THE Bee-Files
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# Integrated Pest Management for Honey Bee Pests and Predators in the Northeast Part I: Managing Wax Moths, Mice, Wasps And Robber Bees

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**Key Words**

**Physical method:** a non-chemical method for managing pests in an IPM program. Two examples are **freezing** and **heating**.

**Mechanical method:** a non-chemical method for managing pests in an IPM program. Examples include **barriers**, **traps** and **fences**.

**Cultural method:** a broad class of methods for managing pests in an IPM program emphasizing management strategies. Examples include the **maintenance of strong colonies**, **pesticide rotation**, and the timing of **pesticide applications**.

**Galvanized:** metal that has been coated with a layer of zinc to inhibit rust.

*Don't let any one kid you! It really is a dog-eat-dog world out there, and, as a beekeeper, it is important that you are aware of the many creatures that would like to eat your bees or damage your equipment. Remember! The honey bee colony, the nest that it builds, and the cavity in which it lives are potentially rich sources of food or shelter for a wide variety of unwanted creatures. If they can't defend it, somebody else is going to take it.*

There are a number of pests and predators that kill bees or damage beekeeping equipment and honey. **Wax moths** destroy combs and cause damage to woodenware. They can also damage section honey and comb honey, rendering it unfit for consumption or sale. Moths cause damage during warm weather and throughout the year in heated buildings. **Mice** make nests in bee hives during the fall and winter, usually destroying several of your best combs in the process. **Wasps** of various sorts eat bees and rob honey, usually in the fall in the northeast. **Bees** themselves can be serious pests when they engage in robbing. Robbers can spread mites and diseases and can kill many bees, often destroying the colony being robbed. Robbing can also lead to serious, even fatal, stinging incidents if the robber bees attack neighbors and neighbors' pets. Bees are inclined to rob anytime there is a dearth of nectar in the field.

## PHYSICAL, MECHANICAL AND CULTURAL CONTROL METHODS

*In this month's article I want to discuss methods you can use to protect your bees and your crop from damage by wasps, wax moths, mice and robber bees. I selected this particular mix of creatures because there are several control*

*measures common to their management. Bears and skunks are also serious predators of honey bees in the northeast, and I will take them up in another article.*

Integrated pest management relies on many methods to keep pest population densities below their economic injury levels. There are many non-chemical methods used in IPM programs and these should always make up your first line of defense against pests and predators. Only when these methods prove insufficient should you turn to an appropriate chemical treatment. Let's take a look at some of the non-chemical methods you should be using as part of your routine management program.

**The strong colony – a cultural method**

The key to protecting your bees from wasps, wax moths, mice and robber bees begins with a strong colony that can defend itself. The strong colony is an example of a cultural method of pest control. I can't tell you how to maintain strong colonies in a single article. You have to follow a rigorous, well-defined management program throughout the season. I can tell you that you should examine weak colonies for disease, mites and failing queens. If you find AFB, burn it. If you find mites, treat it. If you find a failing queen, re-queen it. Combine weak but otherwise healthy colonies with strong colonies. Weak colonies are not worth the effort you invest nursing them along. They rarely produce a good crop and usually fail to winter.

**Pest-tight and predator-tight equipment – a mechanical method**

The second line of defense is a secure hive. In many ways, a bee colony is like a medieval walled city. There were good reasons for building cities with that design – the walls protected the city, including its goods and people, by serving as a barrier defense against would be 'pests and predators'. Your bees are in a similar situation. Since they are naturally cavity-dwellers, it is up to you to ensure that the artificial cavity you provide for them is as good a shelter as any natural cavity they would use. This means a secure, defensible hive. A secure hive has well-fitting parts. When you stack your hive up in the field, the only place the bees should be getting in and out is through the entrance YOU provide for them. *Remember!* Every crack or hole in your hive bodies presents an invitation to unwanted guests. Secure equipment also has advantages when it comes to comb storage because it prevents access by wax moths, wasps, mice and robber bees.

One way to stop robbing, if a weak colony is going to be open for a time, is a portable cage. Keeps bees out, protects the weaker colony, and makes working a lot easier.

