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Ten years of integrated pest management at English Heritage

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Abstract

Integrated pest management at English Heritage covers 65 sites and has been established over the past 10 years. Managed centrally and delivered by site-based staff, the programme has been instrumental in preventing major insect pest infestations. Catch data recorded since 1997 indicates that webbing clothes moth activity is increasing. The main sources of insect pests and preventive and treatment approaches are outlined.

Keywords

Integrated pest management, IPM, insect pests, historic collections, insect monitoring, insect pest control

Introduction

Integrated pest management (IPM) at English Heritage (EH) has been instrumental in preventing damage to significant collections displayed and stored at 65 sites over the past 10 years. This is a remarkable achievement as these sites display and store vulnerable materials including wool, leather, natural history specimens, paper and wood. This paper describes how and why IPM at EH has been so successful.

Background

English Heritage is the United Kingdom government's statutory advisor on the historic environment for England. One of its key roles is the conservation and presentation of over 400 properties. There are 115 sites that display or store collections of which 65 sites house vulnerable collections including wool-based furnishings, natural history specimens, furniture, books and paper artefacts. Those collections on open display in historic buildings are the most at risk from insect pest attack.

IPM commenced at EH in 1997 starting with a sticky-trap monitoring programme at Audley End House, a 42-roomed Jacobean property, which displays and stores 22,478 objects. The developing EH IPM strategy at the time was outlined in a paper published by Xavier-Rowe and Pinniger (2001) in *Pest Odyssey 2001*. Since 2003, the IPM programme has been centralised under the management of one person, our Collections Pest Control Manager, with great success.

In the EH State of Collections Report (Xavier-Rowe and Fry 2010), the risk posed by insect pests was deemed to be low. The report was based on evidence provided from a collections condition audit and site-based risk assessment completed for 115 sites. This result confirms the effectiveness of IPM at EH as the

overall risk of insect pest damage is increasing for historic house and museum collections. It is the opinion of the authors that insect pests should be considered as one of the highest potential risks for historic collections as the density of vulnerable materials on display or in store provides an ideal environment for insect pests to thrive.

The IPM system at EH

The key elements that work together to produce a sustainable and effective IPM programme at EH are described below:

