

## **Flies in Historic Sites and Museums: What are the concerns?**

Margot Brunn and Shannon Coles, Royal Alberta Museum

Flies buzzing inside a rural interpretive centre or an urban historic house are not uncommon during summer. Some will overwinter inside - as do other winged insects such as yellowjackets and lady beetles - preferring sunny windowsills, and ceilings for sleeping at night. In the spring, fly remains can be found in fluorescent light banks and incandescent light fixtures in great numbers. While evidence of mice in food storage and bats in attics calls to mind building maintenance, flies are often considered a nuisance that is traditionally dealt with through sticky flypaper, flyswatters or insecticide spray.

Flies, however, are more than a nuisance. A fly must liquefy its food by secreting the digestive enzymes amylase and protease before it can be ingested. (Amylase is an enzyme that breaks down carbohydrates and protease is a group of enzymes used to break down proteins). They often regurgitate some of their gut contents and that, in addition to enzymes, may deposit microbes. Thus, a fly's saliva has serious implications for disease transmission in medical entomology since fresh, micro-organism contaminated secretions can result in illness. <sup>1</sup>

It becomes a conservation concern when flies disfigure original surfaces of historic buildings, interior architectural details and the artifacts that furnish a room. Many small stains can be attributed to fly excretions, however, spiders, fly predators, may also have contributed to the damage. Fly pellets appear as raised, dark brown spots composed of nitrogenous waste that is known to etch paper and metal surfaces, and weaken textile fibres. Uric acid - the primary excretory product of insects - ammonia and urea make up the secretion (except for Blow flies which secrete allantoin). <sup>2</sup> On porous and fragile museum artifacts, fly excretions can result in permanent staining.

As well, great numbers of dead flies have the potential to attract museum pests by becoming a food source for more ominous insects such as the carpet beetles, larder beetles or the even harder to get rid of odd beetles. The larvae of these museum pests feed on decomposing animal matter, and a ceiling light full of flies may become an entry point into storage or displays of wool, silk, hide or specimens collections.

### **What flies do you have?**

There are two types of flies that may be found in historic sites and museums, Cluster flies and "filth" flies. Proper identification of the type of flies is necessary to understand what underlying conditions might be present that require attention. For instance, finding large numbers of overwintering Cluster flies may indicate a building repair issue while the presence of "filth" flies may indicate a dead animal nearby. Both types of flies warrant a review of food handling and food storage procedures. To determine the fly type, collect and sort the flies in a zip lock bag.

**Cluster flies (*Pollenia spp.*)**

- Short golden tufts of hair on the thorax
- Enter buildings in the fall and hibernate in undisturbed areas such as attics, wall voids, unused rooms
- Common for great numbers (clusters) to form inside buildings in rural settings
- Found on window sills on warm sunny days and in light fixtures
- Will move in a slow and sluggish manner indoors
- Eggs are laid outside in the soil where the larvae attack earth worms
- Dead flies will become a food source for carpet beetles, larder beetles and odd beetles
- Can transmit disease (they typically carry bacteria and other “opportunistic” pathogens)



Fig. 1: Cluster fly. Copyright © 2007 Lynette Schimming

### **Blow Flies (Calliphoridae)**

- Common name for metallic bodied carrion flies. Include Black blow fly (*Phormia regina*), Green bottle fly (*Lucilia sericata*), and the Blue bottle fly (*Calliphora vicina*)
- Body has a metallic sheen. Colours include black, green, blue and copper
- Adults are attracted to lights
- Can be found inside but not in great numbers
- Eggs are laid in moist garbage/decaying matter
- Can transmit disease-causing organisms



Fig. 2: Green bottle fly. Copyright © 2008 Peter Cristofono

### **Houseflies (Muscidae)**

- Dull grey thorax with four dark stripes on the back
- Red eyes
- They do NOT overwinter inside and are NOT attracted to light
- Eggs are laid on fresh, moist, decomposing flesh/materials such as recently deceased animals, garbage and compost piles
- Can transmit disease-causing organisms



Fig. 3: Housefly. Copyright © 2005 Chris Wirth

### **Cleaning of fly specks**

Fly specks are best dealt with as part of a routine maintenance/housekeeping procedure. Regular vacuuming and cleaning will reduce fly populations within museum settings and decrease the chance of permanent stains.

### **Fresh deposits**

Deposits of fresh fly excretions are easier to remove than aged deposits that may have etched into surfaces. Mechanical cleaning methods can be used on ceilings, painted walls, window mouldings and other building surfaces. Always wear gloves and a dust mask to protect yourself. Choose a tool that is softer than the stained surface, e.g., the tip of a wooden skewer, modified so the point is flat, works well for this purpose. Use the flat edge of the tip to dislodge pellets and vacuum up the residue. Clean the stained area by damp-wiping with soapy water and rinsing with clear water. This may be all that is needed to remove any residue and discolouration.

