

# Tropilaelaps mite *Tropilaelaps* spp. Delfinado & Baker (Arachnida: Mesostigmata: Laelapidae)<sup>1</sup>

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## Introduction

Honey bees throughout the world are exposed to numerous pests, parasites, and pathogens. One such parasite is *Tropilaelaps* spp. Delfinado & Baker (Acari: Laelapidae). *Tropilaelaps* is an ectoparasitic mite that feeds on the hemolymph of developing honey bees.

Four species of *Tropilaelaps* have been identified and characterized: *Tropilaelaps clareae*, *Tropilaelaps koenigerum*, *Tropilaelaps mercedesae* and *Tropilaelaps thaii*.



Figure 1. Adult female *Tropilaelaps*.

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## Hosts

The giant Asian honey bee, *Apis dorsata*, is *Tropilaelaps*' primary host. However *Tropilaelaps* may also be found in the colonies of other Asian honey bee species including *Apis cerana* and *Apis florea*. The western honey bee, *Apis mellifera* L., is not a natural host for of *Tropilaelaps*. However, western honey bees are parasitized by *Tropilaelaps* in regions where both species are present. Unfortunately the western honey bee lacks the behavioral defenses that Asian honey bee species have evolved to combat severe *Tropilaelaps* infestations.

## Distribution

*Tropilaelaps* is a native pest in tropical and subtropical Asia. However, *Tropilaelaps*' distribution has been expanding over the past 50 years. *Tropilaelaps* can be found in *Apis mellifera* colonies well beyond the mite's native range. Invasive *Tropilaelaps* populations are most successful in warm environments where honey bees produce brood (developing larvae or pupae) throughout the year. For instance, *Tropilaelaps* have been reported in Kenya and Papua New Guinea.

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## Tropilaelaps Distribution



Figure 2. Present distribution of *Tropilaelaps* reported in peer-reviewed scientific literature.

Credits: Chase Kimmel, Daniel Schmehl, and Tomas Bustamante, University of Florida, using Esri ArcGIS 10.2: the world map layer is from Natural Earth and the data was acquired from a review of the scientific literature (Ellis and Munn 2005).

## Description

### Eggs

A physical description of *Tropilaelaps* eggs is not available.

### Nymphs

In general, *Tropilaelaps* nymphs are not pigmented and are smaller than adults. Nymphs have three pairs of legs, and the first pair is longer than the second and third pairs.

### Adults

*Tropilaelaps* adults are elongated with a heavily sclerotized exoskeleton. The bodies of both sexes are covered with numerous, short, spine-like hairs and are generally a reddish brown color (Fig. 1). *Tropilaelaps* females are approximately 0.7-1.0 mm long and 0.5-0.6 mm in width, while males are significantly smaller. Adult mites have four pairs of legs. Morphologically *Tropilaelaps* differ from another parasitic mite, *Varroa* spp. Oudemans, in both size and shape. *Tropilaelaps* are smaller and have narrow/long bodies whereas *Varroa* are larger in size and are wider than they are long (Fig. 3).



Figure 3. *Varroa* on the left, compared with *Tropilaelaps* on the right. Credits: Zachary Huang, [www.beetography.com](http://www.beetography.com)

## Life Cycle

Much of the *Tropilaelaps* life cycle takes place beneath the wax capping of a honey bee brood cell. Therefore, several aspects of their reproduction are unknown. A mated female *Tropilaelaps* that is ready to produce offspring (foundress mite) enters a honey bee brood cell just before it is capped, while the honey bee is still a larva. Each foundress lays approximately three to four eggs within the cell after the cell is capped. Twelve hours later, *Tropilaelaps* nymphs hatch and feed on the developing honey bee larva/pupa. *Tropilaelaps* infect both worker and drone brood, and develop from egg to adult within a week. Adult mites emerge from the brood cell when the adult honey bee emerges. At this point, the females search for additional honey bee larvae to infect.

It generally is believed that adult *Tropilaelaps* mate in the capped honey bee brood cell before emerging (similar to *Varroa*). However, some believe that adult mites may mate once they have emerged from the honey bee brood cell.

