

# Macadamia Nut Borer



## Key Points

- Macadamia Nut Borer (MNB) larvae burrow into developing nuts, feeding on the kernel, making it unsalable.
- The MNB risk period is from pea size nut size until nut maturity, typically, November-February.
- MacTriX is an effective biological control agent used to control MNB.

## Introduction

Macadamia nut borer (*Cryptophlebia ombrodelta*) is a pest of the macadamia as well as lychee and longan fruit.

Adult MNB are small, brown moths with a wingspan of around 25mm. Females have a more pronounced spot on the back edge of their wings, than males (Figure 1).



Figure 1. Female (left) with the pronounced spot on their wings and male (right) adult MNB (TortAI).

## Lifecycle

MNB eggs are laid singly on developing nuts. The eggs are flat and resemble scale insects. Initially they are white but turn red just before hatching. During summer the eggs hatch in 4–6 days. The larval stage lasts 3–4 weeks, and moths emerge after a pupal period of 8–10 days. The life cycle, from egg-laying to moth emergence, takes about five weeks (Figure 2).

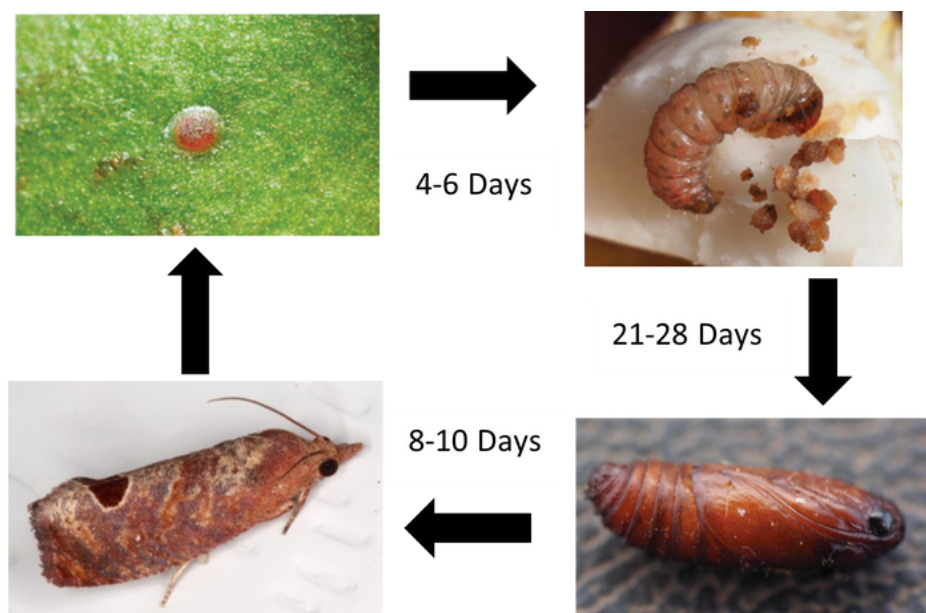
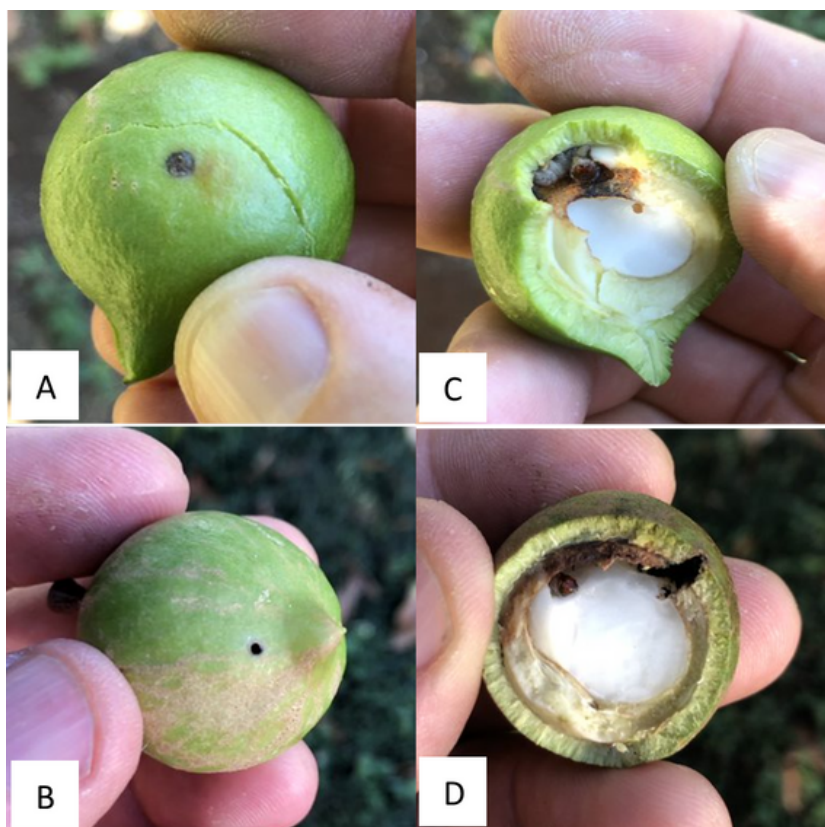


Figure 2. MNB life cycle (Chris Fuller, NSW DPI and Fasio III).

