



The *Tropilaelaps* Mite: A Fate Far Worse Than Varroa

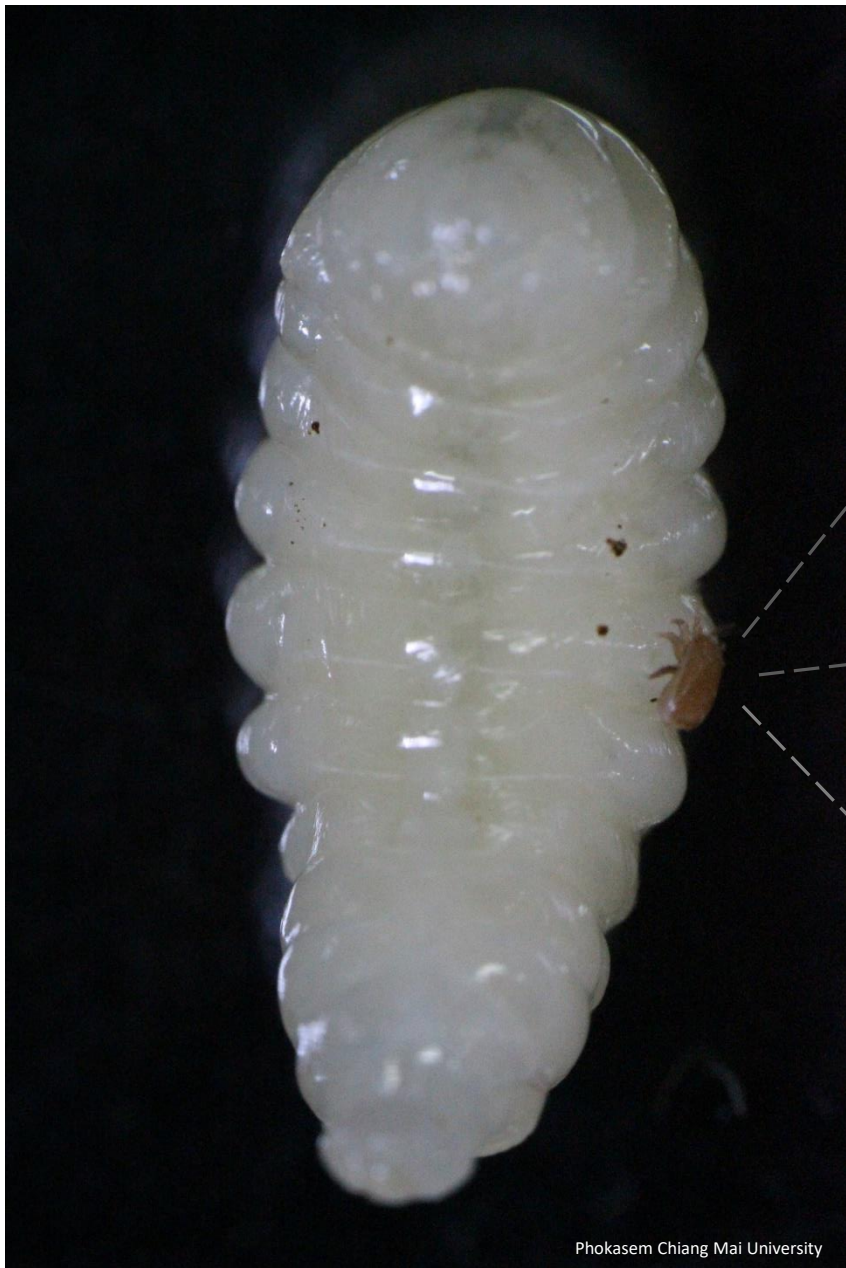
Samuel Ramsey, Khitiphong Khongphinitbunjong, Ronald Ochoa, Gary Bauchan, Panuwan Chantawannakul



Ramsey, Chiang Mai
University

Tropilaelaps mercedesae

The *Tropilaelaps* Mite

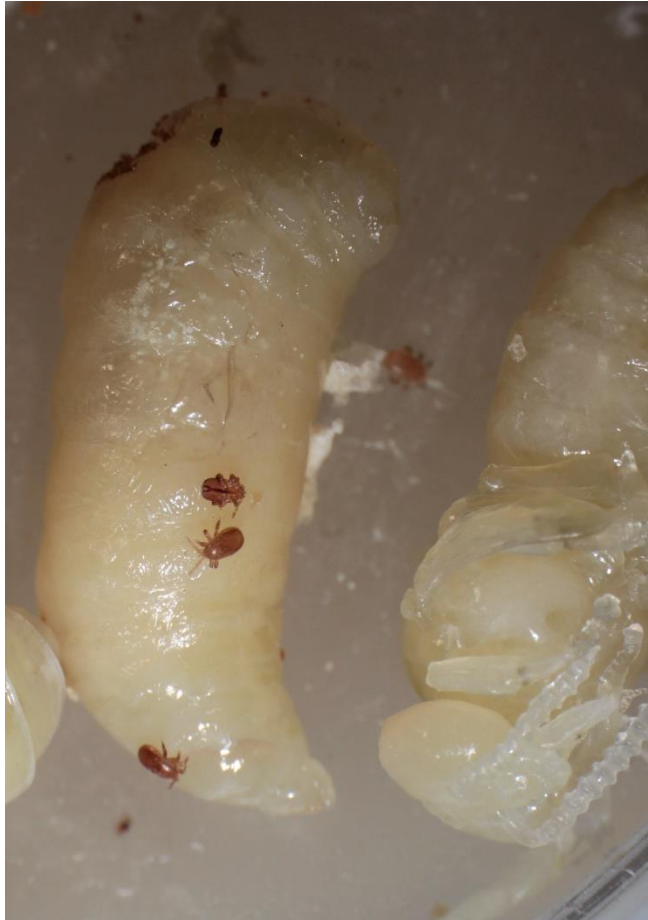


Phokasem Chiang Mai University



Ramsey, Chiang Mai University

What Are Tropilaelaps Mites?

