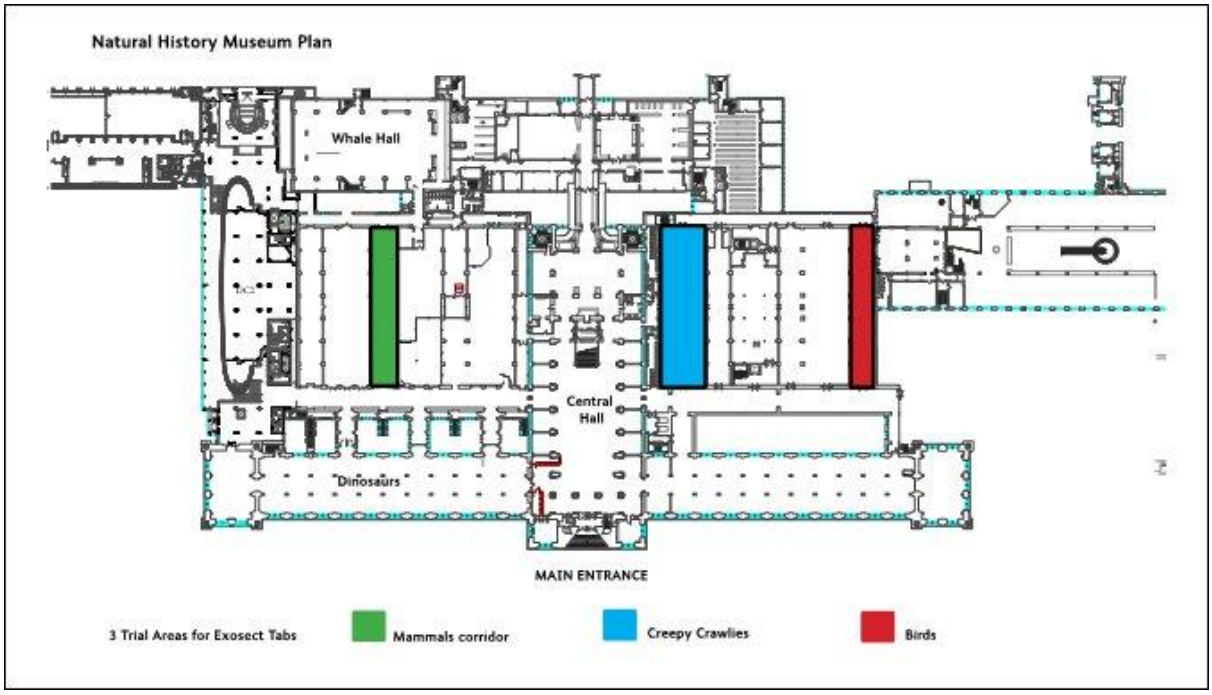

Figure 1 Proximity of galleries in Exosect® trail.

The separation of the galleries chosen was also of interest as they are far enough not to be directly affected by the moths from the other chosen trial galleries but as mentioned before all linked by the vents and ducts. We are still using AF diamond pheromone traps in these areas because;

- We want to maintain consistency, to see if the Exosect® is making a difference
- We looked at using Varroa boards in the AF trap cases but this didn't work as they attracted little to no moths to them although there were still lots on the AF diamond pheromone traps.

3. Results

The line on these graphs indicates the start of the trial but also the deep clean and application of the desiccant dust. Early results are encouraging with a reduction in moth numbers in both the mammal corridor and creepy crawlies. Birds Gallery show similar counts but they are better than the surrounding galleries without Exosect®. With a very mild winter the population has not been eradicated completely so with the start of the warmer weather we will continue monitoring. Time will tell us if the Exosect® control system is really the working as well as we hope.

Figure 2-5 Graphs show the monitoring results for the mammal corridor, the creepy crawlies gallery and the bird gallery.

