

Integrated Pest Management Plan

Proper Handling of Specimens

Storage and handling specimens

Proper storage and handling techniques helps not only with pest management, but also to serves protect the archival integrity of the specimens. These guidelines should be followed for the proper management of the collections.

- Specimens should always be handled carefully. Many are fragile and easily susceptible to physical damage. Care must also be taken not to dislodge specimen tags from specimens, which renders the specimen useless for research purposes. The user or curator should immediately reattach a tag that has become separated from a specimen.
- Specimens should be stored on metal, acid-free trays. Trays should be kept clean to provide a good background when looking for signs of infestations.
- Cases should be kept closed as much as possible. Closed doors create a physical barrier to pests as well as damaging light. Closed doors also keep dust/and debris out of the cases, which may provide food for pests/insects.
- If a case is left open overnight or longer, it should be closed immediately and treated if infestation is suspected.
- Specimens are not to be removed from the collection without approval of the curator.

Handling specimens by staff and visitors

- Wash hands before and after handling specimens.
- Gloves (latex or nitrile) are available to protect users from exposure of previous specimen treatments and to prevent oils, residues, etc., from getting on and damaging specimens.
- Specimens should not be out of the cases longer than necessary.
- Trays should be made available to place specimens on to protect them from dirty work areas and to help identify infestations. Trays should always be used to transport specimens from cases to work areas and back. Specimens should be returned to their appropriate case or holding area at the end of the day.

Pest Prevention and Fumigation

Prevention is the first line of defense against pests accessing specimens in the collection. To prevent pests from entering the collection and specimens, barriers must be created and all pests must be eliminated. Collections staff often rely on prevention as the main tool to keep pests out of the collection. The best ways to prevent pest infestations include a combination of pesticide exposure, cryo-treatments, proper handling of specimens/shipments, and cleanliness.

Pesticide Exposure

Application of pesticides is one way to keep collections free of pests. However, many pesticides such as Vapona (the active ingredient in No-Pest strips) are considered dangerous to humans. Mothballs containing either paradichlorobenzene or naphthalene are employed in each case as a means of year-round prevention and control. Mothballs are placed into open topped plastic containers and refreshed every 6 months.

On a yearly basis, cases are to be chemically fumigated for a minimum of a 1 week period with Ethyl-acetate. Ethyl-acetate is placed into each case in a shallow glass bowl filled with cotton balls and allowed to dissipate. The cases are to remain closed during this procedure.

Cryo-treatment (or Freezing)

Freezing, or Cryo-treatment, is used to prevent insects from coming into the collections from the outside (e.g., loans and recently prepared specimens from field expeditions, etc.). Freezing can be thought of as a first line defense against pests as it is designed to kill any pests before they have a chance to come in contact with the collections. If insects/pests are frozen quickly and at extreme temperatures, internal insect fluids are crystallized and cause cells to burst thus killing the pest (Denlinger and Hallman, eds. 1998. *Temperature Sensitivity in Insects and Application in Integrated Pest Management*. Westview Press. Boulder, Co. 311 Pgs.). However, if insect pests are not cooled quickly enough or for a long enough period of time, they can form “anti-freeze” and are more difficult to kill. For this reason the treatment must not be interrupted or must be repeated at least two times.

Two effective procedures (specified below) can be used for cryo-treatments. Before treatment, specimens should be placed in heavy duty polyethylene bags or good quality “Tupperware” containers to prevent both desiccation of the specimen and to prevent condensation from forming on specimens post-freezing. Bags and containers should be sealed tightly with tape formulated with withstand ultra-cold temperatures.

Procedure 1 (large infestations):

- (1) Place specimens in -30° C walk-in freezer for 7-10 days
- (2) Remove specimens from freezer and keep them in bag/container
- (3) Allow to come up to room temperature to prevent condensation forming on specimens (condensation will form on outside of bag/container)
- (4) Remove from bag/container and distribute accordingly

Procedure 2 (infestations detected early; loan materials):

- (1) Place specimens in -30° C walk-in freezer for 7-10 days
- (2) Remove specimens from freezer and keep them in bag/container
- (3) Allow to come up to room temperature to prevent condensation forming on specimens (condensation will form on outside of bag/container)
- (4) Freeze again; Place specimens in 30° C walk-in freezer for 7-10 days
- (5) Remove specimens from freezer and keep them in bag/container
- (6) Allow to come up to room temperature to prevent condensation forming on specimens (condensation will form on outside of bag/container)
- (7) Remove from bag/container and distribute accordingly

In addition, Cryo-treatments should be used on other prepared specimens, to include:

