



Animal and Plant Health Inspection Service  
U.S. DEPARTMENT OF AGRICULTURE

# Khapra Beetle Program Manual



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When using pesticides, read and follow all label instructions.

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# Acknowledgments

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Cover photograph courtesy of USDA-APHIS-PPQ Sindhu Krishnankutty.

## Acknowledgments

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# Introduction

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## Purpose of the *Khapra Beetle Program Manual*

The APHIS PPQ *Khapra Beetle Program Manual* is intended to provide information to guide PPQ Field Operations and cooperators in the following areas:

- ◆ Survey and sampling to detect isolated infestations at low population levels
- ◆ Eradication efforts on isolated infestations
- ◆ Prevention of human assisted spread of khapra beetle to non-infested areas

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## Background

The khapra beetle, *Trogoderma granarium* Everts (Coleoptera: Dermestidae), is a destructive pest of grain, seeds, and stored food products. Additionally, food products infested by khapra beetle pose a threat to humans as hairs and cast skins from larvae are known allergens and a respiratory hazard. Originally native to the Indian subcontinent, it has expanded into other parts of Asia, Africa, and Europe. Khapra beetle and associated host material are regulated by the USDA under authority of [7 CFR 319.75](#). While khapra beetle is **not** known to occur in the United States, interceptions at ports of entry are common and the pest risk potential of khapra beetle is high. If khapra beetle were to become established in the United States, it would pose a significant threat to the domestic grain industry in terms of yield losses, but more consequentially it would impact the \$10+ billion United States grain export market. The goal of routine survey efforts is to monitor high risk areas for detection of isolated populations to help ensure the United States remains free from khapra beetle.

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## Biology and Ecology

### Lifecycle

Khapra beetle has four life stages; egg, larva, pupa, and adult. Females may lay up to 100 eggs during their lifetime. Eggs are very small and translucent, making them difficult to detect. Eggs usually hatch in 3-10 days, depending on temperature and humidity.

Khapra beetle spends most of its life in the larval stage and nearly all of its feeding occurs during this stage. The number of larval instars is indeterminate, as development is influenced by temperature, food availability, and crowding. Under favorable conditions, the larval period is 20-40 days. However, khapra beetle frequently enter dormancy during later stages of larval development.

During dormancy, development is paused in response to adverse conditions such as overcrowding, low temperature, low food quality, and/or lack of food. The dormancy of khapra beetle larvae is usually referred to as a facultative diapause, where molting and feeding occur sporadically, but development to the pupal stage does not occur. In the absence of food, diapausing larvae have been observed to survive for several years.

The pupation period usually lasts 4-6 days. The adult is short lived, typically for 1-2 weeks. One to ten generations of khapra beetle may occur per year. Under favorable conditions, khapra beetle can complete development in as little as 26 days. Under less favorable conditions, diapause in the late larval stage is common though larvae may resume development and pupate when favorable conditions return.

Khapra beetle is best suited to hot and dry climates, but they are tolerant of both extreme cold and heat. Optimal temperature for development is around 30 °C. At temperatures below 20 °C or above 35 °C development is halted. Khapra beetle endures adverse conditions as late stage larvae in diapause. Diapausing larvae are less susceptible to fumigation treatments due to reduced metabolic activity. They can also be difficult to control with contact insecticides as they frequently seek refuge in cracks or crevices that are hard to reach.

### **Infestations**

Khapra beetles live in stored grains and other plant and animal products. Hairy larval skins (exuviae) found in grain can indicate that there is an infestation. Live insects are usually in the top 50 cm of the grain pile. Larvae tend to aggregate in cracks, corners, and other tight spaces in storage facilities, shipping containers, or other structures without large available food sources.

Khapra beetles can feed on a wide variety of dried plant and animal products. This includes important commercially traded grains and other commodities such as wheat, barley, rice, peanut, cowpea, dried distillers grain, and sorghum. Khapra beetles may also feed on processed products such as dog food, protein drink mix, ground grains, tapioca, dried fruits, pasta, and cereal among others. Animal products like powdered milk, dried blood, dried animal skins, and fish meal are also known to serve as food sources.