The trouble with woodenware often starts before you ever purchase your new equipment. Poor craftsmanship in the manufacturing process often results in poorly fitting equipment with gaps between hive bodies. Depending on the quality of the workmanship, these gaps may encourage snooping and robbing and will stimulate your bees to gnaw on the wood, which will further increase the size of the opening. Gaps also provide an easy entrance for wax moths, whether the equipment is on the hive or in storage. So, before you purchase a large quantity of new equipment, try a few pieces from each of several suppliers. Inspect it carefully for defects, assemble it, then, inspect it again. Hive bodies should stack squarely on top of each other, with no gaps. Box joints should fit snuggly. Joints that are too tight may cause splitting, those that are too loose will promote rot and result in a shell with inadequate strength. Pre-drilled holes in the box joints will prevent splitting when assembling. The wood should have been cut with a sharp saw, indicated by smooth surfaces, and have a tight grain. This will reduce moisture damage. Ideally, there will not be any knotholes, although a few small, tight knots are all right. Fix these in place with waterproof wood glue prior to painting. Once you decide on a supplier, talk with him or her about your expectations and get a money-back guarantee that the equipment will meet your standards.

When assembling equipment, be sure to use galvanized nails where possible. Galvanized 7d (13.5 gauge) nails should be used for assembling hive bodies and bottom boards. Box nails are adequate for most beekeeping equipment and cause less splitting than the thicker, common nails. Use common nails where you may encounter high shear forces such as on pallets. When nailing without the benefit of pre-drilled holes, such as through bottom board side rails, be sure to blunt the tips of your nails with your hammer before driving them into the wood. This will greatly reduce splitting. If you are making your own equipment, use kiln-dried lumber. Pine and poplar work well, but poplar is especially susceptible to moisture. DO NOT make hive parts out of pressure-treated lumber - although PT lumber is fine for hive stands.

The biggest problem you will have with woodenware is simply wear and tear. Constant prying with a hive tool, exposure to the elements, and some gnawing by the bees all contribute to equipment degradation. You can get a jump on the problem by treating your woodenware with an approved wood preservative. Remember! Most wood preservatives are pesticides and must be used according to label instructions. One preservative, PERM-E8TM 8%, is

a soluble concentrate that is thinned with mineral spirits or some other approved solvent prior to use. It contains copper naphthenate and can be used to preserve lumber and boxes. Do not use PERM-E8TM 8% to treat frames. Do not use creosote, pentachlorophenol, tributyl tin oxide, or chromated copper arsenate (Sanford and Hoopingarner 1992) as these will adversely affect your bees.

A coat of high quality exterior-grade primer followed by two coats of exterior-grade finish paint applied to the outside surfaces of your equipment and the narrow top and bottom rails will keep hive bodies and bottom boards in good shape. Pay special attention to the joints, as this is the most common place for rot to get started. Never paint the inside surfaces of your equipment. I use latex paint for the hive bodies and oil-based paint for the bottoms. The latex paint prevents the build-up of moisture in the hive. The oil-based paint protects the bottom board from moisture damage. A mix of colors may help reduce drifting and spice up your apiary.

I have dipped bottom boards in a mixture of beeswax and pine resin. This mix provides good protection against moisture, will not peel, and certainly qualifies as a natural product. Be sure to only use beeswax from a disease free source. Paraffin can be substituted for beeswax. Whenever working with hot wax and resin, remember that you are working with a serious FIRE HAZARD and a SERIOUS HEALTH HAZARD. A hot wax/resin mixture will be around 240 oF, well above the boiling point of water. It is highly flammable and can cause severe burns. You will see water boil out of your woodenware when you dip it in the hot mixture. Remove the wood from the mix when the foaming dies down. This is definitely an outside job for an experienced beekeeper with the proper handling equipment and personal safety gear, including eye protection. NEVER heat wax or resin anywhere where it will pose a fire hazard. Always wear adequate safety gear.

Probably the best thing you can do to protect your woodenware is to keep your hives high and dry. Hives should be kept on stands 6 – 8” off the ground and tilted about 3-5 degrees forward to prevent water from accumulating inside. Don’t tilt them too far forward, because they may fall over as they get taller. Elevating your hives will also help keep out mice.

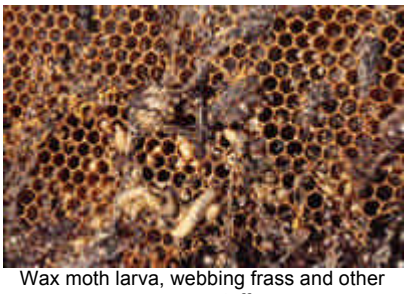
Check used equipment very carefully before buying. The price you pay should be directly related to the quality of the equipment. Tap the wood lightly in several places with a small hammer to determine its integrity. Solid wood has a distinctive sound. Practice by tapping on some new hive bodies to get a feel for the sound of good wood. Examine corners and frame rest ends very carefully for splitting. Beware of old, punky equipment held together with many generous coats of fresh paint.