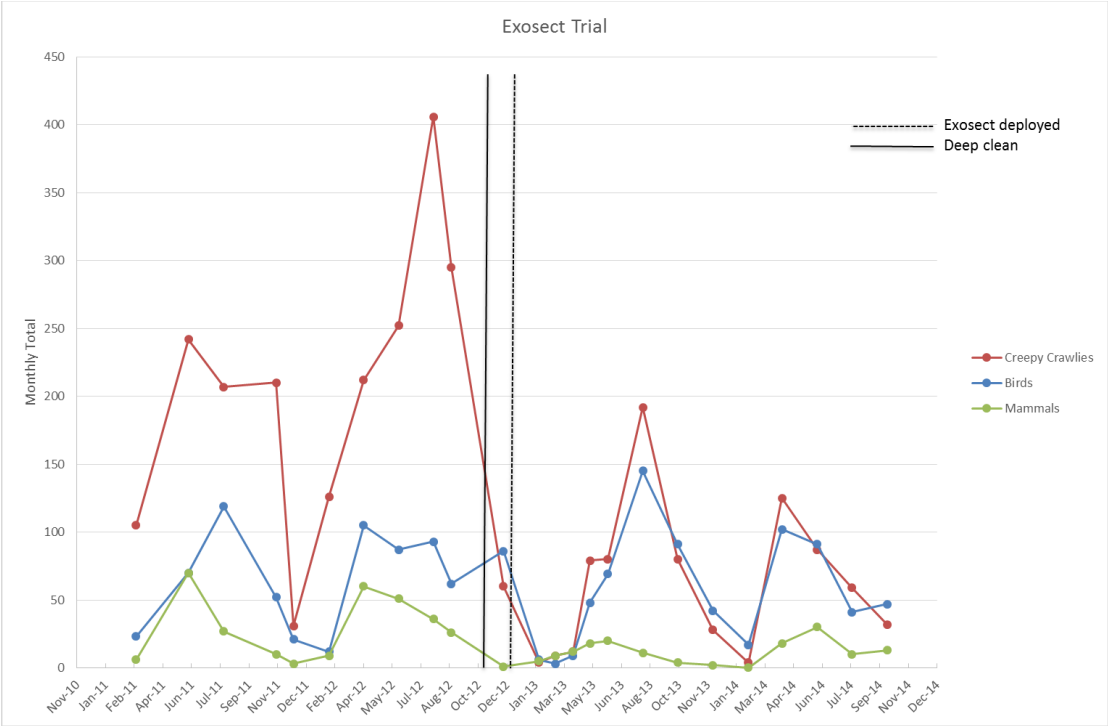

Figure 2 Total moth count.

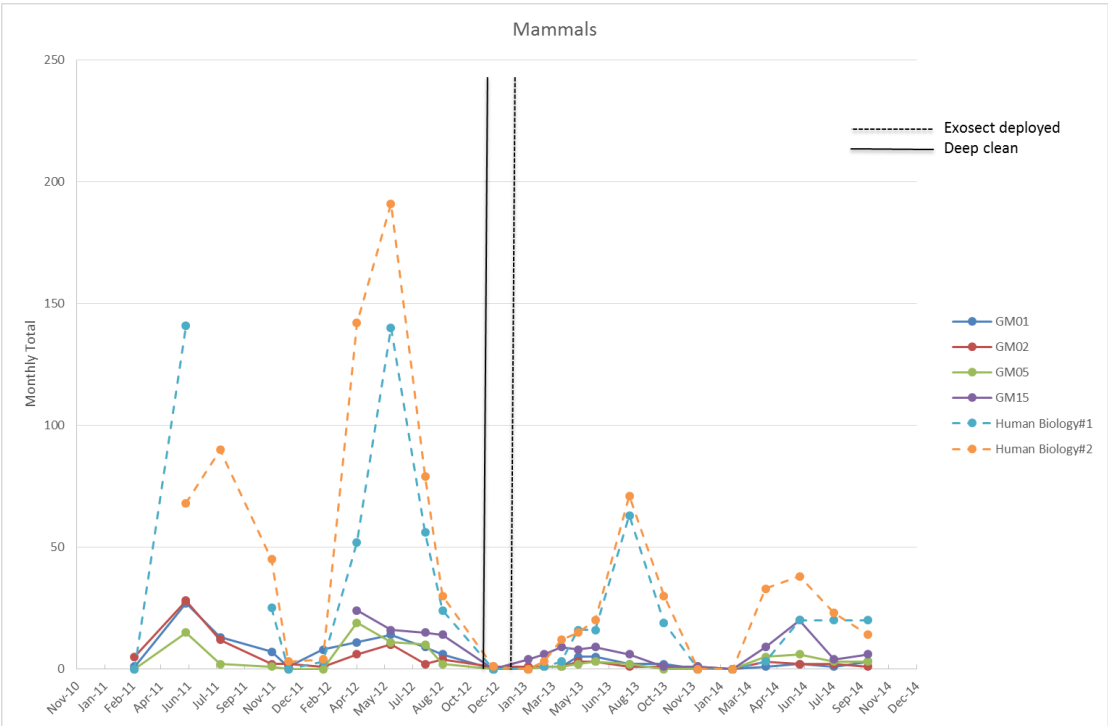

Figure 3 Moth count in the Mammals corridor.