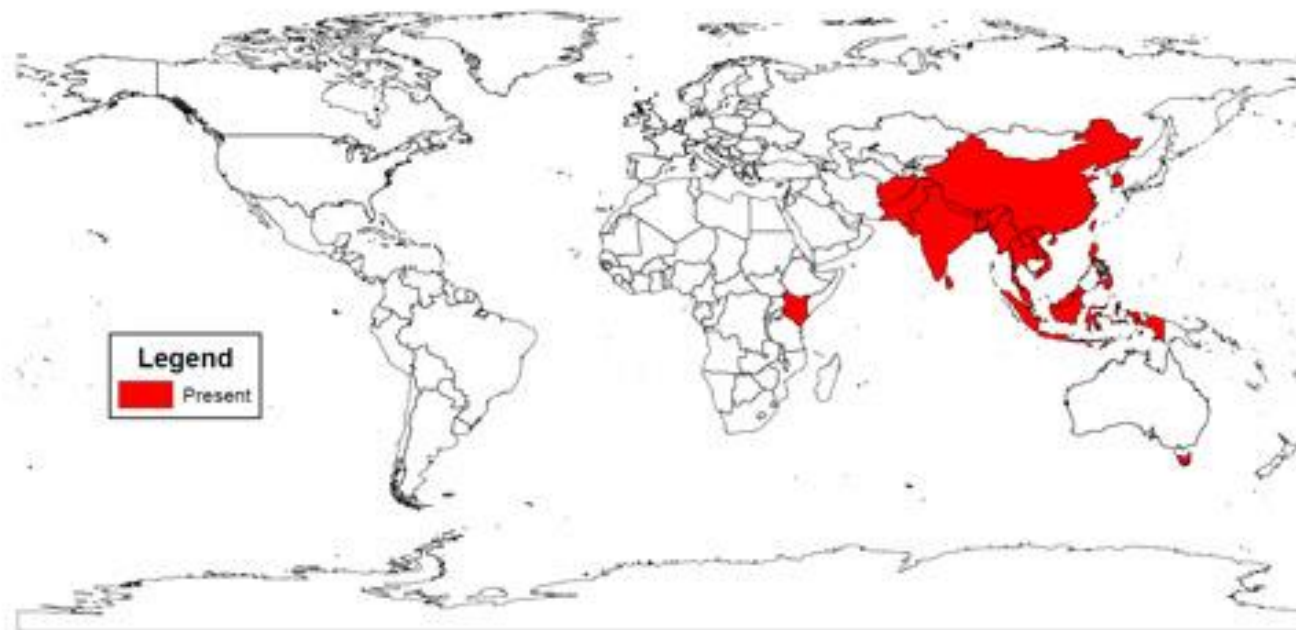


**Another Ectoparasitic
Honey Bee Mite**

**Originally Parasite of the
Giant Honey Bee**

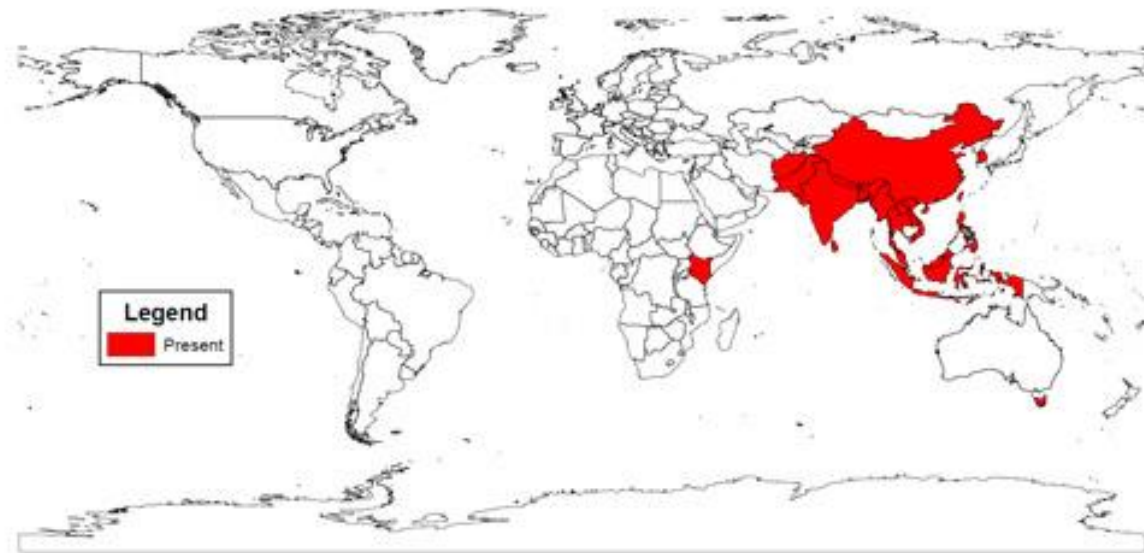
Develop in Brood Cells

Tropilaelaps Distribution



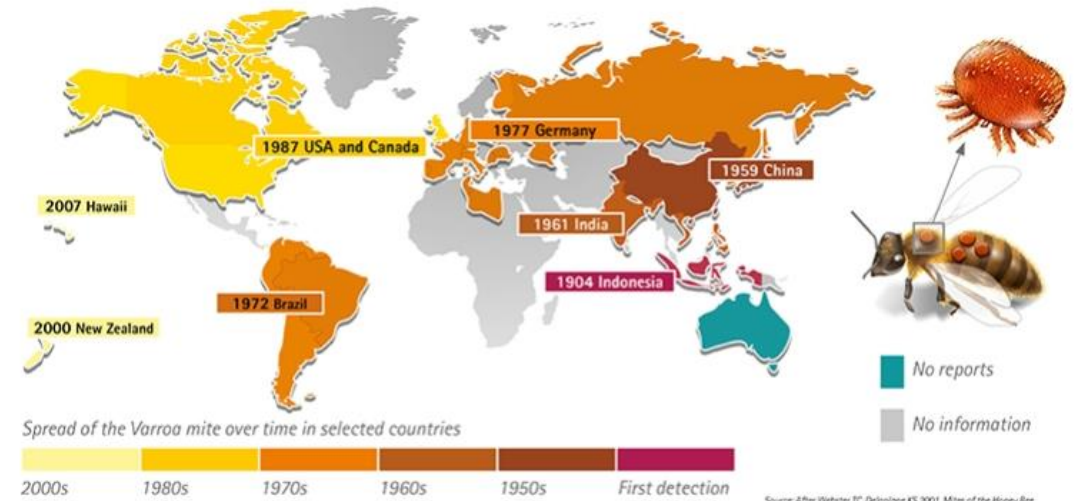
Made with Esri ArcGIS 10.2 and Natural Earth

Tropilaelaps Distribution



Made with Esri ArcGIS 10.2 and Natural Earth

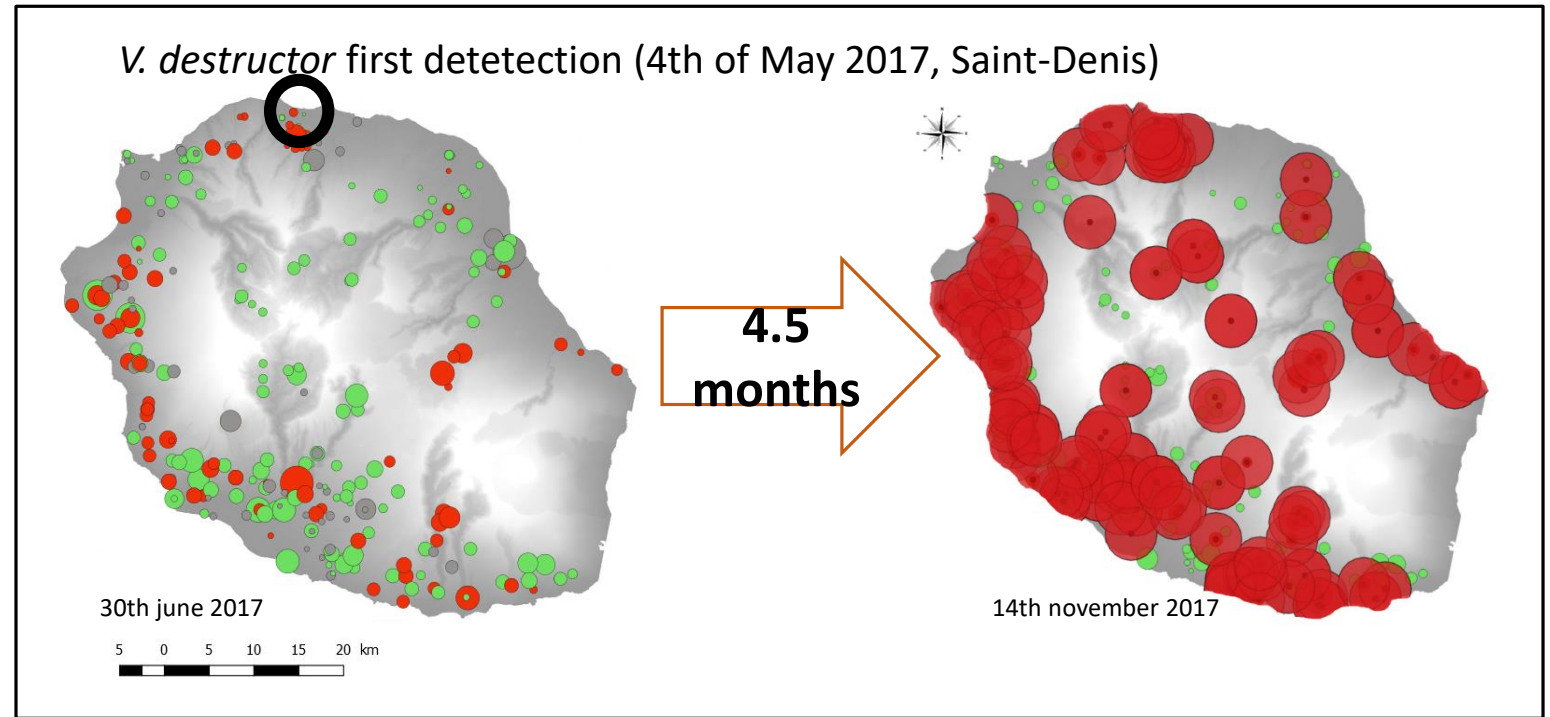
Varroa Distribution



Source: *research* – the Bayer Scientific Magazine

A Case Study in Parasite Spread

It Only
Takes One!



V. destructor invasion on La
Réunion Island

Olivier Esnault, 2018

Why Study Tropilaelaps ????

- We already have a mite
- They're not here yet
- They're all in Southeast Asia
- They're difficult to study if you don't speak an Asian language







An Emerging Threat

- ◆ WHAT WE KNOW
- ◆ WHAT WE DON'T KNOW
- ◆ WHAT WE'RE DOING ABOUT IT

What Do We Know?