Khapra beetle population growth is dependent upon host food, as well as environmental conditions (temperature, humidity) and crowding. Larval development is usually faster when foods with higher protein content are available. For example, population growth is typically higher on wheat compared to barley or rice. Similarly, processed foods such as dog food or protein shake mix can provide excellent food sources for khapra beetle.

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## Pathways of Introduction and Dispersal

Khapra beetle has been intercepted at ports of entry in mail, stores, general cargo, and permit cargo; however, the majority are found in passenger baggage. In recent years, the number of detections of khapra beetle has increased, prompting greater concern for the potential of establishment. This is due to an increase in the number of travelers from countries where khapra beetle is present, along with efforts to train inspectors and improve targeting of inspections.

Khapra beetle adults are flightless, and the movement of adults and larvae is limited to short distances. Infestation of grain stores or other products from the surrounding environment is unlikely. Therefore, the spread of khapra beetle to new areas typically occurs through the movement of host commodities. Spread at a local level may occur on items such as bags, clothing, or in stored products. Over long distances, the pest is spread mostly by humans in commerce and trade, through household moves, and in personal baggage containing dried food products. Movement of grain and seed products or contaminated machinery can also spread khapra beetle. These infestations present the greatest risk for spread into the domestic grain supply where trade could be impacted.

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## Conventions

Conventions are established by custom and are widely recognized and accepted. Major conventions used in this manual follow.

### Advisories

Advisories are used throughout the *Khapra Beetle Program Manual* to bring important information to the user's attention. Please carefully review each advisory. The definitions coincide with the American National Standards Institute (ANSI) and are in the format shown below.

 **DANGER**

The danger message is used in the event of imminent risk of death or serious injury

 **WARNING**

The warning message is used in the event of possible risk of serious injury.

 **CAUTION**

The caution message is used for tasks involving minor to moderate risk of injury.

## NOTICE

The notice message is used to alert a reader of important information or Agency policy.

## SAFETY

The safety message is used for general instructions or reminders related to safety.

## Boldface

Boldface type is used to emphasize important words throughout this manual. These words include, but are **not** limited to: **always**; **cannot**; **do not**; **does not**; **except**; **lacks**; **must**; **neither**; **never**; **no**; **nor**; **not**; **only**; **other than**.

## Bullets

Bulleted lists indicate that there is **no** order to the information listed.

## Change Bars

Black change bars are used to indicate changes and appear on the revised pages. Unfortunately, change bars **do not** always appear when text is merely deleted. Change bars from the previous update are deleted when the chapter or appendix is revised.

## Chapters

This manual contains the following chapters: [Introduction](#); [Identification](#); and [Survey and Trapping](#).

## Contents

Each chapter has a table of contents listing the heading titles within.

## Control Data

Control data is located at the top and bottom of each page to help manual users keep track of where they are in the manual and to be aware of updates to specific chapters, sections, appendixes, etc., in the manual. At the top of each page is the chapter title and first-level heading for that page. At the bottom of each page is the transmittal number (month, year, number), title of the manual, page number, and unit responsible for content.

To track revisions to the *Khapra Beetle Program Manual*, use the Control Data.

## Examples

Examples are used to clarify a point by applying it to a real-world situation. Examples always appear in boxes as a means of visually separating them from the other information contained on the page.

**EXAMPLE** Examples are graphically placed boxes within the text as a means of visually separating information from other information contained on the page. Examples always appear in a box like this.

## Heading Levels

Within each chapter there are four heading levels. The first-level heading is indicated by a horizontal line across both the left and right columns with the heading language across the left and right columns directly underneath. The second- and third-level headings are inside the margined text area with the body text following underneath. The fourth-level heading is inside the margined text area followed by a period and leading into the text.