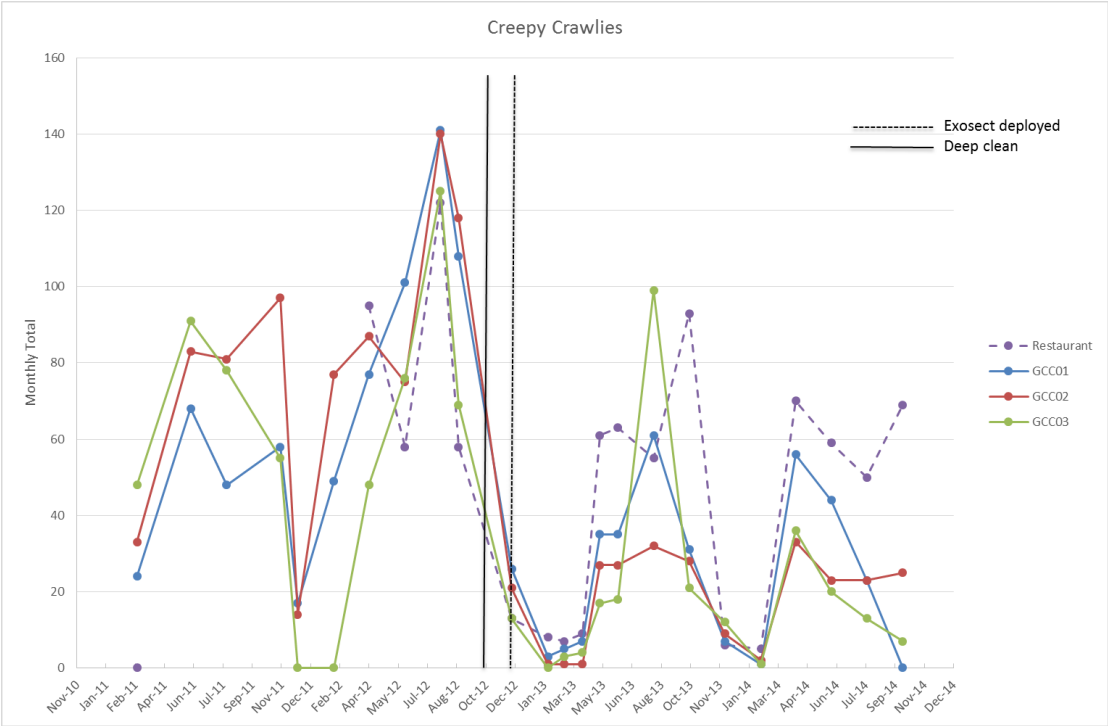

Figure 4 Moth count in Creepy crawlies.

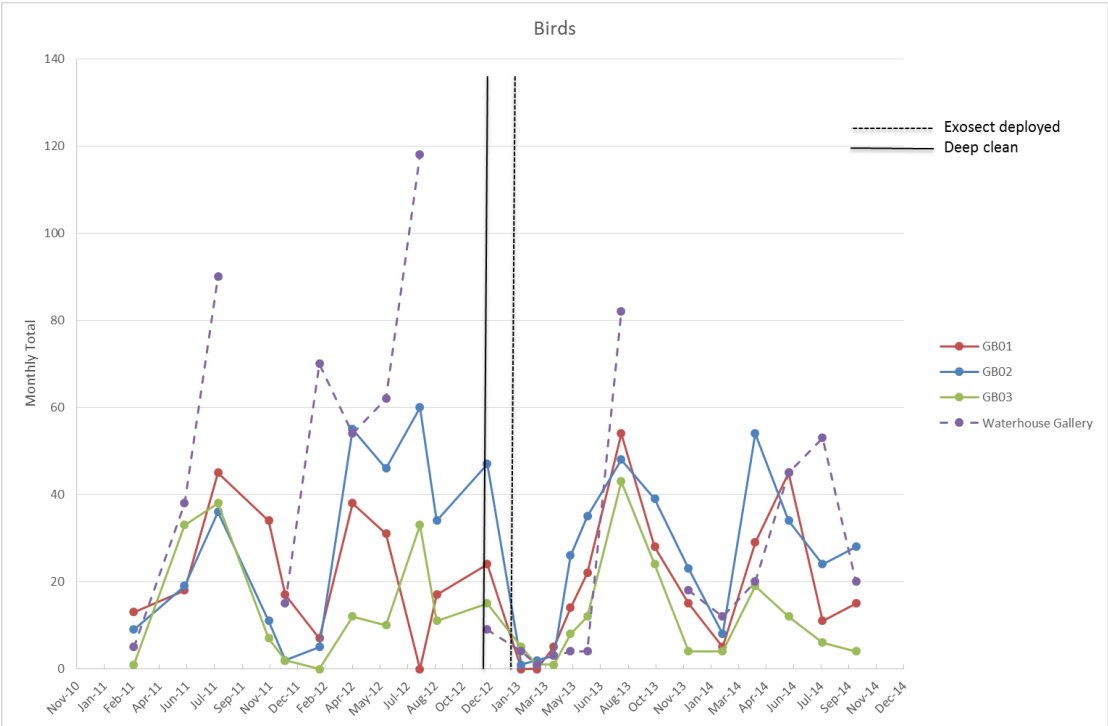

Figure 5 Moth count in Bird gallery.

4. Conclusions

The overall total moth numbers are down to a much more manageable level which is a welcome achievement but the results are far from conclusive as to whether this system is sufficiently controlling the moth population in the NHM. It is worth mentioning that whatever

system of control we find to work for us in the long time will always work in line with the basic principles of IPM and none can be expected to replace best work practice, monitoring, identification, housekeeping, training, quarantine, environmental control, facilities design & management and high quality collections storage. We will continue this trial and publish the results at the end of the three years test. In the meantime we will continue to research other options for control and we are already looking to trail the use of a tiny parasitic wasp *Trichogramma* sp. as a biological control agent. Different biological agents were reported to control many of our Museum pests. So we are keen to try this new approach. We have an area in the Museum identified as a potential trail site, far enough away from our Exosect trail site not to disrupt results.

Acknowledgements

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