## Damage

Macadamia nuts are susceptible to MNB damage from pea size to harvest. When the MNB eggs hatch the larvae emerge and burrow through the husk creating a small hole or small black mark (Figure 3A-3B). If the shell has not hardened the larvae bore into the kernel to feed (Figure 3C-3D). If the shell has hardened larvae tunnel around the shell, under the husk. This doesn't damage the kernel but causes the nut to drop. This is often before oil accumulation is complete, resulting in immature nuts.



*Figure 3. MNB entry and feeding (Mark Whitten).*

## Monitoring

MNB larvae feed on a wide range of plants and breed in mangroves. Adult moths fly with the wind. As a result, the places in the orchard to monitor MNB pressure will be eastern boundaries, high points and hilltops or boundaries facing prevailing winds or near bushland.

Male pheromone and trap systems are available to monitor MNB adult moth populations through BiologicalAg and RapidAIM.

**Cultural**

Remove or destroy fallen nuts to reduce populations. Integrated Orchard Management practices to ensure light and air within the canopy improve access for biocontrol agents and reduce the orchard suitability for pests.

**Biological**

MacTrix wasps (*Trichogrammatoidea cryptophlebiae*) are the most successful biocontrol agents introduced into macadamias. Commercialisation of MacTrix by Bioresources has led to the widespread adoption of MacTrix, which has moved MNB from a major to a minor pest of macadamias.

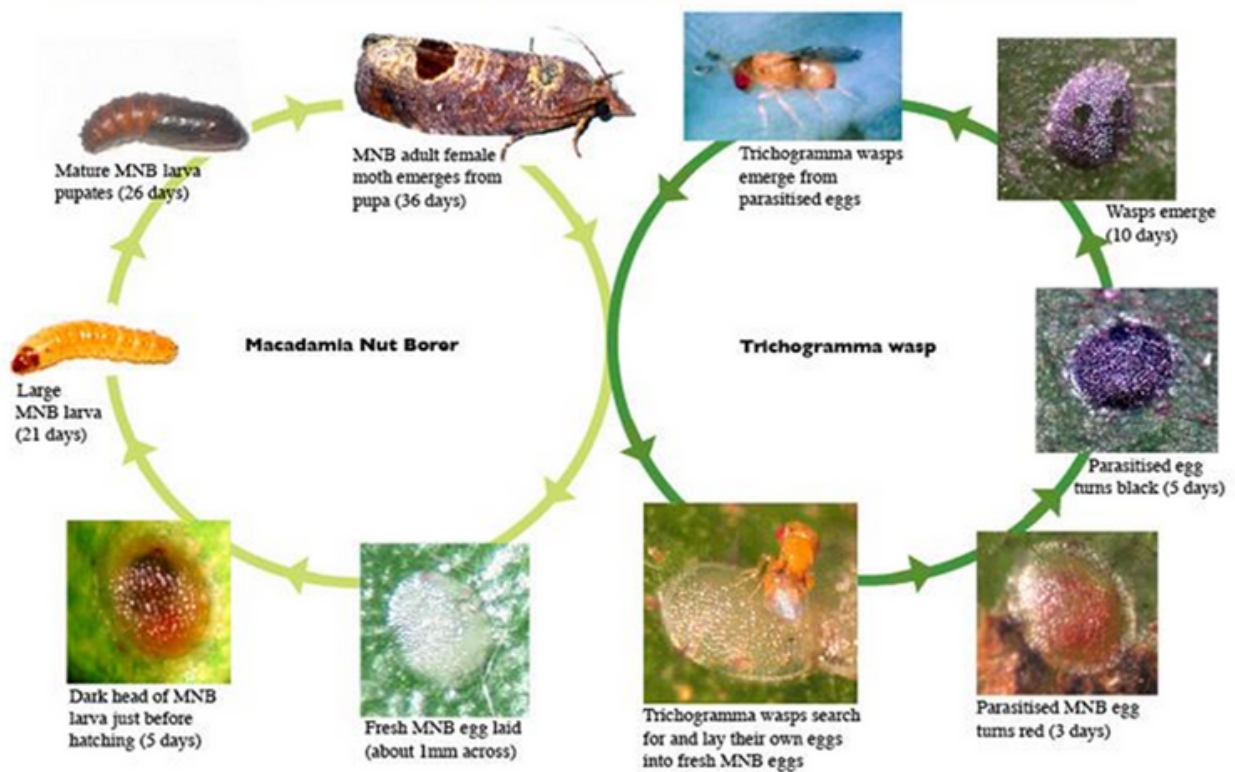


Figure 4: Life cycle of MacTrix wasps (Bioresources).

MacTrix are tiny wasps (<0.5 mm), which lay their eggs into MNB eggs. The wasp develops inside the egg, in the process killing the developing MNB caterpillar (Figure 4). The wasps are supplied as parasitised moth eggs on finely corrugated card. Each card yields 50 - 100+ wasps. Releases of approximately 1,000 wasps per hectare are made for 6-10 consecutive weeks starting from mid-November to mid-December depending on the location and monitoring data.