## Hypertext Links (Highlighting) to Tables, Figures, and Headings

Figures, headings, and tables are cross-referenced in the body of the manual and are highlighted in blue hypertext type.

**EXAMPLE** See [Table 1-1](#) if you want to report an issue with the manual or have a suggestion for improving the manual.

## Indentions

Entry requirements summarized from CFRs, import permits, or policies are indented on the page.

## Italics

Scientific names are italicized throughout the *Khapra Beetle Program Manual*.

## Numbering Scheme

A two-level numbering scheme is used in this manual for pages, tables, and figures. The first number represents the chapter. The second number represents the page, table, or figure. This numbering scheme allows for identifying and updating. Dashes are used in page numbering to differentiate page numbers from decimal points.

## Transmittal Number

The transmittal number contains the month, year, and a consecutively issued number (beginning with -01 for the first edition and increasing consecutively for each update to the chapter). The transmittal number is **only** changed when specific chapter sections, appendixes, figures, tables, glossary, or index is updated. If **no** changes are made, the transmittal number remains unchanged. The transmittal number **only** changes for the entire manual when a new edition is issued or changes are made to the entire manual.

**EXAMPLE** 01/2021-01 is the transmittal number for this update and is located in the control data on the pages in this chapter.

01 is the month the updated was issued.  
2021 is the year the update was issued.  
01 is the edition number (the entire manual has been reformatted).

## Using the Manual

Review the contents of this manual to get a feel for the scope of material covered. Glance through the section to become familiar with the organization of the information. Use the tables of contents that follow each tab to find the needed information. If the tables of contents are not specific enough, turn to the index to find the topic and corresponding page number.

**EXAMPLE** To find information on trapping, see [Trapping](#) on page 2-3.

## Reporting Issues With or Suggestions For the *Khapra Beetle Program Manual*

Use [Table 1-1](#) to determine where to report issues, disagreements, or improvements that directly affect the contents of the *Khapra Beetle Program Manual*.

**Table 1-1 Reporting Issues With or Suggestions for the *Khapra Beetle Program Manual***

If you:	Then:
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Disagree with a policy or procedure, or have an urgent situation requiring an immediate response	CONTACT <a href="mailto:anne.lebrun@usda.gov">anne.lebrun@usda.gov</a>

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The PPQ Manuals Unit electronically issues and maintains manuals on the Manuals Unit Web site. The online manuals contain the most up-to-date information. Immediate update revisions to the manual are issued and distributed via email.

Each immediate update contains the following information:

- ◆ Link to access and download the online manual
- ◆ List of the revised page/table numbers

- ◆ Purpose of the revision(s)
- ◆ Transmittal number

### **Ordering Additional Manuals and Revisions**

Although using the online manuals is the preferred method, APHIS employees may order hard copies of manuals from the APHIS Printing, Distribution, and Mail Services Center in Riverdale, Maryland. Visit the [Riverdale Print Shop Web site](#) for detailed information and printing costs. The Manuals Unit is **not** responsible for printing costs.



# Survey and Trapping

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## Introduction

This chapter provides instruction on how to complete surveys for khapra beetle. Early detection surveys are necessary to find small khapra beetle populations in a timely manner. This ensures that PPQ is able to eradicate the infestation before khapra beetle becomes established locally and ensures trade is not impacted. Delimiting surveys are used to define the extent of infestation and to guide programmatic response. Monitoring surveys are used to determine if treatment is successful and to ensure that the location remains free of khapra beetle for an established amount of time after the initial find.

To ensure that khapra beetle surveys 1) detect early populations and 2) provide reliable negative survey data, it is critical that the surveyor follows the guidance in this chapter and the [Identification](#) chapter. This chapter provides guidance on how to properly plan and conduct a khapra beetle survey.

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## Selecting Survey Locations

Use the following information to select the highest risk locations to survey in your state. Since staffing resources are often limited, you may need to rotate surveys through different locations each year.

