

P. QUERNER, M. MORELLI, E. OBERTHALER, M. STROLZ,
K. SCHMITZ VON LEDEBUR, I. ZATSCHEK, A. FEMI-MEBAREK, J. DIEHL,
R. HÖLZL, I. ENGELHARDT, H. KRAMMER, S. FÜRNKRANZ

Ten years of Integrated Pest Management (IPM) at the Kunsthistorisches Museum in Wien

Abstract - The Kunsthistorisches Museum Wien is one of the largest fine arts collections worldwide, comprising the Kunsthistorisches Museum, the Austrian Theater Museum, the Museum of Ethnology, all placed in Vienna, and Schloß Ambras in Tirol. We present results from up to 10 years of insect pest monitoring in different collections and the implementation of an Integrated Pest Management (IPM) concept. The Kunsthistorisches Museum was the first museum in Vienna to introduce such a concept. We also present specific insect pest problems such as a biscuit beetle (*Stegobium paniceum*) infestation of paintings lined with starch paste backings (linings) or the webbing clothes moth (*Tineola bisselliella*) infestation at the Museum of Carriages, both repeatedly occurring problems in the museum. With the help of the insect pest monitoring programs, these and other problems were found and the infested objects treated, usually with anoxia (nitrogen).

Key words: cultural heritage, insect pests, IPM concept, monitoring.

INTRODUCTION

The concept of Integrated Pest Management (IPM) was developed in the 1950s in the food industry and is since the 1980s successfully applied in museums (see for example Albert & Albert 1988; Linnie 1987; Story 1986). Strategies for museums and IPM concepts were described by Jessup (1998), Kingsley *et al.* (2001), Pinniger & Winsor 2004, Querner & Morelli (2010a,b) and Strang & Kigawa (2006). The most recent and complete works on IPM in museums were written by Pinniger (2004, 2008) and Brokerhof *et al.* (2007). In IPM the prevention of an insect or fungi attack is an important part. This is implemented by sealing the building, regulating the climate, periodical general cleaning, introducing quarantine and regular monitoring the collection with traps. All these aspects have team up and one centralized person should be in charge of the IPM concept. If an infestation still occurs, unharmed treatment methods like freezing, heating or anoxia (nitrogen) are applied. Today, there is hardly any museum in Europe still using pesticides against insect pests. But pests like the webbing clothes moth *Tineola bisselliella* (Hummel, 1823), less frequently the case-bearing clothes moth *Tinea pelli-*

onella Linnaeus, 1758, the drugstore beetle *Stegobium paniceum* (Linnaeus, 1761), the common furniture beetle *Anobium punctatum* (DeGeer, 1774), different carpet beetles (*Attagenus* sp. or *Anthrenus* sp.), silverfish *Lepisma saccharina* Linnaeus, 1758, mice, pigeons and mold regularly cause problems in European museums.

In the present work we describe the IPM strategy applied in the Kunsthistorisches Museum Wien and the experiences collected over the last ten years.

The Kunsthistorisches Museum is one of the largest museums in Europe with numerous exhibitions and storage rooms housed mainly in historic buildings and with a large variety of object types. Formerly all kinds of chemicals were applied in the collections against insect pests or fungi, for example DDT, Naphthalene, Methyl bromide, Lindan (up to 1982), pyrethroids (until 1998) or Ethylene oxide. Eulan was sprayed or objects submerged with until 1990, Thymol applied to remove mold or Xylamon was used to combat wood-destroying insects. In addition, natural crystalline camphor, patchuli, lavender flowers, essential oils like clover in alcohol or lemon grass were used to prevent infestations. From 1996 fumigations with nitrogen were tested in the Picture Gallery collection (Ranacher, 1998) and the construction of the walk-in nitrogen chamber initiated for the whole museum. In 1998 this 32 m³ chamber was built and since then all infected objects from the museum, but also from other museums, institutions and private collections are successfully treated in a five-week rhythm. Different pest species still occur from time to time in the collections (see Querner 2009 for an overview). By now, most collections have set up an insect pest monitoring and no pesticides or other chemicals are applied. In 2011 a large part of the museum collection will move to a new high standard storage site.