Tropilaelaps clareae

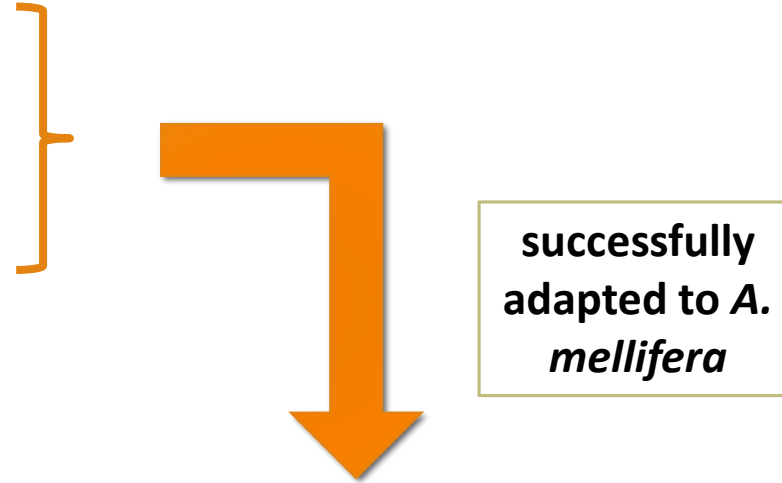
Tropilaelaps mercedesae

Tropilaelaps koenigerum

Tropilaelaps thaii

*Based on genetics and
morphological differences

(Anderson and Trueman 2007)



Originally Parasites of Giant Honey Bees



Giant Honey Bees of Asia

(Burgett et al. 1990, Buawangpong et al. 2013)



Tropilaelaps clareae
Tropilaelaps mercedesae

European honey bee
(*Apis mellifera*)



What do we Know?

- Same generalized life cycle
- Mites are found on brood and adult bees at different portions of the life cycle

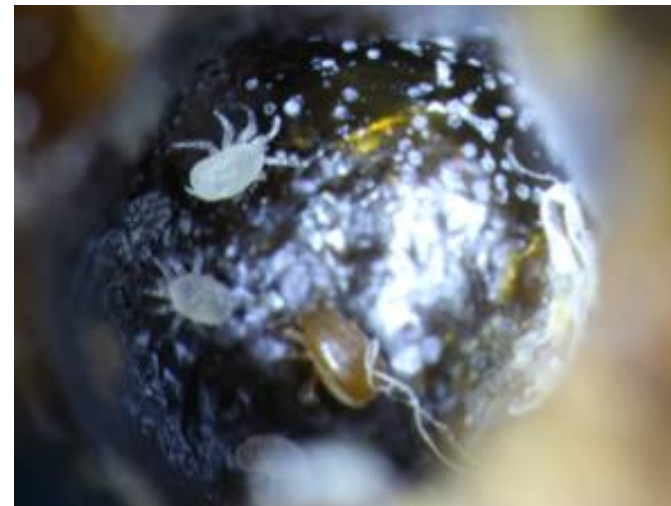
Phoretic phase?



Cell Invasion



Basic Life Cycle



Reproduction

What do we Know?

- They're smaller

Varroa destructor

Tropilaelaps spp.



What do we Know?

- They're smaller
- They're faster



What do we Know?

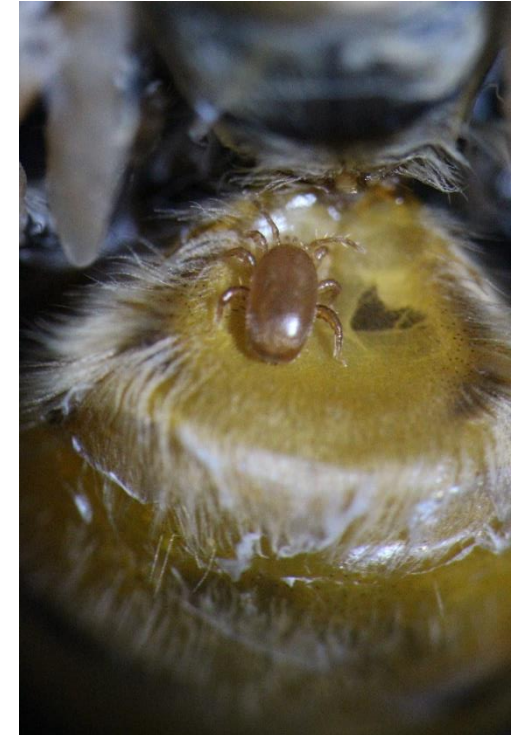
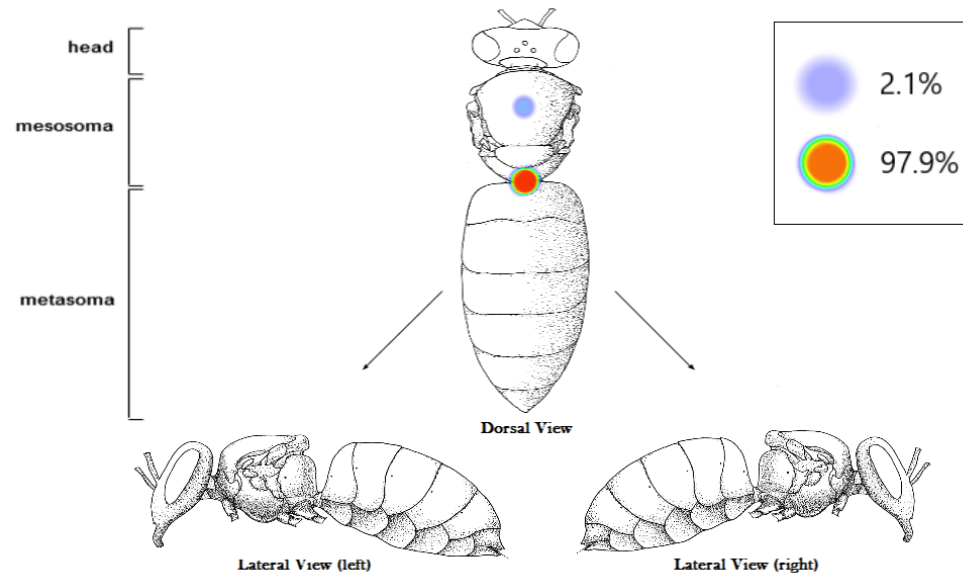
- They're smaller
- They're faster
- Shorter phase on adult bees



What do we Know?