Use locally available resources to assist you in identifying high risk sites of introduction/interception. Local PPQ Smuggling Interdiction and Trade Compliance (SITC) staff are a good resource to identify high risk products, as well as importers, distributors, and retailers in the area. Your local U.S. Customs and Border Protection (CBP) contacts can assist with finding high risk locations as well. In addition, you may want to include locations that have received Emergency Action Notifications (EANs) for khapra beetle.

Use the following list as a starting point to identify areas of potential risk in your state in conjunction with the input from your local SITC and CBP counterparts:

- ◆ A commercial location that is the known, intended destination for a shipment of host material that CBP found to be infested by live khapra beetle at the port of entry. Previous shipments from the same supplier are possible and may have entered without inspection.
- ◆ Air cargo warehouses at international airports. These warehouses belong to individual airlines that service that airport. The warehouses often receive household goods and other materials that may be a pathway.
- ◆ Coffee roasters that import coffee beans in used burlap bags from khapra beetle countries
- ◆ Distribution warehouses for companies that sell high-risk merchandise
- ◆ Express consignment facilities (DHL, FedEx, UPS, etc.) or other facilities where potentially infested materials may pass through
- ◆ Grain dealers. If there is a known pathway for introduction of khapra beetle, or if in proximity to a known or possible pathway, then these sites may be considered much higher risk.
- ◆ Importers of brassware or other products from khapra beetle countries packaged in burlap bags
- ◆ Importers of bulk grains and spices from khapra beetle countries. Importers who repackage these products within the warehouse for retail distribution are highest risk. Examples include but are not limited to dried chickpeas, cracked corn, cracked or bulghur wheat, and hibiscus.
- ◆ Importers of manufactured, processed, or otherwise pre-packaged host material that is ready for retail sale from khapra beetle countries
- ◆ Military facilities where returning luggage or household goods are stored
- ◆ Retail markets selling materials outlined above
- ◆ Transload facilities, locations where container cargo is transferred from one load unit to another. When a container is transloaded, it usually occurs at a facility that is close to a port terminal. A container will be taken into a facility and transferred to a domestic container or truckload.

## Trapping

### Trap Placement

Survey a new facility with a company representative, if possible, to identify locations before placing traps. Check exit and entry areas, as well as any storage locations on the premises. Observe the movement of products, containers, and/or people handling products which could have been exposed to khapra beetle.

Be alert for cartons, burlap or jute sacks, debris, woodwork, cracks, loose plaster, loose paint, and other such hiding places. Carefully inspect rodent bait stations and other such traps with grain or cereal. Khapra beetle are attracted to dirty grain and storage or handling facilities; conversely, sanitary conditions are a deterrent. Areas of low light are also favorable for khapra beetle.

In empty bins and warehouses, larvae are likely to be in or on ledges, cracks in the floor or walls, old cartons, rags, sacks, newspapers, scrap lumber, or other debris. Elevator tunnels also serve as hiding places for khapra beetle larvae. When inspecting sacked material, the ears and seams of bags are common hiding places for the beetle and should be inspected. In bulk storage where heavy infestations may occur, larvae tend to congregate in the surface grain and on or near the walls. Look for cast larval skins as a sign of an active infestation.

### When to Trap

Conduct surveys when average temperatures are above 70 °F in the trapping environment. Survey outdoor areas throughout the warm season.

Environmental conditions may be less severe than prevailing weather conditions in areas immediately surrounding ports and grain processing and storage facilities. Use practical judgment to determine if temperatures are warm enough. In more temperate areas, conduct surveys from mid-May through mid-September. In heated warehouses, food storage and processing areas, dwellings, and other moderated environments, surveys with traps are appropriate at any time of year.

### Trapping Supplies

The Khapra Beetle Wall Mount Trap Kit contains all supplies necessary to complete a khapra beetle survey. The kit includes:

- ◆ Six khapra beetle wall-mounted traps ([Figure 2-1](#))
- ◆ Seven khapra beetle pheromone lures ([Figure 2-2](#))
- ◆ Organic wheat germ (the food bait for the beetle) ([Figure 2-3](#))
- ◆ Plastic collection tray for wheat germ ([Figure 2-4](#))

◆ One decoy sticky trap (Figure 2-5)

The wall mount traps may be re-used.