Museum of Carriages and Department of Court Uniforms (Wagenburg und Monturdepot).

Museum of Carriages is located in the park of the Schönbrunn Palace. The collection includes about 180 historic vehicles, sleighs and sedan chairs. There are currently about 60 carriages and sleighs displayed in the 1,300 m² exhibition space, the remaining objects are stored in two depots also located in the historic buildings. These also house large parts of the historic horse harnesses collection. The badly insulated building (historic doors and windows, untight roof and a number of shafts) result in reoccurring pest infestations. For many years the major pest in the collection has been the *Tineola bisselliella*, since many objects are made of wool, silk, feathers and the padding of the carriages and sleigh upholstery are filled with horse hair. Other pests are *Stegobium paniceum* that are infecting the starch paste of the horse harnesses and horse figurines. *Anthrenus (Nathrenus) verbasci* (Linnaeus, 1767) and *Anthrenus (Florilinus) scrophulariae* (Linnaeus, 1758) are also repeatedly found in the collection where they probably mainly feed on dead insects (Querner, 2009). Heavily infested objects are treated with nitrogen in the chamber of the museum and in especially constructed large tents on the storage sites. Since 2000 a monitoring for webbing clothes moths is carried out and so the number of moths trapped could already be reduced over the years (Tab. 1). In 2010 a powderpost beetle *Lyctus brunneus* (Stephens,

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Collected moths	580	249	220	197	175	136	103	120	97	158

Tab. 1 - Results from the webbing clothes moth monitoring the Museum of Carriages in the Schönbrunn Palace in Vienna.

1830) infestation was discovered in the parquet floor in the exhibition space. It was first treated with microwaves (2010), but after beetles and exit holes repeatedly reoccurred, a heat treatment using heat blankets was applied against the beetles in 2011.

Picture Gallery (Gemäldegalerie)

The Kunsthistorisches Museum has a large collection of historic paintings that are exhibited in the museum and stored in two locations. In the Picture Gallery *Stegobium paniceum* are repeatedly attacking and damaging paintings lined with starch paste backings (also described by Fohrer *et al.*, 2006). Objects are treated with anoxia and additionally in 2010 a mass-release of parasitoid wasps was tested in the storage depot (Querner & Biebl, 2011). Many pictures were damaged by the beetles over the last decades. Biscuit beetles were also found in the collection feeding on old poisonous mouse baits that were left in the storage depot by a pest control company. The removal of the old bait boxes resulted in an improvement of the situation.

Collection of Sculpture and Decorative Arts (Kunstkammer)

In October 2004 an infestation of rhinoceros horn objects (goblets) was found in the storage room of the collection. Feeding traces on the horns and some individuals of the two spotted fur beetle *Attagenus pello* (Linnaeus, 1758) were found on and around the objects. All relevant objects were treated in the nitrogen chamber of the museum. In 2010 some of the 16th century tokens were damaged by *Lepisma saccharina* in a further storage room. The miniature portraits were made of a protein and cellulose based substance. All infested objects were treated with anoxia and since then, monitoring was started with sticky blunder and pheromone traps for webbing clothes moths.

Treasury (Schatzkammer)

The treasury houses a large collection of precious royal and religious valuable gems and jewels, textiles and artifacts and is the collection with the highest percentage of visitors per year. After webbing clothes moths were discovered in the exhi-

bition space in 2008, an insect monitoring was introduced with traps placed *in* and *underneath* the show cases and in the *exhibition rooms*. The monitoring showed that no objects like the royal coats or other precious textiles were infested, but it revealed that the moths were coming from spaces underneath the show cases that have not or could not be cleaned over the past years (Querner & Morelli, 2009).