- Different preference for location on honey bee

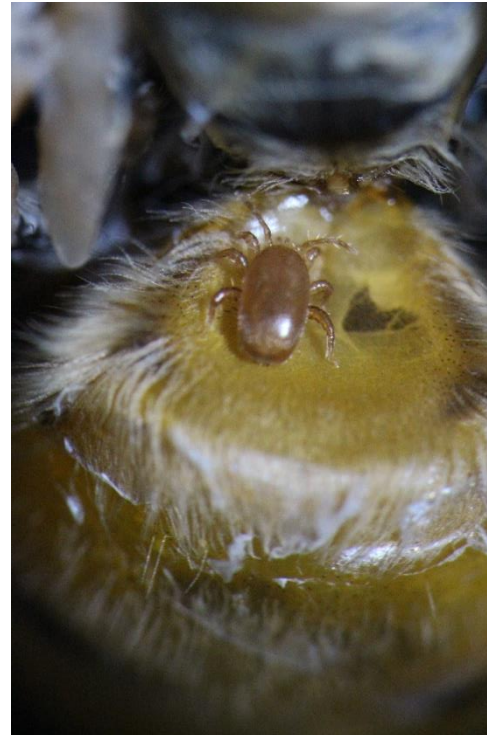
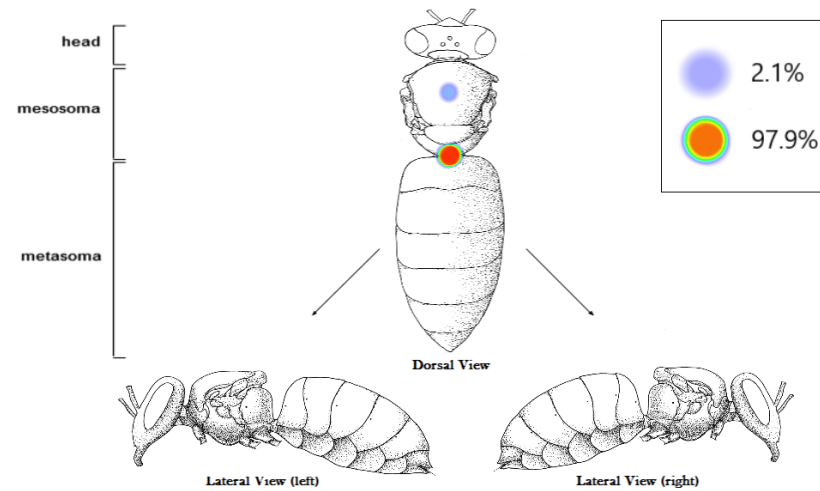
Observed Dispersal of Parasitic *Tropilaelaps* spp. on *Apis mellifera*



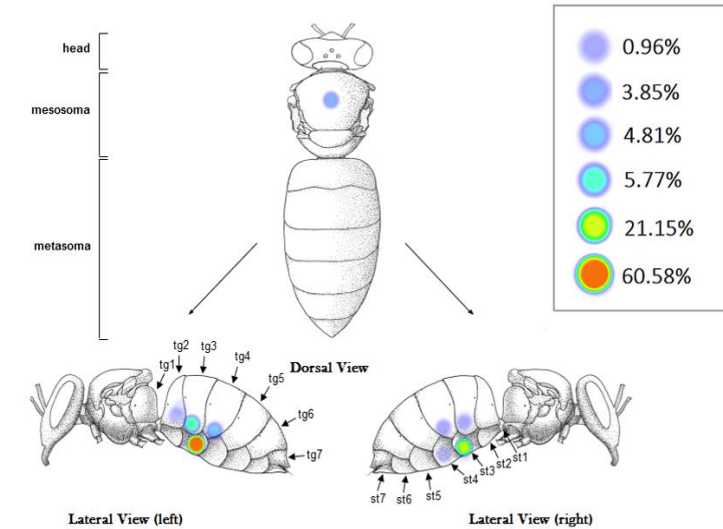
What do we Know?

- Different preference for location on honey bee
- Easier to dislodge in sugar shake
- More difficult to see
- Do not wedge themselves between abdominal plates