- All new materials from field expeditions or other new preparations
- Incoming shipments (loan returns, borrows, etc.)
- Specimens loaned to the Teaching Collections, regardless of time on loan

Cleanliness

Cleanliness is a vital tool in collections management for a number of reasons. Cluttered areas can provide hiding and potential breeding places for insects, and unsanitary conditions can act as a food source for these pests. Pests are harder to detect in unclean areas. Below are some guidelines for keeping the collection and adjacent areas clean:

Offices

Food is allowed only in office areas and the kitchen. Food should not be eaten in the collection areas or when handling specimens. Many of the older specimens contain Arsenic or other compounds that can poison the skins, and ingestion of food nearby may not be healthy. Also, eating food near specimens may transit oils, residues, etc., to the specimens which could attract insects or discolor specimens. If food is consumed in the designated areas, then it is the responsibility of the “consumer” to dispose of unused food items in a trash receptacle that gets emptied regularly or to close the trash liner until trash pick up is made. The “consumer” is responsible for cleaning up after eating, and special assignments may be needed for cleaning after social activities.

As mentioned before insects can use clutter to hide/reproduce/forage. Reduce clutter as much as possible. A clean office allows access for cleaning and reduces the chances of pests using clutter.

Along with reduction of clutter, regular cleaning can reduce pest/insect occurrences. Although daily cleaning is not necessary, people should at least do the following:

- Empty trash receptacles on regular basis
- Sweep/mop occasionally
- Vacuum and dust as necessary

Collection or Common Areas

Food is forbidden at all times in the collections areas. Common areas are of the most concern for cleanliness. Each user needs to take the time to make sure common use areas are clean and clutter free when they are finished using them.

Monitoring

In establishing and performing an effective Integrated Pest Management program, consistent monitoring is essential. Consistent monitoring is an overall gauge to the effectiveness of our program, allowing us to determine the presence and trends of pest activity and the effects of preventive measures. We will modify our procedures and preventative measures to meet the changing results from the monitoring. Below are the procedures set forth for the monitoring program:

Trapping

Insect monitoring using Light traps will be regularly employed. Light traps will be located throughout the collections to attract/kill insects. Traps will be checked and cleaned monthly by Curators, staff or interns. The following data are collected from the traps and are stored in a Microsoft Excel spreadsheet:

- (a) Date checked
- (b) Location of trap
- (c) Number of insects
- (d) Type of insect (Pest, Predator, or Misc.)

If a given trap(s) has large numbers of insects, all cases in the immediate vicinity will be checked for potential infestation.

Case inspections

Specimen cases are inspected by the curatorial staff on a yearly basis. During case inspections, personnel look for any signs of pest activity; thus these yearly assessments are vital for the discovery of new infestations. Live pests, insect frass, shed insect casings and/or an unusual amount of loose feather fragments all indicate recent pest activity. To undertake yearly inspections, each individual active in the collections is assigned a proportionate number of cases by the Curators and are given a time frame to complete their inspections. For each case assigned, the inspectors must look in every drawer and move an appropriate number of specimens to search for signs of infestations. The inspectors are to report findings (positive or negative) to the Curators who will summarize the findings. Appropriate action is decided on a case by case basis. Results from previous inspections, fumigation, and cryo-treatments also will be posted on the outside of each case.

At Large Monitoring

Personnel, volunteers, and collection visitors perform this type of monitoring during routine activities. During their normal duties, these individuals are asked to watch for signs of infestations and insect activity. Personnel should be aware of any discussions of increased pest

activities in other parts of the building, and report this to the Curators. Visitors using the collections are a great resource for finding potential infestations as these individuals are in the position to observe certain specimens closely

Dealing with infestations

No matter how effective our preventative measures are, there is always a chance of pest infestation to a part of our collection. When an infestation is found, the below procedure should be followed:

1. Identify infestation

As soon as an infestation is found, alert Curators. The Curators will identify the type of pest involved and determine extent of infestation.

2. Deal with infestation

First, clean the area affected by sweeping and/or vacuuming frass and casings from the drawers and clean infested specimens with the HEPA vacuum or dustbuster. While using the vacuum gently tap the specimen to free loose materials/pests to be sucked away with the vacuum. Replace the soiled case paper and/or unit trays, and dispose of the HEPA vacuum collection bag.

3. Kill pests

The affected specimens should be isolated and treated using the Cryo-freezing method outlined above. This is the most appropriate method for infestations affecting a whole case of specimens.

4. Monitor for signs of re-infestation

After the infestation has been handled, the infested area(s) should be rechecked carefully for signs of re-infestation at least once within six months. If the original infestation was severe, the area(s) should also be checked again periodically for at least 12 months.