The Austrian Theatre Museum (Österreichisches Theatermuseum)

A systematic insect monitoring was introduced in the different storage sites of the Austrian Theater Museum in 2010 as part of the forthcoming move to a newly built storage site. An active webbing clothes moth infestation was already known to the conservators, but its large extent could be shown by the monitoring in 2010. All textile objects from the infested storage site will be treated with nitrogen prior to the transfer to the new storage building.

The Museum of Ethnology (Museum für Völkerkunde)

The Museum of Ethnology in Vienna is one of the most significant ethnological museums in the world. Its collections comprise more than 200,000 ethnographic objects, 25,000 historical photographs, 136,000 printed works, and over 10,000 minutes of film on the history, culture, art and everyday life of predominantly non-European peoples. Like in all ethnographic collections the use of pesticides was formerly very common in order to prevent pests. The Museum of Ethnology in Vienna had also its own ethylene oxid fumigation chamber for treating infested objects. Many pest problems were found related to climate, the characteristics of a historic building and neglected general housekeeping (cleaning). But with retrospective effect we can state, that only a small amount of ethnographic objects were infested by different insect pest species and mold. After the renovation of the storage rooms, infested objects were treated in the nitrogen chamber. In 2003 an intensive pest monitoring was started as part of a new developed IPM concept. Now, after seven years of regular (partly weekly) checking with pheromone traps for webbing clothes moths and self-made sticky traps, pest outbreaks seldom have occurred and new infestations by *Tineola bisselliella* or *Anthrenus* sp. are quickly detected. The IPM in this collection with thousands of valuable materials and objects is very time consuming but the results show it is worth the effort.

DISCUSSION AND CONCLUSIONS

Two aspects, the characteristics of historic buildings and the allocation of the multidisciplinary responsibilities, have been particularly problematic and difficult in the application of an IPM strategy in a large museum with many historic buildings and different collections like the Kunsthistorisches Museum Wien. Our experience showed that the transition to an IPM concept is a process taking several years. The old buildings are often difficult to seal and are repeatedly infested. Renovating historic buildings to the standard of a modern museum is often too costly. The building and planned moving of large parts of the museum collection (the picture gallery for example) in the sum-

mer 2011 to a new storage site will be a big improvement as the new storage was built under modern and high conservation standards and will therefore better prevent pests infestations from outside. All infested and relevant collections (like the pictures) will be treated with nitrogen before the relocation. A new and larger nitrogen chamber will be built in the new storage site for the rising demands of the museum.

Currently, an external company (the first author) specialized in IPM in museums is responsible for the pest monitoring, coordination of various tasks and adjustment of the overall concept in most collections of the museum (all except for the Museum of Ethnology). He is cooperating with the conservators of the individual collections.

ACKNOWLEDGEMENTS

We thank the Kunsthistorische Museum in Vienna for supporting and funding an IPM program in the different collections the conservators Ernst Gregor and Marianne Novotny-Kargl for their help and informations on past pesticide treatments in the collection and Daniela Sailer for comments on the manuscript.

REFERENCES

- ALBERT G.D., ALBERT L.M., 1988 - Integrated Pest Management: A Program for Museum Environments, In: Zycherman L.A., Schrock J.R., (Eds.) - A Guide to Museum Pest Control. The Foundation of the American Institute for Conservation of Historic and Artistic Works and Association of Systematics Collections, Washington D.C.: 169-173.
- BROKERHOF A.W., VAN ZANEN B., VAN DE WATERING K., PORCK H., 2007 - Buggy Biz: Integrated Pest Management in Collections, Netherlands Institute for Cultural Heritage (ICN), Amsterdam: 79.
- FOHRER F., BASLÉ K., DANIEL F., 2006 - Problématique de l'infestation des colles de rentoilage des peintures de chevalet par le *Stegobium paniceum* (L.), Support tracé, 6: 78-85.
- JESSUP W.C., 1998 - Integrated pest management into operation. Collections Caretaker, 1 (3): 1-8.
- KINGSLEY H., PINNIGER D., XAVIER-ROWE A., WINSOR P., 2001 - Integrated Pest Management for Collections, In: Proceedings of 2001: A Pest Odyssey, James & James, London: 150.
- LINNIE M.J., 1987 - Pest Control: A Survey of Natural History Museums in Great Britain and Ireland. The International Journal of Museum Management and Curatorship, 6: 277-290.
- PINNIGER D.B., 2004 - Pest Management in Museums, Archives and Historic Houses, Archetype Publications, London: 115.
- PINNIGER D.B., 2008 - Pest Management a practical guide. Collection Trust, Cambridge: 52.
- PINNIGER D.B., WINSOR P., 2004 - Integrated pest management. A guide for museums, libraries and archives. Museum Libraries Archives.
- QUERNER P., 2009 - Museumsschädlinge und die Umsetzung der integrierten Schädling bekämpfung in Wiener Museen. Ein erster Überblick. Mitteilungen der Deutschen Gesellschaft für allgemeine und angewandte Entomologie, 17: 231-233.
- QUERNER P., BIELB S., 2011 - Using parasitoids wasps in Integrated Pest Management in museums against biscuit beetles (*Stegobium paniceum*) and webbing clothes moths (*Tineola bisselliella*). J. Ent. Acar. Res Ser II, 43 (2).