### **Aged deposits**

The longer fly excretions are left in place the deeper they will have etched into the affected materials. The same mechanical method used for fresh pellets can be used to remove the residue but a brown stain will likely remain behind. Damp wiping with soapy water (using a mild alkaline such as Calgon), will help to clean the area and will lighten the brown stain to a less noticeable grey.

Some nitrogenous wastes are more soluble in lower pH solutions (adding some baking powder or a little vinegar), but this could have a bleaching or delaminating impact on the material to be cleaned. Always test a small area first. Cleaning an old, heavily spotted area like a ceiling can be a respiratory irritant and a dust mask should be worn as a precaution.

### **Exceptions to cleaning of artifacts**

There are important exceptions to cleaning fly excretions. Never use damp-wiping on the porous and soft surfaces of artifacts. When deposits are found on paintings, gilded picture frames, textiles, water colours, prints, photographs, calendars, certificates, and other paper objects, mechanical cleaning may tear or scratch the surface. Wet cleaning may weaken, create holes or make staining more visible. These types of artifacts need a specialized treatment by a conservator.



Fig. 4: Fly excretions on painting. Photograph by Margot Brunn.

### **Control and Preventive Methods**

A preventive approach to reducing indoor fly populations is a year-round commitment for historic sites and museums with artifact-rich settings such as a General Store, a country kitchen, or ethnographic and natural history collections.

Sealing gaps and ensuring window and door screens are in good repair is the first preventive step in controlling flies and other insects. Make sure the housekeeping plan allows enough time to thoroughly vacuum and wash wainscoting, ceilings, light fixtures and the mouldings around windows and doors. Also inspect attics and drop ceilings regularly, and vacuum dead insects and the white egg cases of spiders frequently.

Vacuuming is recommended over dusting because it is more efficient at removing dust and insect larva and eggs. Use micro-lined anti-bacterial bags or a HEPA (High Efficiency Particulate Air) type vacuum that traps 99% of particles and bacteria and prevents their dispersion through the exhaust. Make sure to regularly replace the bag before it gets too full and eggs have a chance to hatch.

To manage “filth” flies ensure practices are in place to reduce their breeding grounds. Keep garbage bins covered and regularly emptied and the containers cleaned inside and outside. Place compost areas away from buildings and ensure they are regularly maintained. Use non-toxic flypapers in areas that are difficult to control, such as barns.

## Conclusion:

Keep all food covered using bins or mesh screens and discourage the use of traditional tools such as flyswatters or spray insecticides. With appropriate preventive measures in place – and a handy vacuum - exposure to potentially harmful pathogens is avoided, flies as food source for museum pests is eliminated, stains on building materials is minimized and artifact collections on display are protected from disfigurement and deterioration.

## References:

- 1) Dr. Douglas A. Craig, Professor Emeritus, Department of Biological Sciences, University of Alberta. Personal communication.
- 2) Nation, James L. 2002. *Insect Physiology and Biochemistry*. Pp. 376-378. Chapter 13: Excretion. CRC Press Online.  
and  
Waldbauer, C.P. 1968. *The Consumption and Utilization of Food by Insects*. P. 273 in Beament, J.W.L. (ed.) *Advances in Insect Physiology Volume 5*. Elsevier.

Goble, H.W., W.A. Attwater, R.T. Wukasch. *Cluster Flies*. Pest Diagnostic Clinic. 1999. University of Guelph. 22 April 2009  
<http://www.uoguelph.ca/pdc/Factsheets/Insect/clusterflies.htm>

Potter, Mike. *Cluster Flies, Face Flies, and Blow Flies in Homes*. 6 March 2009. University of Kentucky College of Agriculture. 22 April 2009.  
<http://www.ca.uky.edu/entomology/entfacts/ef624.asp>

## Further Reading

Strang, Tom and Kigawa, Rika. 2009. *Combatting Pests of Cultural Property*. Technical Bulletin #29. Canadian Conservation Institute, Ottawa.

Strang, Tom. 1996. *Preventing Infestations: Control Strategies and Detection Methods*. *CCI Notes 3/1*. Canadian Conservation Institute, Ottawa.

Strang, Tom. 1996. *Detecting Infestation: Facility Inspection Procedure and Checklist*. *CCI Notes 3/2*. Canadian Conservation Institute, Ottawa.  
[www.museumpests.net](http://www.museumpests.net)

## Image credits:

Cristofono, Peter. Photo # 180785. 2008. BugGuide.Net.  
<http://bugguide.net/node/view/180785>

Schimming, Lynette. Photo # 141016. 2007. BugGuide.Net.  
<http://bugguide.net/node/view/141016>

Wirth, Chris. Photo # 40053. 2005. BugGuide.Net.  
<http://bugguide.net/node/view/40053>

## Acknowledgements:

Many thanks for expert entomological advice: Matthias Buck, Royal Alberta Museum, for identifying cluster flies in light fixtures, Dr. Douglas A. Craig, University of Alberta, for information on fly saliva disease transmission, Dr. Andy Keddie, University of Alberta for reading the draft and comments, Dr. Bert Finnamore, Royal Alberta Museum, for inspiration.