Use the decoy aerial trap to capture warehouse beetle, *Trogoderma variabile* Ballion adults and minimize their numbers in khapra beetle wall traps. The warehouse beetle is often present in warehouses and it is difficult to distinguish between warehouse beetle and khapra beetle. Since both species are attracted to the same pheromone lure, warehouse beetles may overwhelm khapra beetle traps. However, since the warehouse beetle is a strong flyer, unlike khapra beetle, which **does not** fly, use the aerial decoy trap to minimize or exclude warehouse beetles collected in khapra beetle wall traps.

Fit the decoy aerial trap with one of the khapra beetle lures and hang it high in the open head space of the building. Use one aerial trap for every five to six khapra beetle wall-mounted traps.



Figure 2-1 Khapra Beetle Wall-Mounted Trap



Figure 2-2 Khapra Beetle Pheromone Lure



Figure 2-3 Organic Wheat Germ



Figure 2-4 Plastic Collection Tray with Wheat Germ



Figure 2-5 Decoy Aerial Trap with Khapra Beetle Pheromone Lure

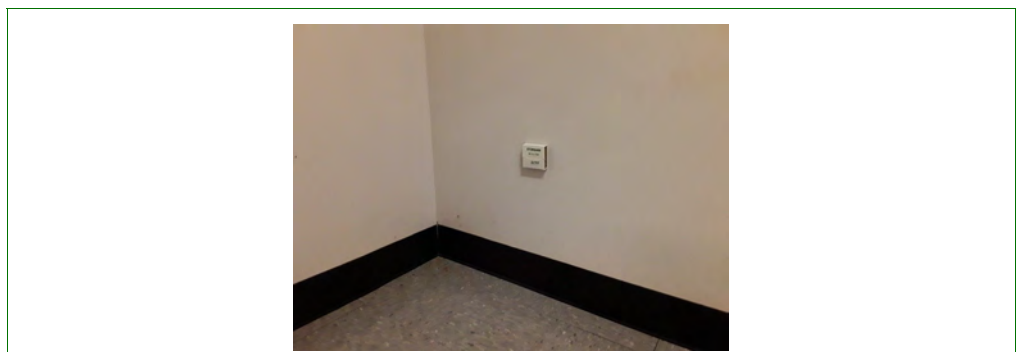
### Additional Supplies (Locally Available)

- ◆ Aspirator or vacuum collection device (may be sourced from vendors such as BioQuip Products)
- ◆ Brightly colored flagging (to help you find traps for return visits)
- ◆ Cooler with ice packs
- ◆ Disposable gloves (for sweep sampling)
- ◆ Double-sided tape or another adhesive (Gorilla brand tape works well)

- ◆ Dust mask (for sweep sampling)
- ◆ Forceps
- ◆ Hard hat
- ◆ Headlamp
- ◆ Labels for samples
- ◆ Orange safety vest
- ◆ Permanent marker
- ◆ Pencil
- ◆ Plastic bins to store and provide easy access to equipment
- ◆ Plastic re-sealable bags (sandwich and gallon sized)
- ◆ Small paintbrush for brushing insects out of the trap
- ◆ Wipes or paper towels to clean the wall surface before hanging traps

### Trap Set Up

Follow the instructions from the manufacturer that are included with the trap kit to assemble the traps. Use a permanent marker to label each trap with a unique identification number, for instance County Code-Facility Code-Trap Number. Use the wall mount trap inside and outside structures. Place traps around the inside of exterior walls and along interior walls of structures under investigation (Figure 2-6). Pay special attention to cracks in the walls and walls made of porous materials like cement blocks. Cracks may serve as pathways for insect movement. If possible, place a trap over a wall crack if one is found.



