

FOUR-WAY SCREENED BOTTOM BOARD FOR SMALL HIVE BEETLE CONTROL IN 8-FRAME AND 10-FRAME HIVES

by
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One of the many strategies to deal with the invasion of small hive beetles is to use specialized screened bottom boards that can trap and kill the beetles. This method capitalizes on the natural behavior of bees which is

to drive beetles from the hive by pushing them off the frames and out of the hive. When the beetles fall through the screened bottom boards they are killed by landing in a tray containing water and or oil.

To maximize this process, I have developed a screened bottom board that is simple to assemble and use. This bottom board is very sturdy since the base is made from 2"x6" lumber and has a sturdy aluminum tray. It can be used year-round. Importantly, the hive does not need to be dismantled or disturbed to check and maintain this bottom board.



225 square inches

Size: 22 3/4" x 16 1/4"



Beetle Biology and Implications for Control with Screened Bottom Boards

The average length of adult female small hive beetles is 5.7 mm and the length of males averages 5.5 mm -- both are nearly identical in width of 3.2 mm (Ellis, J. D. and A. Ellis. online at http://entnemdept.ufl.edu/creatures/misc/bees/small_hive_beetle.htm).

Therefore, the screen of a bottom board for small hive beetle control needs to have openings that will allow an adult beetle to fall through but restrict the passage of honey bees. Commercially available screen mesh comes in many different materials, opening sizes, wire gauge, and prices. Galvanized screens with the following specifications are potentially options for a beetle trap based on availability and price.

#6-020 screen mesh has an average opening of 3.7 mm

#7-018 screen mesh has an average opening of 3.2 mm

#8-023 screen mesh has an average opening of 2.5 mm

In summary

#6-020 full passage of small hive beetles, partial passage of bees

#7-018 high passage of small hive beetles, no passage of bees

#8-023 partial passage of small hive beetles, no passage of bees

Based on the sizes of the average beetle and bee, the #7 screen mesh should be optimum for a bottom board trap. I am now using the #7-018 sold by Funny Bug Bees and Woodworks in Kingston, North Carolina.

Innovative Features:

This Beetle Bottom Board fits 8-frame and 10-frame hives without modification.

An important new feature of this 1 bottom board is that the opening can be operated in four different ways to address different management needs based upon the situation. For example:

- 1) To provide full ventilation: Screen completely open with no tray installed.
- 2) To capture beetles: Tray can be installed with rim up for holding liquid.
- 3) To restrict air flow based upon the season or other needs such as to maintain heat for the brood or cluster: Tray can be installed with rim down
- 4) To provide partial ventilation in the back of the hive: Tray can be pulled forward.

The aluminum tray can be removed during winter and completely or partially replaced with solid wood pieces or a sheet of $\frac{3}{4}$ -1" styrofoam. The screen keeps the hive secure from the bottom.

The screened portion of the bottom board covers about 85% of the area below a hive box. Importantly, the plastic beetle diverter strips block the remaining horizontal space between the inside of the hive body box and the outside frames. The function of diverter strips is to guide the beetles moving along the 3/4" rim inside the bottom board onto the screen.

Once it has been installed, this bottom board can be inspected and maintained without dismantling the hive. The screened drawer panel and the aluminum tray are accessed from the **front** of the hive. The tray fits flush with the drawer panel so there is no danger of bees drowning if they go below the landing board.

The rigid aluminum tray is easy to clean and should never need to be replaced.

Parts: This screened bottom board consists of very few parts and has been constructed for ease of assembly. The parts are shown in the figures.



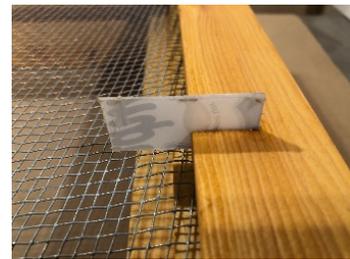
Sides and Back: Constructed from 2x6 lumber that has been milled with a dado grooves and rabbets. The upper groove is cut below the top to provide a permanent 3/8" hive opening. The upper dado groove is cut deep and wide enough to accept the drawer panel. The second dado groove holds a cleat used to support the length of the aluminum tray. The rabbets on the ends of the back piece will fully hide the grooves from the outside.

