

LATIN AMERICAN NATURAL ENEMIES OF THE COFFEE BERRY BORER, WITH EMPHASIS ON THE NEMATODE *Metaparasitylenchus hypothenemi*



Francisco Infante

El Colegio de la Frontera Sur (ECOSUR)
Tapachula, Chiapas, Mexico

Contents...

- Introduction
- The importation of African natural enemies of CBB into Latin America.
- Latin American natural enemies of the CBB.
- The nematode *Metaparasitylenchus hypothenemi* as a natural enemy of CBB.
- Interference between *M. hypothenemi* and *P. coffea*.
- Concluding remarks and perspectives.

Introduction...

- The CBB is the main entomological problem
- CBB has a cryptic life-cycle
- Exotic pest in Latin America



Introduction...

- Damage is caused by larvae and adults
- Damage in quality and quantity of coffee
- Classical biological control attempts



The African Parasitoids...

Prorops nasuta

Cephalonomia stephanoderis



The African Parasitoids...

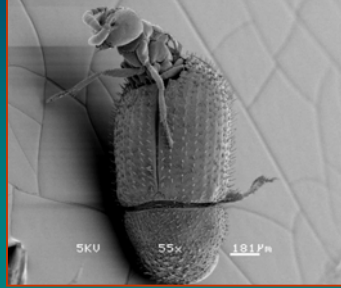
Prorops nasuta

Cephalonomia stephanoderis



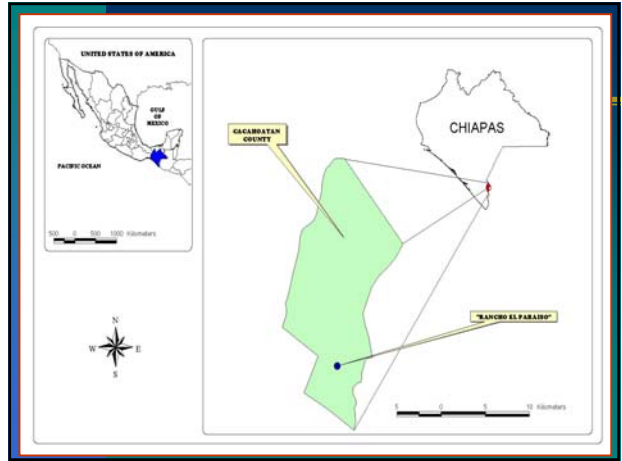
The African Parasitoids...

Phymastichus coffea



Latin American Natural Enemies of *Hypothenemus hampei* Recorded Under Field Conditions.

Agent	Country	Notes	Reference
<i>Crematogaster curvispinosus</i>	Brazil	Generalist predator	Da Fonseca & Araujo, 1939
<i>Auximobasis coffeaeella</i>	Brazil	Occasional predator	Da Fonseca & Araujo, 1939
<i>Beauveria bassiana</i>	Ecuador (Cosmopolitan)	Attack on adults	Klein-Koch <i>et al.</i> , 1988
Unidentified species (Proctotrupoidea)	Brazil	Endoparasitoid of adults	Benassi, 1995
<i>Cephalonomia hyaltipennis</i>	Mexico	Ectoparasitoid of larvae	Pérez-Lachaud, 1998
<i>Cryptoxilos</i> sp.	Colombia	Endoparasitoid of adults	Bustillo <i>et al.</i> , 2002
<i>Calliodes</i> sp.	Colombia	Predator of immature stages	Bustillo <i>et al.</i> , 2002
<i>Scoloposcelis</i> sp.	Colombia	Predator of immature stages	Bustillo <i>et al.</i> , 2002
Seven species of ants	Colombia	Generalist predators	Bustillo <i>et al.</i> , 2002
<i>Tapinoma</i> sp.	Mexico	Predator of immature stages	Infante <i>et al.</i> , 2003
<i>Metaparasitylenchus hypothenemi</i>	Mexico	Endoparasitoid of immature stages and adults	Castillo <i>et al.</i> , 2002; Poinar <i>et al.</i> , 2004