Observed Dispersal of Parasitic *Tropilaelaps* spp. on *Apis mellifera*



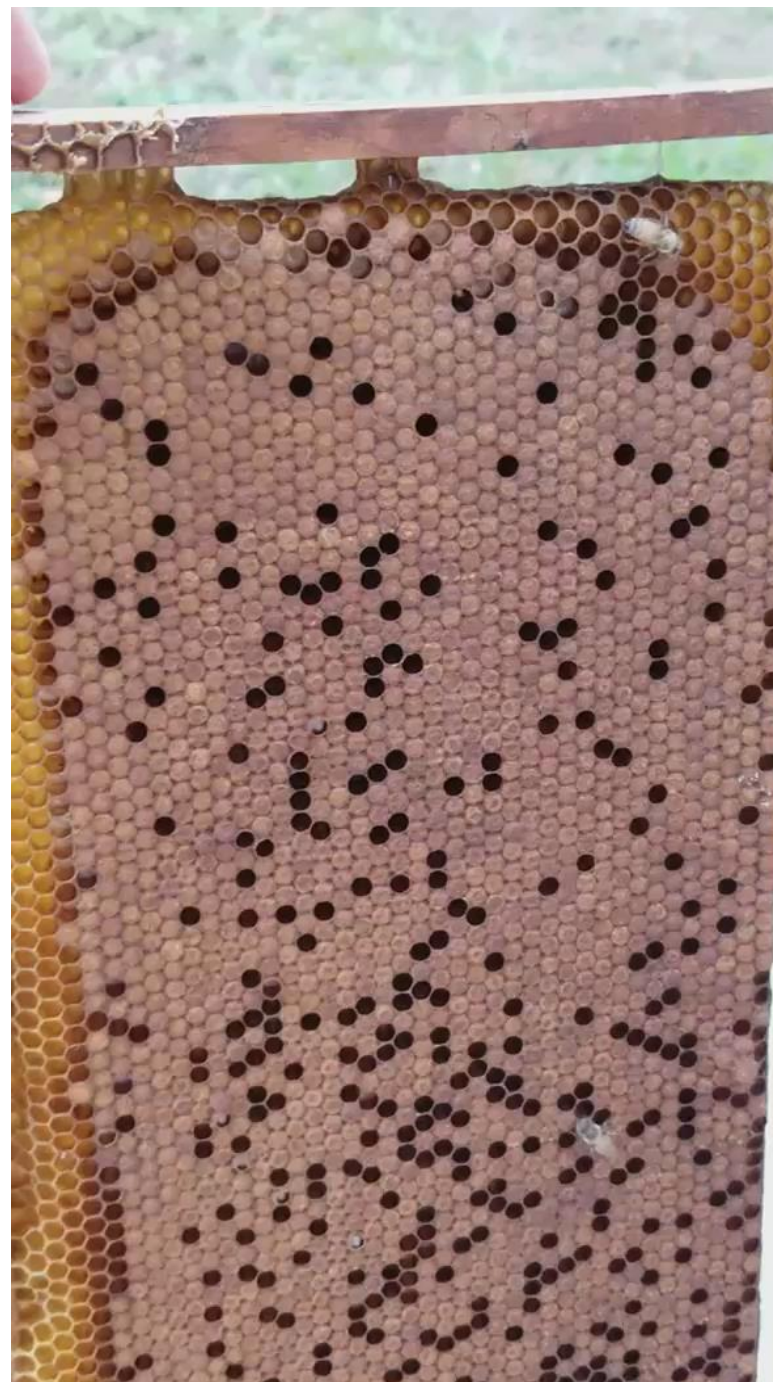
Observed Dispersal of Parasitic *Varroa destructor* on *Apis mellifera*



Observe: A Healthy Colony



Observe: A Healthy Colony



What do we Know?

- Reproduce more quickly
- Cause irregular brood pattern quickly
 - Characteristic “bald brood”



What do we Know?

- Reproduce more quickly
- Cause irregular brood pattern quickly
 - Characteristic “bald brood”



Thai Beekeeping



What do we Know?

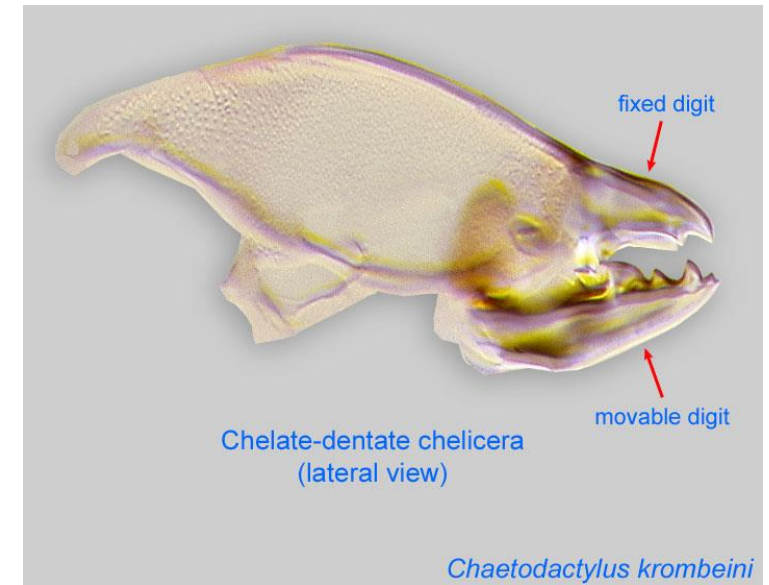
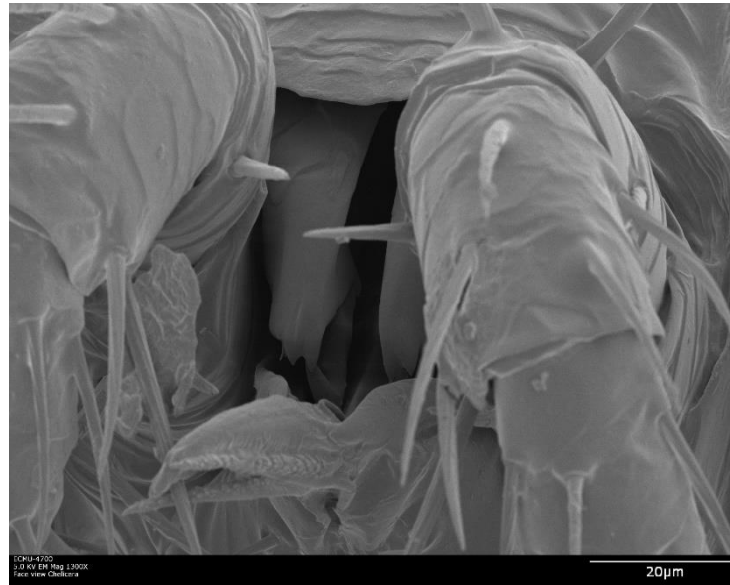
- Spread's virulent Deformed Wing Virus and Black Queen Cell Virus
- No other viruses confirmed at this time
- Damage to colony likely a result of feeding