The wasps will only survive in temperatures between 13-35°C. MacTrix wasps are not strong fliers and cannot fly far upwind. Unless assisted by wind, their movement is restricted to around 50m per week. Effective deployment involves utilising high points, hotspots, prevailing winds and release points within ~50m of each other as seen in Figure 5. This means you can't depend on releases by your neighbours to manage MNB on your property.

MacTrix are easily killed by insecticides and require re-release after use of a broad-spectrum insecticides. It is important to wait approximately seven days after these sprays before releasing MacTrix again. Research in South Africa shows that beta-cyfluthrin (Bulldock) doesn't kill the wasp larvae inside the nut borer eggs that are yet to emerge.

More information about MacTrix can be found on the Bioresources website: <https://bioresources.com.au/>

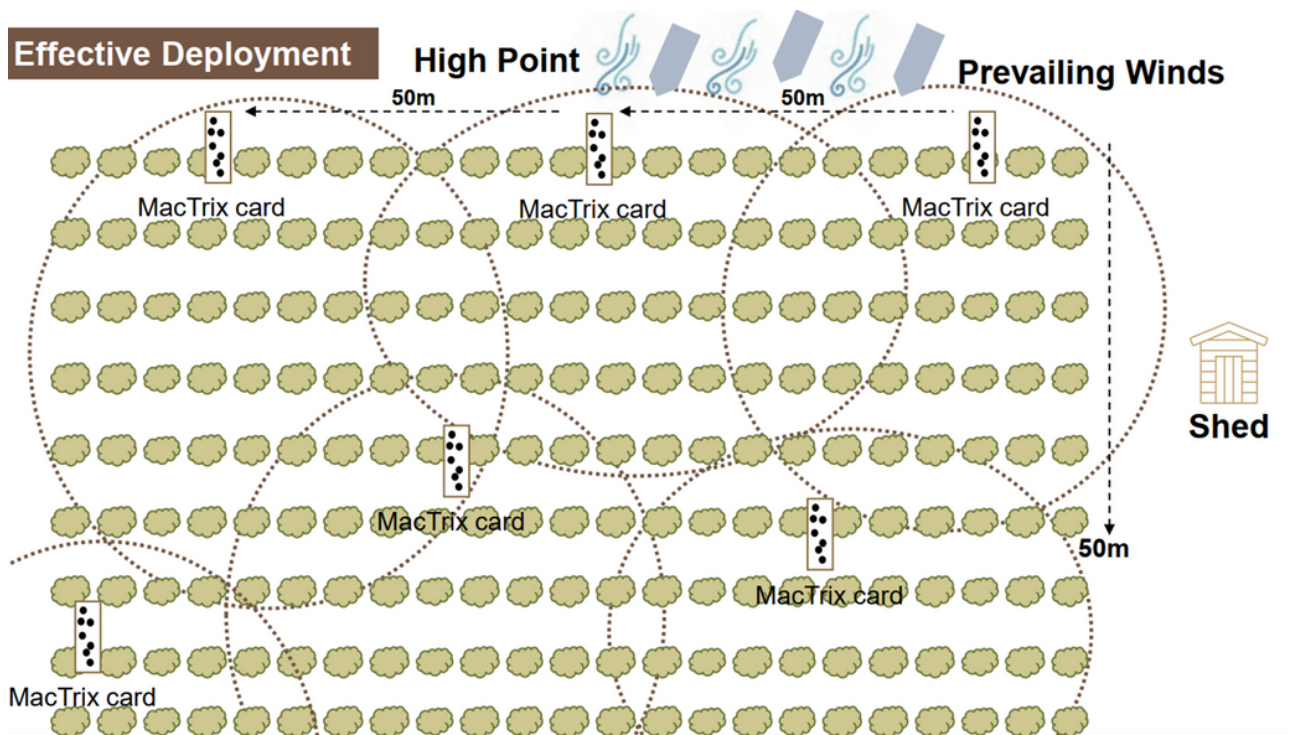


Figure 5: Effective deployment of MacTrix cards (AMS).

## Chemical

Where possible, try to use an insecticide that is less disruptive to beneficial insects. This isn't always possible when targeting MNB, in the November-February period, due to competing pressure from other pests such as Fruit Spotting Bug (FSB) that require more disruptive chemistries.

- IPM compatible, (low/moderately disruptive): methoxyfenozide (Prodigy), tebufenozide (Mimic), spinetoram (Success Neo).
- Broad spectrum, (highly disruptive): acephate (Orthene), carbaryl (Bugmaster), beta-cyfluthrin (Bulldock)

## Further Information

- Bioresources Pty Ltd (<https://bioresources.com.au/>)
- BiologicalAg <https://biologicalag.com.au/product/mac-borer-pheromone/>
- Bright, J. (2020). Primefact 20/778 - Macadamia nut borer
- Griffin, K. (2021). Macadamia Nut Borer: Know thy enemy. Australian Macadamia Society MacGroup presentation.
- RapidAIM <https://rapidaim.io/rapidmoth/>

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