Juvenile Stages of *M. hypothenemi* After Being Extracted from a CBB Adult Female



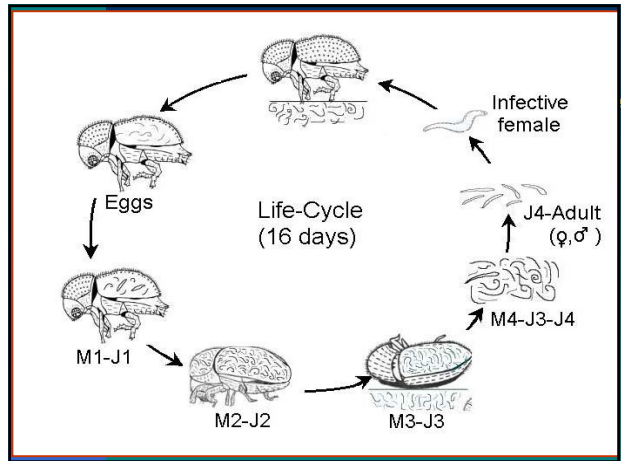


The Nematode...


Metaparasitylenchus hypothenemi
(Allantonematidae)

Discovered in 1999 and described as a new species in 2004

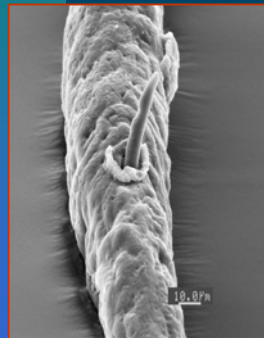
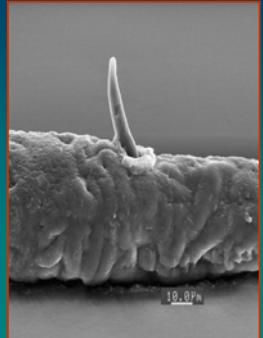


The Nematode...

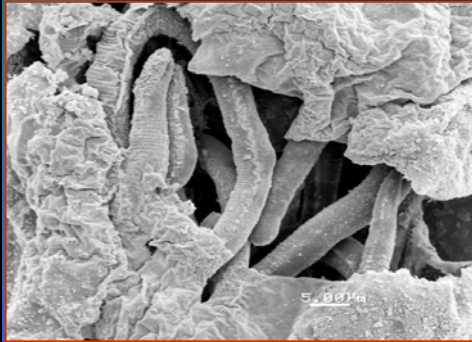


An adult female of *M. hypothenemi*

The Nematode...

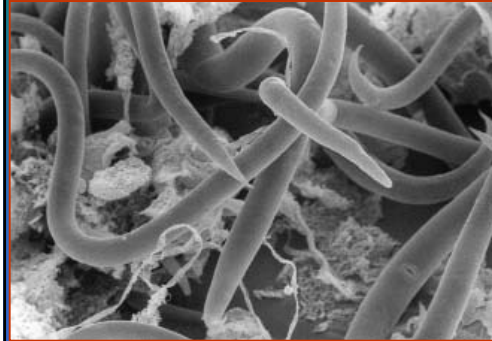



The Nematode...



J-1
Nematodes

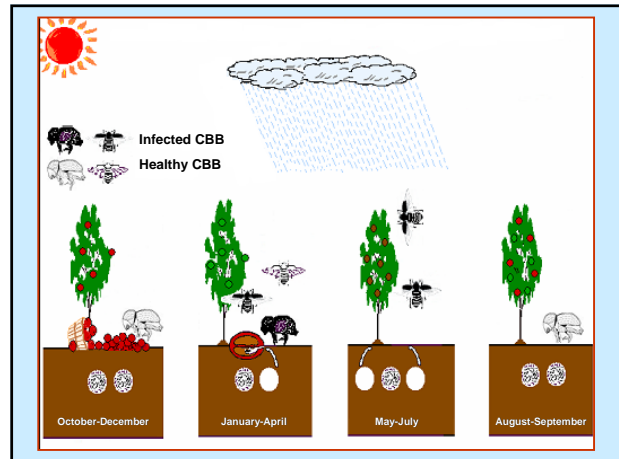
The Nematode...