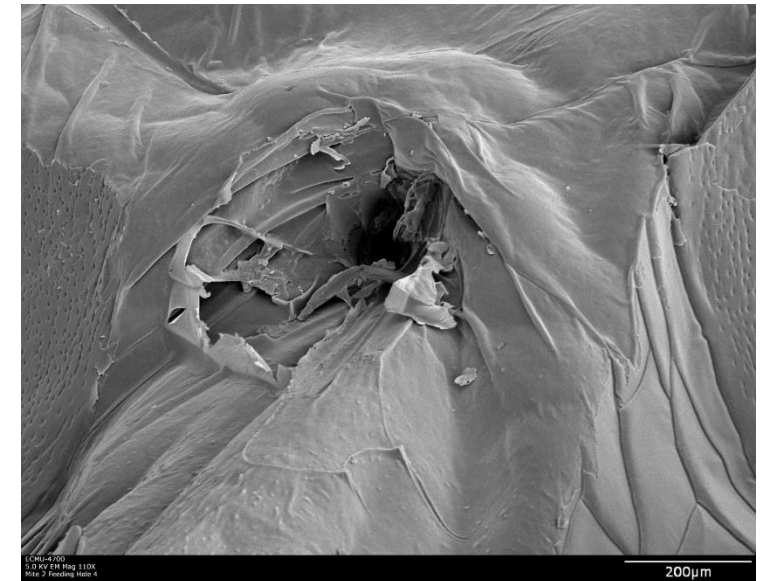
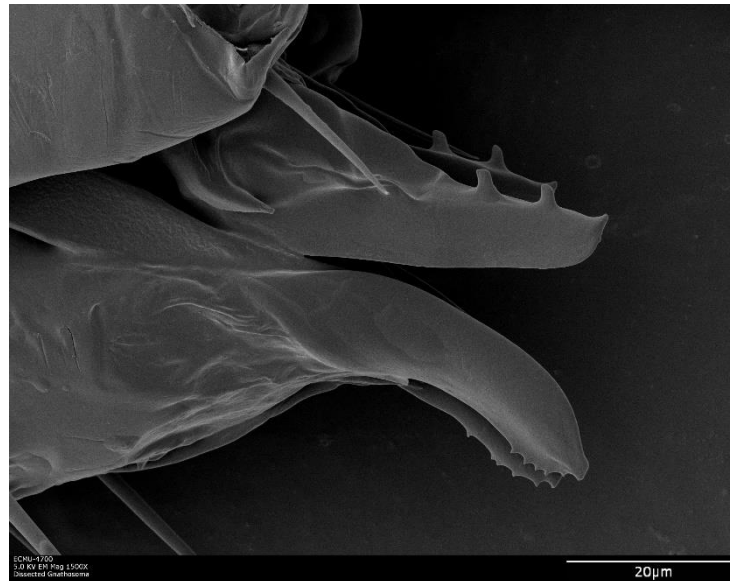
What do we Know?

- Tropilaelaps have very muscular jaws
- Top and bottom jaw present unlike *Varroa*

Tropilaelaps spp.



Varroa destructor



What do we Know?