Winter is the perfect time to clean up your equipment for next season. Accumulations of burr comb and propolis make it difficult to work your bees. You end up prying a lot with your hive tool, and this results in broken frames and damaged hive bodies. You can keep your equipment in manageable condition by scraping it each winter. I do this on a special table with a heavy metal grate for a top. I remove the combs from a shell, scrape ALL surfaces of the shell with a sharp hive tool. Next, I scrape all wooden surfaces of each frame, which are then returned to the shell. The propolis and wax scrapings fall through the grate into a drawer, which I periodically empty. This is also a good time to cull poor combs. Next season, I have supers of high quality combs that are easy to work when they go back on the colonies.

**The entrance reducer:**
Think of the entrance reducer as the door securing the castle gateway. If you leave the door open and unguarded, somebody is going to wander in and help themselves to the goods inside. The easiest way to help your bees defend their nest from mice, wasps and robber bees is to use a dual-purpose, one-piece mouse-guard/entrance-reducer. This reduces both the equipment you need to build or purchase and the labor required to prepare your bees for winter. The entrance reducer, like no other piece of equipment, makes it very clear why standardizing your bee equipment is best. If you use bottom boards with different inside widths and different heights, you will find it impossible to use a single size of entrance reducer, and that will cause you lots of headaches in the fall.

You can use the standard entrance reducer that fits in between the bottom board and the bottom hive body. Alternatives include a piece of ¾” lumber or 1/8” sheet metal, 3”- 4” tall, with a length equal to the inside width of the bottom hoard. This reducer can be easily fixed to the front of hive with a couple of nails. It is a little easier to put in place than the standard reducer, but it does require more material, and the nails will expose your hive bodies to moisture. The metal reducer has the advantage of being resistant to gnawing by mice. So, if you rely on a wooden reducer, I would suggest making them out of hardwood. Regardless of which reducer you use, it should have two entrances. With the standard reducer, the entrances should be cut on adjacent sides. On the front fitting reducer, entrances should be cut on opposite sides. Cut one entrance 5/16” deep by 2” wide. Cut the other one 5/16” deep and 6” wide. Always position the standard reducer so that the flat side faces out. *Remember!* Bottom entrances can become blocked with dead bees and ice during the winter, so be sure and provide the bees with an upper entrance during that time.

**ADDITIONAL CONTROL METHODS**


Wax moth larva, webbing frass and other messy stuff.

**Wax moths:**
The greater wax moth, *Galleria mellonella L.*, is a member of the *Lepidoptera*, an order of insects that includes numerous agricultural pests. The wax moth is primarily a pest of stored combs, although you will often see it in the field in weakened or dead colonies. It can also be a pest in your 'hot room' if you store your combs for too long before extracting. It also damages comb and section honey, rendering it unsuitable for sale or consumption. It is not a major pest of foundation.

The larval stage of the moth feeds on combs, cast larval skins, honey and pollen. You can often see evidence of wax moth larvae tunneling through a comb in a hive. A straight wisp of silk just under the comb surface is a giveaway. If you dig around this area you will usually uncover a wriggling larvae. Always assume that your equipment in the field is infested with wax moth eggs.

The threat from wax moths is greatest in warmer climates, but it poses a threat to stored combs in all parts of the US at some time during the year. Strong colonies prevent the larvae from inflicting too much damage. Larvae that succeed in reaching maturity spin a cocoon, often in an area that they hollow out of the wood of a frame or hive body. Large infestations can cause extensive damage to your woodenware. In addition to maintaining a strong colony, there are several other methods you can sue to control wax moths, including freezing, heating and chemical treatments.

**Freezing:**
If you live in a temperate area, store your combs in an unheated room to take advantage of the natural control provided by the outside environment. If you can, install a screened opening to the outside, as this will increase ventilation. Eggs are killed by freezing at 20 oF for 4.5 hours, or at 10 oF for 3 hours, or at 5 oF for 2 hours (reviewed in Shimanuki et al. 1997). So, combs stored over the winter this way will be moth free in the early spring.