**Figure 2-6 Correct Placement of Khapra Beetle Trap**

Clean the wall thoroughly before attaching the trap to the wall. An alcohol prep pad or paper towel soaked with ethanol works well to clean the wall. Allow the wall to dry before affixing the trap to the wall. You may use any locally available double-sided foam tape (Gorilla brand, 3M, double-sided foam tape, etc.). Duct tape **does not** work well for this purpose. Replacing the tape is often

necessary when servicing traps. Do **not** cover the entry holes on the back of the trap. Use an opened paper clip to open the side tabs, which may not be perforated completely. When attaching the trap to the wall, make sure that all four back entry tabs are in contact with the wall and that the trap is also attached loosely enough so that entry holes are not closed (Figure 2-7). These are the places where the larvae will enter the trap.

Be aware that the trap adhesive or tape (if used) may remove some paint from walls when the trap or tape is removed. Let the facility know this. You may need to choose a less prominent location.



**Figure 2-7 Wall Trap with Back Entry Tabs Opened Correctly**

Fill the plastic collection tray with wheat germ (Figure 2-3). Fill the dish only 1/4 to 1/3 full, being careful **not** to spill wheat germ in the trap, and keeping it vertically oriented after assembly through attachment to the wall.

### Areas to Avoid

Areas exposed to human activities such as sweeping, foot traffic, or frequent use of mechanized equipment may lead to trap loss. Placement in very oily or damp locations will lead to trap damage or poor adhesion. Slippery surfaces, such as metal, plastic, glossy painted concrete, or glass walls may inhibit khapra beetle movement.

### Height

Mount traps as low as possible to maximize captures. However, in most cases, to avoid trap loss from maintenance activities, mount the traps at least above broom height. Look for locations up to about 2 feet off the floor where they can be easily serviced.

### Density

Allow 25 to 40 feet between traps or base the placement of traps on the layout of buildings. The more traps that are set, the greater the chance of finding khapra beetle, if present. However, if there are too many buildings and travel is a problem, half of the locations can be trapped in alternate years. This way, a building can be more intensively trapped, thus increasing the chances of finding khapra beetle.

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## Survey Supply Procurement

Order all traps and lures through the IPHIS Survey Supply Ordering System. Follow the national guidance for procuring traps and lures during the two ordering open periods each year. If you need immediate assistance, contact Laurie Morales at [laurie.m.morales@usda.gov](mailto:laurie.m.morales@usda.gov) or 970-494-7535 or Darrell Bays at [darrell.a.bays@usda.gov](mailto:darrell.a.bays@usda.gov) or 919-500-9959.

When ordering the trap kits, be sure to order additional lures so that you can change out the lures during the trapping season.

### Product Names in the IPHIS Survey Supply Ordering System

- ◆ Khapra Beetle Wall Mount Trap Kit (includes 6 traps and 7 lures)
- ◆ Khapra Beetle Lure (additional lures that can be ordered)

If you need to purchase additional organic wheat germ, it may be purchased locally; **however, it must be organic wheat germ.**

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## Trap Servicing and Sample Collection

Check traps every 1-2 weeks. When inspecting the trap, dump the contents of the plastic collection tray (including the wheat germ and any insects) into a resealable plastic bag. Inspect the trap for any other larvae that have not yet reached the collection tray. You can do this by tapping the tray into the plastic bag and using a fine paintbrush to dislodge any insects into the tray. Place a label on or inside each bag with a unique trap identification number, date of location, and facility name. Place the bag in a cooler with ice packs.

### NOTICE

It can be difficult to remove the wheat germ tray when servicing the trap. If this is an issue, the entire trap may be removed at each sample collection, and a new trap placed.

Refill the plastic collection tray with fresh wheat germ. **Do not** dispose of used wheat germ onsite. Even if there are no visible insects present in the wheat



germ, bring the used wheat germ back to the lab/office for proper disposal. See the [Identification](#) chapter for further information.

The khapra beetle lure is effective for 28 days. Change lures in both the khapra beetle and decoy traps every 28 days.

