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A ban on the use of dichlorvos [DDVP] in the UK resulted in a need to implement an Integrated Pest Management (IPM) programme to protect vulnerable collections in storage areas and on display at the Natural History Museum, London.

With such a large diverse collection in a complex series of interconnecting buildings it was necessary to break the programme down into sections.

A key to this was the decision to define and adopt the concept of "Risk Zones" from high risk A, to low risk D, for all areas of the museum.

The paper describes the development of ideas and subsequent implementation of the "Risk Zone" concept.

We will also make observations on the need to identify priorities and the importance of training staff at all levels in pest awareness.

The application of GIS to IPM risk zone mapping

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A geographic information system (GIS) is a computer-based tool for mapping and analysing features that exist, and events that happen, on earth. It offers a platform to overlay the visual representation of tabular data and build queries to interrogate the variables to analyse trends or hotspots and assist in planning strategies.

The holistic approach of the Integrated Pest Management (IPM) regime was established through a strategy of managing risk to the collections. Each area of the museum has been designated in one of four zones grading from high to low risk. This then determines the priorities for action, the working practice in that area and the level of monitoring for pests. Analysing and correlating variable levels of documentation from so many concurrent initiatives could not be possible without a system that could translate the data into a common and comprehensible format. A pilot project demonstrated that the application of geographical information software to the improved integration of the various pest management activities was a viable solution.

The results of the pilot project demonstrated quite conclusively that the digital representation of risk zones would enable effective development of targeted strategies. Together with the attachment of captured data to a scaled plot of the spatial array of insect monitoring traps, this exercise showed that geospatial analytical software could be a hugely powerful tool to monitor pest population density across the museum and analyse trends with time. With the digital zones firmly embedded, there are enormous museum-wide implications in terms of environmental conditions of collection areas, space planning, disaster planning, exhibition design and security. The Natural History Museum, London will now look to implement a centralised database of pest monitoring data and integrate building environmental data to further improve the resolution of 'cause-and-effect' assessments.

Levels of IPM control, matching conditions to performance and effort

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Abstract
In this paper we model pest control activities across a wide spectrum of cultural objects that we try to protect, organized as a perceptual scale of biodeterioration situations. Within the scale, we set seven levels, in large part determined by accessibility to pests in commonly found protective structures against other deleterious agents. For each level there are described appropriate remedial IPM solutions to the more significant vulnerabilities. Long term planning would attempt to move collections up the levels to increase their protection.

The potential uses seen for this model are: 1) A starting point for IPM planning or instruction. 2) For classifying risks to collections from pest activities during collections surveying. 3) A contribution to setting guidelines for institutions offering tax benefits, or hosting exhibitions indemnified by government programs.

Climate control in an uncontrollable building

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Introduction

In this study we present our collections storage building as a case study demonstrating the effectiveness of attempts at climate control using the limited available means in an antiquated building. A central aim of this is to estimate the value of the staff time investment required for manual intervention (control of climate by radiator adjustments). This is a key factor for the NMINH since staffing levels are low, with just three full-time curatorial staff and one technician (divided between two buildings) for a collection of approximately two million specimens. Furthermore, we intend to determine the reliability of earlier decisions made about building usage, particularly in light of specimen storage and researcher access. The majority of visitors to the collections building are researchers working through the Museum's partnership with University College Dublin (Collections-based Biology in Dublin; CoB*i*D), and the establishment of effective (and comfortable) research space is of increasing priority.

Methods

Temperature and relative humidity data have been digitally monitored (using the MEACO Museum Monitor, www.meaco.com) continuously in the NMINH collections building since May 2002, prior to this Casella T9420 analogue monitors were in use in limited areas. Shortage of technical staff (four in 1990, only one today) limited environmental monitoring until the MEACO system was introduced. Our study period reported here ends in March 2005, although the system remains in place. Half-hourly measurements that are logged (via a radio telemetry system) by a central computer, and all readings are stored electronically in a dedicated stand-alone computer.

From January 2004, the NMINH's technician initiated a programme to moderate internal climate within the collections building, by responding to pre-defined non-optimal conditions identified by the MEACO system. An optimal range (from 40% to 55% RH and from 15°C to 18°C) represents the recommended climate values for the safe and stable storage of material throughout building. On two to three days per week the technician would review the reading from each monitor, and take action to adjust the internal climate in particular rooms when the immediate climate was found to outside the these optima. This intervention programme was maintained for a period of 15 months until March 2005.

We compared the total internal (building) climate records with external (weather) climate conditions, supplied by the Irish National Meteorological Service, Met Éireann. The data were divided into two phases: non-intervention and intervention. During the period of monitoring the collections building was heated between late October and mid-May. Although direct-action means to control room conditions were unavailable when the heating was turned off, the technician intervention programme also included a regime of electric lights being switched off when not in use (to prevent unnecessary warming in collections spaces) and all doors between rooms were kept closed at all times. These collections space management strategies were implemented throughout the year.

For analysis, we determined the average climate within the building as a whole, using the mean hourly temperature and RH across fourteen monitors (one was excluded due to unreliable data). The average daily range was calculated as the mean difference between maximum and minimum temperature and RH recorded by each sensor over a 24-hour period. We visually examined time-series plots of daily maxima and minima of temperature and RH (external and internal) to assess how much time the collections experience outside generalised optimal conditions, as imposed by the climate intervention programme. We also compared the magnitude (i.e. difference between daily maximum and minimum values) of temperature and RH