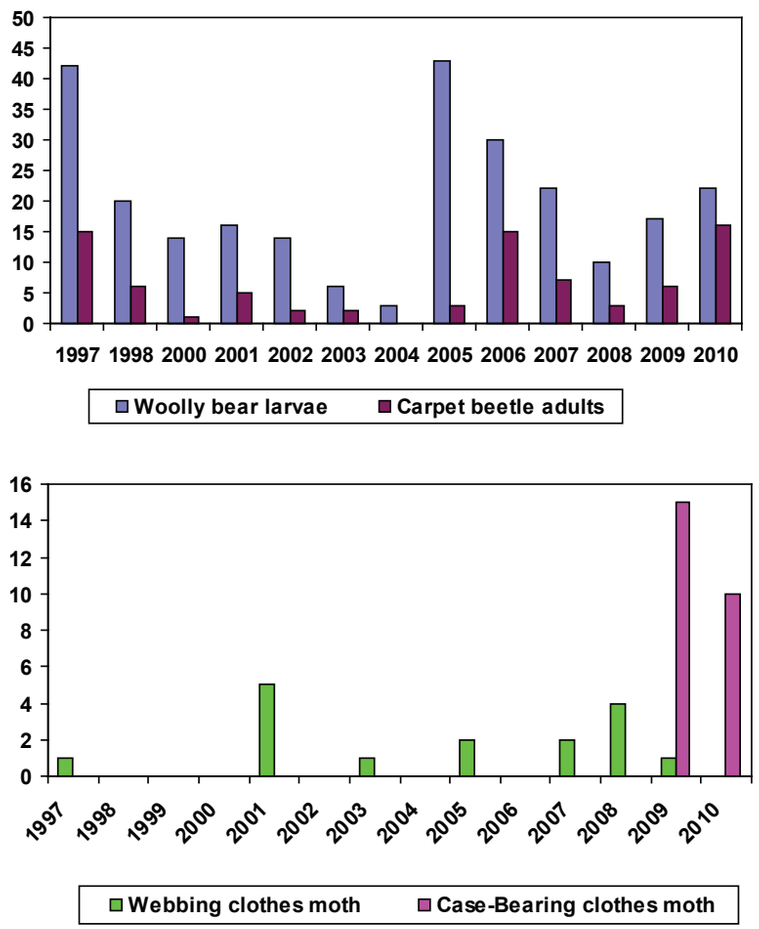
Insect pest trapping and interpretation

The foundation for success at EH is a systematic monitoring system delivered by a range of people who have been coached and supported by the Collections Pest Control Manager. The monitoring system, based on sticky museum traps and pheromone lure traps, has been designed so that site staff, conservators, collections care assistants and curators can monitor the traps. Keeping the number of traps to a realistic number and checking them two to four times a year has proved to be achievable. Results are logged onto an Excel spreadsheet and house plans using a standardised key chart. These were created to enable staff to electronically send in the results by email every quarter instead of posting paper returns (Lauder 2009).

However, an element of quality control is required with 27 site-based staff completing the returns. All quarterly or bi-annual returns are checked by the Collections Pest Control Manager to remove errors and quickly spot any unusual insects or potential insect pest problems. High catch numbers are investigated either over the telephone or through a site visit. Annual insect trapping and monitoring reports are prepared for each property which highlights trends in terms of insect pest numbers and actions needed to reduce the likelihood of an infestation. The annual site report is circulated widely to both inform and raise awareness of insect pests and the ongoing actions being taken to control them.

Annual results have been gathered and recorded in this manner since 1997, providing useful trend data which has directly informed collections care practices. At Audley End, for example, the data relating to the varied carpet beetle, *Anthrenus verbasci*, webbing clothes moth, *Tineola bisselliella,* and case-bearing clothes moth, *Tinea pellionella,* flagged up issues relating to housekeeping and chimney cleaning (Fig 1). *Anthrenus verbasci* numbers decreased over seven years until 2005 when numbers suddenly increased. Upon investigation, it turned out that housekeeping standards had dropped due to staff changes. Whilst the impression was given that all was well, the deep cleaning of vulnerable rooms and collections was not being targeted effectively. The monitoring results provoked a change to the housekeeping schedule and recognition by the conservator and collections care assistants that certain areas and collections in the house needed to be deep cleaned more frequently during the summer months. The new schedule was implemented during 2006 and the catch numbers started to decrease. However, in the last two years they have increased again, which is related to a

Fig 1
Audley End House insect pest catch results 1997–2010.



number of chimneys that require sweeping. The arrival of *Tinea pellionella* in the last two years in high numbers is also linked to debris in these chimneys. A programme of chimney cleaning has therefore been implemented.

In order to keep the monitoring programme sustainable, properties have been divided into four categories. This has ensured that effort is focused on the important and vulnerable collections. Category A and B sites (33) are monitored four times a year. Category A sites hold the most important objects whilst B sites may have less important collections that are still vulnerable to attack. Category C sites (7) are monitored twice a year, during the spring and summer months, whilst D sites (23) are annually deep cleaned and visually checked. Category D sites do not have an annual site report written up as there are no monitoring records. Most of these sites are 'buildings related' where, for example, there has been a history of wood borers in the structure or just a few vulnerable items on display such as pews and traceries in churches.

Annual site reports are written up, based upon the quarterly trapping information over the past year, and are either emailed to the individual sites and staff concerned or compiled together into a report (Lauder and Pinniger 2010). This is circulated to all the managers involved, including senior management, with the purpose of raising awareness of IPM as a long-term collection care activity. The annual site reports have been produced for the last eight years.