*Tropilaelaps* have small mouth parts that are unable to pierce the integument (skin) of adult honey bees. Therefore, both nymph and adult *Tropilaelaps* must feed on the hemolymph of the honey bee brood. After emerging from the honey bee brood cell, adult *Tropilaelaps* must reenter another brood cell to feed on a developing bee or the mite will die within two days. *Tropilaelaps* have a short reproductive cycle and possess the potential for rapid population growth. Furthermore, their rapid reproduction enables *Tropilaelaps* to outcompete *Varroa* in honey bee colonies infected by both mites.

*Tropilaelaps* are transported inside and outside of the honey bee colony by the adult honey bees. Phoretic mites (mites attached to an adult honey bee) can be transported throughout the colony's brood combs or into another colony when adult bees drift into another colony, rob resources from other colonies, or swarm. Beekeeping management techniques, such as movement of infested combs and/or bees between colonies, can spread *Tropilaelaps*.

## Detection

*Tropilaelaps* infestation is evident from visible colony symptoms such as irregular brood patterns, perforated brood cell cappings, and newly emerged bees with misshaped abdomens, irregular wings and distorted or missing legs. In severe cases, *Tropilaelaps* infestations may cause the colony to abscond (the honey bee colony abandons the brood and hive) or even die.

Several methods exist for detecting *Tropilaelaps* infestation. One rapid, easy, and effective technique is the “bump” method. To collect mites using the bump method you: 1) remove a frame of capped brood from the colony, 2) shake adult bees off the surface of the comb, 3) firmly bump (hit) one side of the frame over a white surface, 4) turn the frame over and bump again, 5) repeat steps 3 and 4 so that you conduct a total of four bumps (2 bumps each side), 6) then quantify the *Tropilaelaps* present on the white surface. It is important to remember that *Tropilaelaps* are small and fast moving. It is recommended that a pan be used as the white surface, this will help contain the dislodged mites.

## Economic Importance

Due to a high reproductive rate and quick development time, populations of *Tropilaelaps* can grow rapidly. This rapid build-up makes this parasite difficult to manage. *Tropilaelaps* can cause significant mortality of the honey bee brood. In severe cases, up to 50 percent of a honey bee colony’s brood may be killed by *Tropilaelaps*, and colonies may have so much dead brood that the smell of decaying remains is apparent. Brood patterns may be irregular and may contain areas of neglected brood along with cell cappings that have been perforated. *Tropilaelaps* parasitism during the larval and pupal stages often results in reduced lifespans of adult bees. In addition to shorter lifespans, these parasitized honey bees may have lower body weights as well as shrunken or deformed wings and legs.

*Tropilaelaps* is considered a potential threat to the honey bee industry throughout the world because this mite has the potential to thrive in any tropical/subtropical region that hosts honey bees. In countries like the United States and Australia, *Tropilaelaps* could cause colony losses and reduce the viability of the commercial beekeeping industry.

## Management

Widely recommended beekeeping management strategies for *Tropilaelaps* include: regular re-queening with hygienic queenlines and use of modified bottom boards. Cultural control methods involving caging queens have been successful in treating *Tropilaelaps* infestations. A colony’s *Tropilaelaps* population can be reduced greatly if a colony is made broodless for a sufficient period of time by caging the queen for nine days and removing the mature capped brood. It is likely that many of the miticides used against *Varroa* in the U.S. are efficacious against *Tropilaelaps*.

Strict monitoring programs have been established throughout the world to prevent further spread of *Tropilaelaps*

beyond its native range. Any transportation of honey bees from an area infested with *Tropilaelaps* to a region that does not have *Tropilaelaps* should be done using packages (adult bees only- no comb) rather than established colonies (Fig. 4). These packages should be stored away from any honey bee colonies for a minimum of two days. Following a two day hold, any *Tropilaelaps* that may have been transported within the package will be dead because there is no brood in a package to support mite feeding.



Figure 4. A package of honey bees. Note that no wax comb or brood is present within a package of bees. Only adult honey bees and 1 queen are contained within a package. Any phoretic *Tropilaelaps* will die within two days. This is the recommended practice for transporting honey bees from an area infested with *Tropilaelaps* to a region that does not have *Tropilaelaps*.

Credits: Brandi Simmons, University of Florida

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