When checking a trap for the last time and removing it, place the complete trap in a resealable plastic bag. Place a label inside the bag with a unique trap identification number, date, and facility name.

Before leaving each facility, wipe down any tubs or containers that you brought into the facility with a lab wipe or paper towel soaked with ethanol. Clean your boots and clothing well before traveling in the government owned vehicle to avoid tracking khapra beetle life stages to other locations.

### Sample Preparation and Storage

Keep specimens as cool as possible. Transport samples back to the lab in a cooler. At the lab, if samples cannot be sorted and screened immediately, store the samples in a freezer. Place the entire plastic bag with the trap contents in the freezer. For samples taken from the last trap servicing of the season, freeze the entire trap inside a plastic bag. This will prevent sample degradation and also the potential for larvae or adults to escape into the lab. Larvae otherwise may degrade to the point where they are difficult to find within sweepings or food baits. Such precautions will also help with potential visual or molecular identification.

Refer to the [Identification](#) chapter for instructions on sample sorting, sample screening, specimen routing, and taxonomic guidelines.

#### NOTICE

The manufacturer's instructions mention rearing out of specimens. **DO NOT** rear out suspect khapra beetle eggs or larvae from PPQ, Cooperative Agricultural Pest Survey (CAPS), or Plant Protection Act (PPA) 7721-funded khapra beetle surveys.

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## Survey Records

Enter survey records into the Integrated Plant Health Information System (IPHIS) under the template Khapra Beetle Detection. The types of data that will be collected are: location, date, host, activity (install, remove, or trap check), and lure.



# Identification

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## Introduction

This chapter provides guidance for individuals who will process trap collections and submit samples of suspected khapra beetles for identification. In addition, the chapter provides information for specimen routing and results reporting.

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## Sorting and Screening

Sort and screen trap collections before submitting specimens for identification. Sorting raw trap samples requires familiarity with insect groups and experience in examining specimens. Sorting is the first level of activity that assures samples submitted are of the correct target group of pests being surveyed. Sorting samples in a khapra beetle survey involves removal of non-beetle specimens.

Screening is removing obvious beetle larvae or adults not fitting the general descriptions of dermestid or similar-looking beetle families. Screening in a khapra beetle survey involves removal of non-dermestid beetles before specimens are submitted to a PPQ Identifier.

### NOTICE

Microscopes with 10X–15X magnification are recommended for sorting and screening.

Freeze samples according to the directions outlined in the [Survey and Trapping](#) Chapter. Pour the frozen contents of the trap onto a lab tray. Remove wheat germ and other debris. Remove insects that are not beetles. To the best of your ability, remove any beetles that are not in the Dermestidae family. When in doubt, keep the insect in the final sample to be submitted.

### NOTICE

A small paintbrush moistened with alcohol is useful for moving suspect specimens from the sample to a vial without damaging the specimens.

The following linked module, developed for Customs and Border Protection Agriculture Specialists, provides useful background on sorting and screening of domestic survey samples: [Dermestid Beetle Recognition and Screening Aid](#).

Whenever an entire trap is removed and replaced, such as during the last trap servicing of the season, thoroughly inspect for larvae that may be hidden inside. Gently dismantle the trap and inspect the corrugated cardboard and the entire interior of the trap. Khapra beetle larvae are attracted to the corrugated cardboard, and specimens may be found within the folds of the cardboard. Separate the corrugated cardboard to examine for larvae within the folds. Use a fine paintbrush to dislodge any insects from the cardboard. If the specimen is caught in adhesive, cut the insect out of the trap with scissors so that only a small piece of trap backing remains.

The following resources are useful guides for identification of suspect specimens from sorted or screened samples:

- ◆ [Dermestidae Adults Self-tutorial](#)
- ◆ [Dermestidae Larvae Self-tutorial](#)

If the trap was not previously frozen, place the entire trap in a freezer for 15 days before disposal or reuse after the trap has been inspected. The majority of household freezers maintain temperatures from -9 °F to 0 °F.