Centralised management

The sustainability and effectiveness of the EH IPM programme are due to the centralisation of management under one person supported by senior management. In many organisations, pest management duties are usually undertaken as an add-on to a job description. Until a dedicated post was created in EH in 2003, progress had been inconsistent and difficult to sustain. At EH the conservators and collections care assistants mainly assist with IPM, but they do not have the time to focus on monitoring, reporting and dealing with potential problems before they turn into an active infestation.

The other main advantage of having a dedicated post is that this person can keep up-to-date with key developments in monitoring and control as well as health and safety regulations and other legislation, for example, treatments and protected species. Whilst the focus of the Collections Pest Control Manager is on insect pests, vertebrate bodies and the baits left by contractors are becoming an increasing problem to collections as they provide a food source for the insect pests.

English Heritage IPM strategy

The EH IPM Strategy was written in 2006 and last updated in 2011 (Lauder and Pinniger 2011). It is used widely by staff involved with monitoring as well as being used by the senior management as the formal set of standards for implementing IPM at our sites.

Training

At the heart of the influencing, coaching and training programme is the EH poster recently updated to include new pest species (Pinniger *et al* 2009). This simple publication has been very effective both at raising the awareness of IPM and as an insect pest identification tool.

The training programme consists of four courses. The IPM training course taught over two days concentrates on insect pest identification and gives an understanding of how they become established in historic houses and collections. An important learning outcome is to correctly identify insect pests and the damage they cause. The EH monitoring and recording system is then introduced through practical sessions. This can then be set up and established with participants over the following year through one-to-one coaching at their sites by the Collections Pest Control Manager. Since 1998 we have trained 119 members of staff.

The IPM master-class is a follow-up day course designed to provide EH house staff with updated information which advances the knowledge they have all previously gained by attending the IPM training course. It introduces new pest species and also any updates to our IPM procedures. Other topics covered include bats and legislation, and other insect pest trapping techniques currently available. The presenters provide instruction, practical sessions and advice. Since 2001 we have trained 39 members of staff and one person from the National Trust for Scotland.

The pests master-class, co-presented with vertebrate consultant Ed Allan, is for EH conservators, IPM-trained staff, building

maintenance managers and property curators. Updates are given on current insect pest species and issues and their implications for the collections and buildings. Other topics covered include vertebrate issues, protected species updates and also new low-hazard/non-chemical treatments and prevention methods. All current legislation and health and safety issues are also covered. We also advise on pest control companies or consultants who are experienced in working in the historic house context. Since 2008, we have trained 45 members of staff and two external members of staff from Historic Royal Palaces.

An Insecticide Treatment course co-presented with Bob Child is also run. Conservators, collections care assistants and curators are trained in the safe use of desiccant dusts and Constrain insecticide application using pump sprays and 'fogging' equipment. The training also covers all current health and safety and legal requirements. From 2005 to the present day we have trained 22 members of staff and 12 members of staff from other heritage organisations.

National trends

On reviewing the national data over the past 14 years we are starting to get a picture of which insect pests are on the increase. Looking at results for webbing clothes moth, *Tineola bisselliella,* numbers have increased sharply since 2008 (Fig 2). Whilst the introduction of more effective moth lures in 2008 is responsible, in part, for the increased catch, they cannot be totally accountable for such a dramatic rise. These results suggest that of all the pest species, clothes moth currently present the greatest risk to EH collections.

This type of long-term data analysis can both provide a warning to the risk level and help with securing and targeting resources for research into control methods. To this end EH staff have been working with David Pinniger and Jane Thompson Webb at the Birmingham Museum and Art Gallery to provide data for an online national IPM database that could be used to highlight risk levels by region and town. The project is currently being piloted on the What's Eating Your Collections website. When we have a good baseline, with data from a wide range of reliable sources, we can use this information to show changes in distribution and frequency of insect populations and how they are affected by climate and other factors.