Cleats: Two pieces of lumber fit in the dado groove to support the tray.

Tray: A standard 13x18" commercial grade 18-gauge aluminum baking sheet with wire reinforced beaded rim that prevents warping. No modification is required. The tray can be completely removed from the bottom board. The tray will hold approximately 2 quarts of liquid.



Beetle Deflectors: Plastic strips that wedge into cuts made on top of the sides and back of the bottom board. The deflectors guide the beetles from the rim inside the hive so that they will fall onto the screen and into the tray. These parts can be made of any scrap plastic that fit in the pre-cut slots.



Fasteners: The sides and back of the bottom board are joined with four deck screws using the pilot holes in the back board. The cleats are mounted using four screws using the pilot holes in the sides. The drawer panel can be locked in place with two screws using pilot holes. All parts can be permanently joined using Tightbond 2 or 3 wood glue prior to inserting the screws.

Assembly:

Tools: Electric drill for driving screws, #20 and #15 torsk driver bits, air tool for stapling ¼" crown staples (2" and 1" in length), staple gun with ½" staples, and an angle grinder with thin cutoff blade.

Base Assembly: Apply wood glue to the rabbet cut on the 2" x 6" back. Align the top edges of a side and the back. Drill a pilot hole through the back pilot hole into the end of the side. Install two screws. Repeat on the second corner. Apply wood glue to the second groove on both sides. Insert the cleats and install screws through the pilot holes. Use a carpenter's square to check the base for square alignment. **The distance across the front of the base should be 16 ¼"**. If necessary, clamp the base until the glue has dried.

Finishing: Once the main parts of the bottom board are assembled, some type of finish should be applied. I suggest a latex primer (Kilz) and good quality latex topcoat paint so that volatile organic compounds are not introduced into the hive. Excessively thick layers of latex paint may make removal of the drawer panel difficult so apply thin coats and let dry thoroughly before assembly of the base and drawer panel.

Installation of Beetle Diverters: Wedge the strips in the slots on the top edge of the base. Do not permanently attach them to the base so that they can be replaced if necessary.

Installation on Hive:

Select a fairly level location for the hive stand. Place the screened bottom board on the hive stand and shim (1/2" metal washers or other suitable shims) until the bottom

board is perfectly level side to side and front to back. Align the first hive box to the sides and back of the bottom board. The bottom board will extend about 3 ½” beyond the front of the box creating an entrance and landing area for the bees.

Filling the Aluminum Tray:

Many people recommend the use of used cooking vegetable oil in the tray. It appears that used cooking oil is an attractant for the beetles. I recommend using the used cooking oil the first week to remove most of the beetles. If used oil is not available, I would recommend inexpensive vegetable oil. Then switch to a mineral oil that does not go rancid. The tray has a capacity greater than 2 quarts. Add about 5 cups of water to the tray and then add 2-3 cups of oil.

Powered Sugar Treatment to Move Beetles:

See YouTube video posted by Jerry Freeman

Bottom Board Maintenance:

Check the tray as often as deemed necessary to ensure that liquid is present. If the liquid needs to be replaced dispose of the oil properly.

Trouble shooting:

This bottom board has been designed to reduce the loss of bees due to drowning in the tray below the screen. There appears to be some bees that can actually go through a #6 screen mesh. If necessary, the #6 screen should be replaced with #8 screen which is readily available at Ace Hardware stores.

References on use of beetle bottom boards:

Jerry Freeman Beetle Trap

<https://www.youtube.com/watch?v=qHsOI9C3Jis>

Jerry Freeman Sugar Dusting for Hive Beetles

<https://www.youtube.com/watch?v=Ld7rRC6S2Ss>

University of Florida Honey Bee Lab

<https://www.youtube.com/watch?v=tydo9rABsK4>