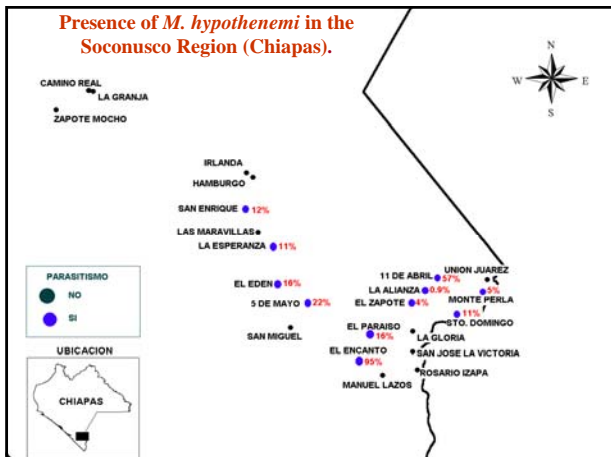
J-1
Nematodes

Fecundity of CBB Infected with *M. hypohenemi*

Sample	CBB Parasitized	CBB Unparasitized
1	0	23
2	0	4
3	0.8	10.3
4	6.5	33.3
5	1.3	11.8
6	4.3	6.5
7	0	4.5
8	6	9.3
9	0	7.1
10	0	8.2
11	0	0



Presence of *M. hypohenemi* in the Soconusco Region (Chiapas).



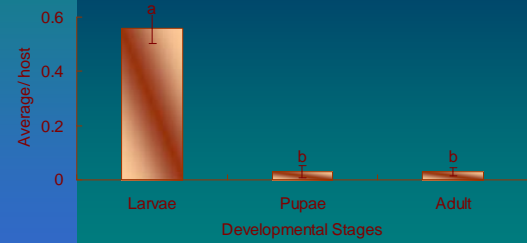
Interference between *M. hypohenemi* and *P. coffea*

Treatment	CBB Survivorship	CBB Parasitized by the Nematode	CBB Parasitized by <i>P. coffea</i>	CBB that Yielded Adults of <i>P. coffea</i>	Adults of <i>P. coffea</i> Emerged from each Host
<i>P. coffea</i>	12.1 ± 0.5 a*	0	80.8 a	79.2 a	1.5 ± 0.12 a
<i>M. hypohenemi</i>	23.6 ± 1.5 b	95 a	0 b	0 c	0 c
<i>P. coffea</i> + <i>M. hypohenemi</i>	12.1 ± 1.1 a	85 a	86.7 a	18.3 b	0.13 ± 0.10 b
Control (No Parasitism)	41.2 ± 1.2 c	0 b	0 b	0 c	0 c

The Interaction Between *M. hypothenemi* and *P. coffea*



The Interaction Between *M. hypothenemi* and *P. coffea*



Developmental stages of *P. coffea* affected by *M. hypothenemi*

Conclusions...

- The discovery of *M. hypothenemi* expands the number of natural enemies recorded for the CBB.
- This is the first record of a nematode attacking the CBB under natural conditions in the Americas.
- Apparently this organism is widely distributed in coffee plantations of Chiapas and Central America.

Conclusions...

- Levels of mortality in CBB adults due to this nematode reached 15.3%.
- Average number of eggs laid by CBB was lower in parasitized individuals (1.7 eggs) than non-parasitized (10.7 eggs). This leads to believe that *M. hypothenemi* affects the reproductive organs of the CBB.
- *M. hypothenemi* occurs in the body cavity of larva, pupa and adult stages of the CBB.

Conclusions...

- This nematode can interfere with the parasitic activity of *Phymastichus coffea* increasing the mortality of its progeny.
- Because the CBB is the most important pest of coffee and *M. hypothenemi* partially or completely sterilizes the female beetle, it is worthy of further investigations as a potential biological control agent.