Sources of insect pests in English Heritage sites

Through maintaining an IPM database on which all information relating to IPM at each site is logged, we can confirm the main sources of insect pests.

Poor housekeeping

Poor housekeeping is by far the biggest contributor to increases in pest activity. The build up of dead insects, including flies, ladybirds, dirt, dust and litter, has been responsible for increased pest activity.

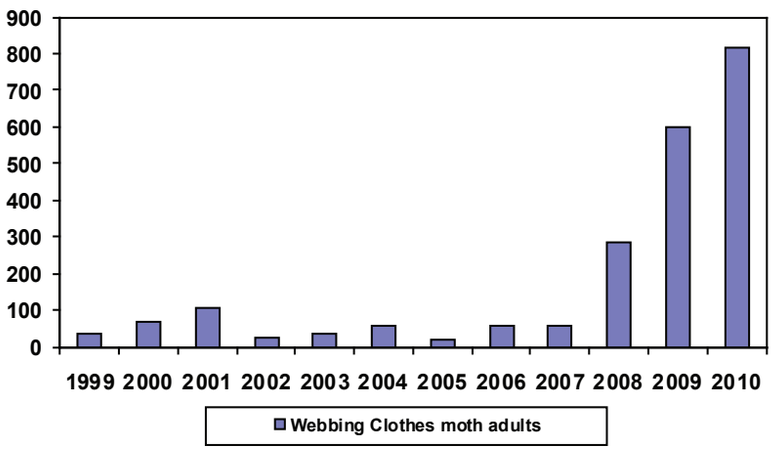
Chimneys

Chimneys, which are nearly always present in EH sites, are the principal source of significant rises in moth species. They have been largely missed from cyclical maintenance schedules as they are no longer used. This situation has changed at EH through the IPM programme, and chimney cleaning and capping is now recognised as a core maintenance activity.

Forgotten rooms

Rooms not open to the public are often left off cleaning schedules. These spaces often become the final resting place for dead insects, and even birds, which have then attracted insect pests.

Fig 2
English Heritage properties webbing clothes moths catch 1999–2010.



Lack of building maintenance

The lack of building maintenance related to downpipes, guttering, roof spaces, bird proofing, window- and door-proofing, and roof repairs have all been responsible for damp ingress resulting in death watch, *Xestobium rufovillosum,* and furniture beetle, *Anobium punctatum,* activity in the fabric of the building.

Vertebrate pests

Birds, rodents, bats and other protected species, squirrels, rabbits and moles have also been responsible for pest activity through nesting materials, droppings and dead bodies.

Prevention and control

Producing an annual report for each IPM site provides the key information for prioritising actions over the coming year and is fundamental to preventing damage.

There are about 600 chimneys in the 23 Category A and B sites that require cyclical cleaning. Chimneys that are linked to rises in insect pests are prioritised for cleaning using a budget that has been ring-fenced for collections maintenance. Requests for chimney sweeping are logged on the building maintenance database system to ensure that jobs appear on cyclical schedules using agreed specifications. Establishing a close link with Estates teams through engaging with their system should mean that this relatively simple and cheap task which can have such a major impact on collections is dealt with in a methodical and timely manner. We also alert maintenance teams of a range of building maintenance issues noticed through insect monitoring.

Housekeeping schedules are regularly reviewed and revised in response to annual results and targeted deep cleans are undertaken when required.

Birds and rodents are becoming an increasing problem for collections often due to the increased consumption of food and frequency of functions at many sites. We are therefore aiming to influence EH practices relating to vertebrate control through a standard specification for the appointment of contractors and advocating a central cyclical contract carefully monitored to ensure effective control and value for money.

Control treatments

The insecticide Constrain, a pyrethroid microemulsion is used for the local treatment of textiles (carpets, curtains, upholstery), plant fibres and wood.