- QUERNER P., MORELLI M., 2009 - Nachweis von Museumsschädlingen in Schmutz. *Restauro*, Fachzeitschrift für Kunsttechniken, Restaurierung und Museumsfragen, 2: 85.
- QUERNER P., MORELLI M., 2010a - Integrierte Schädlingsbekämpfung in Museen - Erfahrungen einer Umstellung. *Restauro*, Fachzeitschrift für Kunsttechniken, Restaurierung und Museumsfragen, 4: 234-241.
- QUERNER P., MORELLI M., 2010b - Leitfaden für eine Einführung und Umstellung zur Integrierten Schädlingsbekämpfung (IPM). *Restauro*, Fachzeitschrift für Kunsttechniken, Restaurierung und Museumsfragen, 5: 332-333.
- RANACHER M., 1998 - Mikroorganismen- und Schadinsektenbefall im Depot: Ursachen, Sanierung, Hygiene und Gesundheitsschutz. In: Landesstelle für die nichtstaatlichen Museen (Eds.) *Das Depot. Der andere Teil der Sammlung*, 9. Bayerischer Museumstag, München: 53-74.
- STORY K.O., 1986 - Approaches to Pest Management in Museums. In: *Conservation Analytical Laboratory*, Smithsonian Institution, Washington D.C.: 85-101.
- STRANG T.J.K., KIGAWA R., 2006 - Levels of IPM Control: Matching Conditions to Performance and Effort. *Collection Forum*, 21 (1-2): 96-116.

PASCAL QUERNER, University of Natural Resources and Life Sciences Department of Integrated Biology and Biodiversity Research, Institute of Zoology, Gregor-Mendel-Straße 33, A-1180 Vienna, Austria.

E-mail: pascal.querner@boku.ac.at

MICHAELA MORELLI, Kunsthistorisches Museum mit MVK und ÖTM Museum of Carriages and Department of Court Uniforms, Textile conservation Schloss Schönbrunn, A-1130 Vienna, Austria.

ELKE OBERTHALER, MONICA STROLZ, KATJA SCHMITZ VON LEDEBUR, JOHANNA DIEHL, Kunsthistorisches Museum mit MVK und ÖTM, Picture Gallery, Maria Theresien-Platz, A-1010 Vienna, Austria.

ISABELL ZATSCHKE, ANNA FERMI-MEBAREK, Austrian Theatre Museum Lobkowitzplatz 2, 1010 Vienna, Austria.

REGINA HÖLZL, IRENE ENGELHARDT, Kunsthistorisches Museum mit MVK und ÖTM, Egyptian and Near Eastern Collection, Maria Theresien-Platz, A-1010 Vienna, Austria.

HUGO KRAMMER, SOPHIE FÜRNKRANZ, Kunsthistorisches Museum mit MVK und ÖTM, The Museum of Ethnology, Neue Burg, A-1010 Vienna, Austria.