Comb and section honey must be treated by freezing within 3-4 days after removing it from a colony. Placing section honey and comb honey in a household freezer at 5 oF for 24 hours is a good method for controlling all stages of the wax moth. Of course, section and comb honey must be protected from re-infestation after treatment. If you have room, comb honey and section honey can be kept in the freezer until needed. Freezing not only kills the wax moth, it retards crystallization. Be sure to store comb honey and section honey in the freezer in tightly-sealed plastic bags. Let it come to room temperature before opening the bags after removing them from the freezer. That will prevent condensation form building up on the comb surface.

**Heating:**
You can also control wax moths by heating your equipment to 115 oF for 80 minutes or 120 oF for 40 minutes (Shimanuki and Knox 1997). Start your timer when the equipment has attained the desired temperature. **NEVER** heat combs above 120 oF, as they will sag and become misshapen.

**Para-dichlorobenzene (PDB):**
PARA-MOTH ™ is 100% paradichlorobenzene (PDB). PDB crystals provide good control of wax moths in stored combs; but you may need to treat several times, as PDB does not kill the egg stage. Place 3 ounces (about 6 tablespoons) of crystals on a shop towel placed on top of a stack of 5 deep supers of combs and cover. Be sure the equipment is moth-tight. After the first treatment has vaporized, usually 2-3 weeks, depending on temperature, apply a second treatment. After that, check your combs periodically and treat on an 'as-need' basis. If your equipment is not moth-tight, you will need to treat throughout the warm season. Your comb storage room should be unheated and have adequate and secure ventilation [moth tight screens]. This will help keep the temperature down in the winter and reduces PDB levels in the room during the summer.

Air out treated combs for at least 24 hours prior to placing them back on a colony. **Never** apply PDB to comb honey, section honey, unextracted honey or any other hive product destined for food use. **Always** read the label for latest instructions. Follow all instructions, including the Precautionary Statements and subheadings:

- Environmental Hazards
- Physical or Chemical Hazards and the Statement of Practical Treatment
- PDB vapors are heavier than air
- PDB and PDB vapors are a fire hazard
- **Keep all pesticides under lock and key!**

**Robber bees and wasps:**
I talked about management techniques you can use to prevent robbing in November's IPM article. Let me re-emphasize two points here. First, adjust the size of your entrance to the size of the colony. Small colonies need small entrances and large colonies need large entrances during the growing season. All colonies should have reduced entrances in the early spring, fall and winter. You may also want to partially reduce entrances during a dearth, especially if you have to work the colony. Second, use the equipment tips mentioned above to maintain your equipment in bee tight shape. This will make it much easier for your colony to defend itself from robber bees and wasps. Next month, I will give you some tips on repairing damaged hive bodies.

This article has focused on some of the major pests and predators of honey bees found in the northeast. Beekeepers in other parts of the country will find that the extent of damage from these creatures will vary with local conditions. For example, wax moths are a threat throughout most of the year in southern states. Other areas will also have somewhat different mixes of pests and predators. Ants and termites, for example, can be serious pests of honey bees (Fell 1997), especially in the south. Contact your local apiculture extension specialist for information specific to your region. There are also several excellent books that discuss pests and predators.

**REFERENCES AND RECOMMENDED BOOKS**


Ambrose, J. T. Birds. 1997. In Honey Bee Pests, Predators and Diseases. 3rd edition (R.A. Morse and K. Flottum eds.). The A. I. Root Company, Medina, OH

Fell, R. D. Insects: Hymenoptera (Ants, Wasps, and Bees). 1997. In Honey Bee Pests, Predators and Diseases. 3rd edition (R.A. Morse and K. Flottum eds.). The A. I. Root Company, Medina, OH

Hood, M. W. and D. M. Caron. 1997. Mammals. In Honey Bee Pests, Predators and Diseases. 3rd edition (R.A. Morse and K. Flottum eds.). The A. I. Root Company, Medina, OH

Sanford, M. T. and R. A. Hoopingarner. 1992. Business practices and profitability. In The Hive and The Honey Bee (ed. J.M. Graham). Dadant & Sons, Hamilton, IL.

Shimanuki, H., D. A. Knox, B. Furgala, D. M. Caron and J. L. Williams. 1992. Diseases and pests of honey bees. In The Hive and The Honey Bee (ed. J.M. Graham). Dadant & Sons, Hamilton, IL.

Shimanuki, H. and D. A. Knox. 1997. Summary of control methods. In Honey Bee Pests, Predators and Diseases. 3rd edition (R.A. Morse and K. Flottum eds.). The A. I. Root Company, Medina,



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