Fogging using Constrain and the IP Mini Fogger is used to treat rooms both as a preventive measure and for control of moth outbreaks. This control measure is mainly used for large recreated interiors where wool has been used.

Temperature treatments, freezing and heating, are the preferred methods. For the treatment of multiple objects we prefer heating using the Thermo Lignum (UK) Ltd mobile treatment chamber due to the short treatment time and proven efficacy, particularly for wood borers (Strang 2001). Following the successful trial of Exosect Ltd's Exosex CLM and CL moth confusion pheromone lures since July 2007, we can now consider deploying it at other sites to control webbing clothes moth numbers to acceptable levels. This is a non-chemical 'pest confusion' treatment designed specifically to reduce the number of highly destructive larvae of the webbing clothes moth. It uses a synthetic female pheromone to attract male clothes moths into a dispenser where the 'Entostat' powder combined with the pheromone is situated. Males are lured into the dispensers and upon entering the powder coats their bodies. The senses of the coated moths are overwhelmed and they cannot detect females as a result. As they leave the dispenser, they then attract other male clothes moths and so spread the confusion effect even further. Female moths do not get mated and lay very few fertile eggs and as a consequence there are far fewer larvae.

The introduction of wool-based materials as part of new presentation schemes is carefully managed. Where possible wool is avoided, however, this can be challenging when authenticity, texture and drape of textiles are essential to the successful historic interior scheme. Where no acceptable material can be found to replace wool, the method of installation is controlled to ensure easy access for removal and cleaning. In some cases we have also implemented an annual fogging with Constrain insecticide to prevent a moth outbreak.

A significant proportion of EH collections (87%) are in store (Xavier-Rowe and Fry 2010). We are in the process of developing new storage facilities on our estate. This is an excellent

opportunity to dispose of accumulated materials, check vulnerable collections as they are packed and to design the new stores so that relative humidity can be kept below 60% for most of the time. Quarantine areas and procedures for receiving goods and collections relating to insect pests are also being updated.

Raising the public profile of IPM

The insect pest story can be very successful in attracting public interest through the media. When we have given a press release relating to IPM the response has been strong. The most recent example is the in-depth interview with Dee Lauder by BBC Radio 4 as part of a programme called 'What's Eating The Museum?' about pest control in museums and historic collections in 2011 (Fig 3).

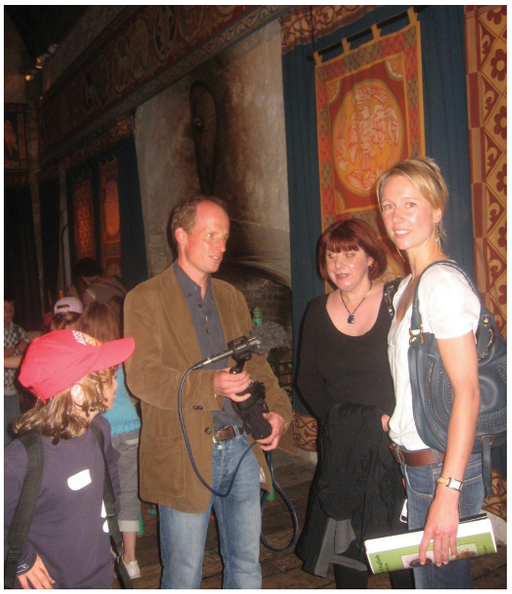


Fig 3
Dee Lauder and Ann Katrin Koester from English Heritage being interviewed for a BBC Radio 4 programme 'What's Eating The Museum?' about pest control in museums and historic collections. (Photo © English Heritage)

Conclusion

With climate change and the cuts to funding in the UK, the risk of major damage to the nation's heritage from insect pests is increasing. IPM successfully mitigates this risk, which has been the experience at EH over the past 10 years. It is an efficient, manageable and effective strategy at EH because one staff member is responsible full-time for the programme.

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