Likewise, freeze any used wheat germ for 15 days before disposal, even if suspect specimens are not found.

Place insect larvae and adults in vials with non-denatured 95% or higher ethyl alcohol.

### NOTICE

The manufacturer's instructions mention rearing out of specimens. **DO NOT** rear out suspect khapra beetle eggs or larvae from PPQ, Cooperative Agricultural Pest Survey (CAPS), or PPA Section 7721-funded khapra beetle surveys.

## Specimen Routing and Taxonomic Guidelines

Identification of dermestid beetle larvae or adults recovered from khapra beetle survey traps is difficult and requires specialized training. State or PPQ offices given the responsibility for this survey should consider the ability, experience, and expertise of those assigned to the various steps of sorting, screening, and identification of trap samples to ensure quality data is collected.

Qualified state, county, or cooperating university personnel can screen and perform tentative identification of suspected khapra beetle specimens. The specimens **must** be forwarded with a completed PPQ Form 391 to a PPQ domestic identifier. (Many PPQ port identifiers are skilled at identifying *Trogoderma granarium*, but their workloads normally **do not** allow processing of domestic samples). Suspect *Trogoderma* spp. going to a domestic identifier should be entered into the [Agricultural Risk Management system \(ARM\)](#) by those who have access. The domestic identifiers can also enter these records if necessary for samples going forward for final confirmation.

The domestic identifiers listed below will accept specimens for possible dissection, forwarding to the USDA Systematic Entomology Laboratory for final confirmation, and logging into the ARM database.

Before initiating delimiting surveys and/or control activities in the United States, a specialist recognized by USDA-APHIS-PPQ National Identification Services (NIS) **must** confirm the specimen is khapra beetle. All *Trogoderma* species that are **not** khapra beetle will be recorded as *Trogoderma* sp. (not *T. granarium*). All specimens that NIS morphologically confirm as khapra beetle collected during domestic surveys require molecular confirmation.

For confirmatory identification, follow the steps here: [Request Official Confirmation of Preliminary Pest Identifications of Domestic Samples](#)

Prior to each survey season (fall/winter), confirm by phone or email with the identifier that they have the capacity to process your sample(s). Include the following information:

- ◆ Expected number of samples for the survey season
- ◆ Name and email of person who will be submitting samples

Always notify the identifier that samples are being mailed along with the following information:

- ◆ The number of samples and how many adults and larvae in each
- ◆ The shipment's tracking number

For the Eastern States, both PPQ surveyors and/or state taxonomists may send screened specimens (to Dermestidae) to:

Bobby Brown  
Department of Entomology, Purdue University  
Smith Hall  
901 W. State Street  
West Lafayette, IN 47907-2089  
[robert.c.brown@usda.gov](mailto:robert.c.brown@usda.gov)  
Phone: 765-496-9673

For the Western States, both PPQ and/or state taxonomists may send screened specimens (to Dermestidae) to:

Xanthe Shirley  
USDA, APHIS, PPQ  
2771 F&B Road, Building 2, Room 105  
College Station, TX 77845  
[xanthe.a.shirley@usda.gov](mailto:xanthe.a.shirley@usda.gov)  
Phone: 512-383-2474

For States with no taxonomist and/or screening ability, the domestic identifiers can accept sorted or screened samples with prior arrangement. Contact the National Operations Manager for Khapra Beetle to arrange taxonomic assistance ([feridoon.mehdizadegan@usda.gov](mailto:feridoon.mehdizadegan@usda.gov)).

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## Results Reporting

Negative results from identifiers will be communicated directly back to the submitter. Morphological determinations of “*Trogoderma* sp. (not *granarium*)” are considered negative results. No additional information is required for specimens with final determinations of “*Trogoderma* sp. (not *granarium*)”.

Any suspect positives going to SEL for molecular confirmation will be communicated via the PPQ Domestic Diagnostics Coordinator to the khapra beetle cross functional working group members as well as the State Plant Health Director and State Plant Regulatory Official of the state of origin.

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