- Create multiple feeding wounds
- Pupal feeding wounds cause permanent damage



The Wounds of a Mite



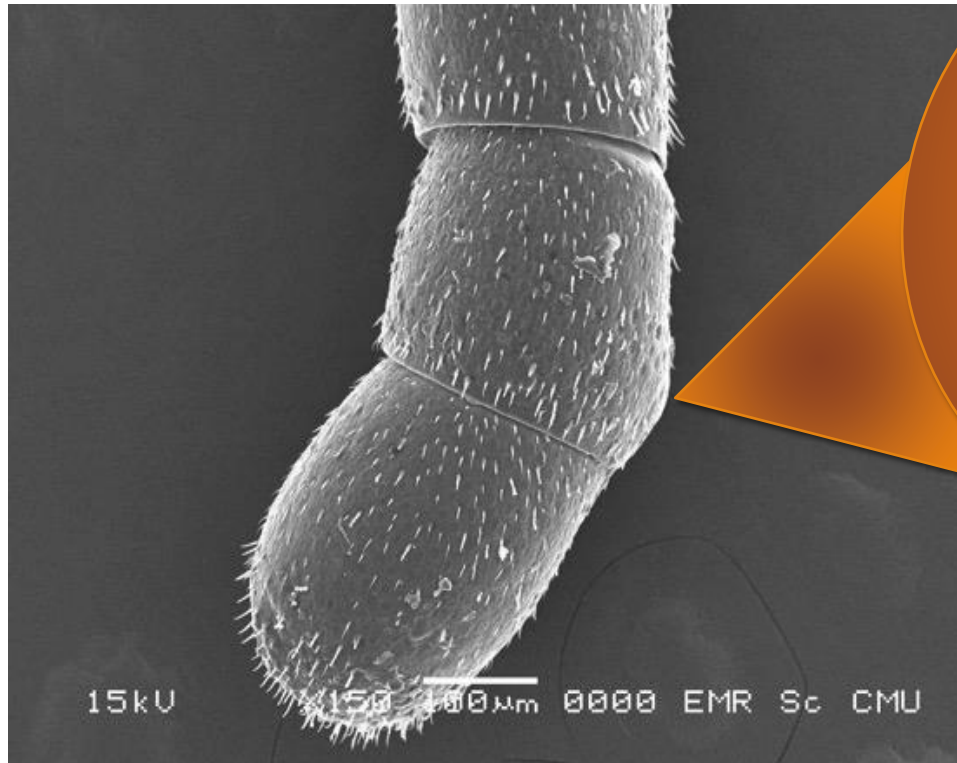
**Wound site
on antennae
of pupa**

The Wounds of a Mite



**Wounds on
antenna of
adult worker
bee**

The Wounds of a Mite



**Feeding
Results in
lifelong injury
even without
viruses!**

What do we Know?



Tropilaelaps mite: an emerging threat to European honey bee

Panuwan Chantawannakul^{1,2,3}, Samuel Ramsey^{2,4},
Dennis vanEngelsdorp^{2,4}, Kitiphong Khongphinitbunjong⁵ and
Patcharin Phokasem^{1,6}

The risk of transmission of honey bee parasites has increased substantially as a result of trade globalization and technical developments in transportation efficacy. Great concern over honey bee decline has accelerated research on newly emerging bee pests and parasites. These organisms are likely to emerge from Asia as it is the only region where all 10 honey bee species co-occur. *Varroa destructor*, an ectoparasitic mite, is a classic example of a pest that has shifted from *A. cerana*, a cavity nesting Asian honey bee to *A. mellifera*, the European honey bee. In this review, we will describe the potential risks to global apiculture of the global expansion of *Tropilaelaps mercedesae*, originally a parasite of the open-air nesting Asian giant honey bee, compared to the impact of *V. destructor*.

Addresses

¹ Bee Protection Laboratory, Department of Biology, Faculty of Science, Chiang Mai University, 50200, Thailand

² International College of Digital Innovation, Chiang Mai University, Chiang Mai 50200, Thailand

³ Environmental Science Research Center, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

⁴ Department of Entomology, University of Maryland College Park, College Park, MD 20742, United States

⁵ School of Science, Mae Fah Luang University, Chiang Rai 57100, Thailand

⁶ Graduate School, Chiang Mai University, Chiang Mai 50200, Thailand

Corresponding author: Chantawannakul, Panuwan (panuwan@gmail.com)

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This review comes from a themed issue on **Parasites/parasitoids/biological control**

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(Table 1), in a number of respects. Both parasites complete their lifecycles within capped brood cells of their host. Like *Varroa*, the life cycle of *Tropilaelaps* is separated into two phases: the reproductive phase and phoretic phase (though the latter is significantly truncated in *Tropilaelaps*) (Figure 1). During the reproductive phase *Tropilaelaps* cause significant damage to their host via feeding and vectoring viruses often leading to irregular brood patterns (Figures 2–4). There are, however, several important differences between the two genera. *Tropilaelaps* appear to be true brood parasites. Unlike *Varroa* there is no evidence that they feed on adults, with the morphology of their mouthparts and body shape apparently restricting their feeding to brood exclusively. They are further distinguished from *Varroa* by their smaller size, shorter duration of their phoretic phase, characteristically rapid locomotion, faster reproductive rate, and their ability to mate outside of brood cells. Several of these differences are concerning as they allow for populations of these mites to grow even more rapidly than *Varroa* populations suggesting that this parasite may be a greater threat than the infamous *Varroa destructor* [1,2*,3,4].

Based on genetic and morphological differences, four *Tropilaelaps* species have been described (i.e. *Tropilaelaps koenigerum*, *Tropilaelaps thaii*, *Tropilaelaps clareae*, and *T. mercedesae*) [5]. *T. koenigerum* is a parasite of *A. dorsata* in Sri Lanka, mainland Asia, and Indonesia apart from Sulawesi and Borneo [5,6]. *T. thaii* has only been observed parasitizing *A. laboriosa* in Vietnam [5]. *T. clareae* parasitize *A. dorsata*, and *A. breviligula* in the Philippines and Indonesia [5]. *T. mercedesae* was originally found in *A. dorsata* in mainland Asia and Indonesia and *A. laboriosa* in Himalayas.

Amongst the four species of *Tropilaelaps*, *T. clareae* and *T. mercedesae* are successfully adapted to *A. mellifera* as they can reproduce in the drone and worker brood cells of this new host [2*]. *T. mercedesae*, however, has a wider geographic distribution whereas *T. clareae* was only

What We Don't Know

- What they eat

Feeding Trials



What We Don't Know

- ◆ What they eat
- ◆ Whether or not they feed on adult bees
- ◆ How they spread
- ◆ What is most effective at controlling them

What We're Learning

- ◆ How they feed
- ◆ Whether they are capable of feeding on adult bees
- ◆ How they are controlled by their native hosts
- ◆ Which chemical and non-chemical controls are most effective

Avoiding Past Mistakes



Avoiding Past Mistakes



Avoiding Past Mistakes



Avoiding Past Mistakes



Ramsey, Chiang Mai
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Avoiding Past Mistakes



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Research on a New Honeybee Parasite

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Avoiding Past Mistakes





-and Win!

The vanEngelsdorp Lab

- Dennis vanEngelsdorp
- Karen Rennich
- Heather Eversole
- Rachel Fahey
- Dan Reynolds

กิตติกรรมประกาศ



The Bee Protection Lab

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- Patcharin Phokasem
- Sasiprapa Krongdang
- Chainarong Sinpoo
- Wannapha Mookhploy



Many Thanks!

