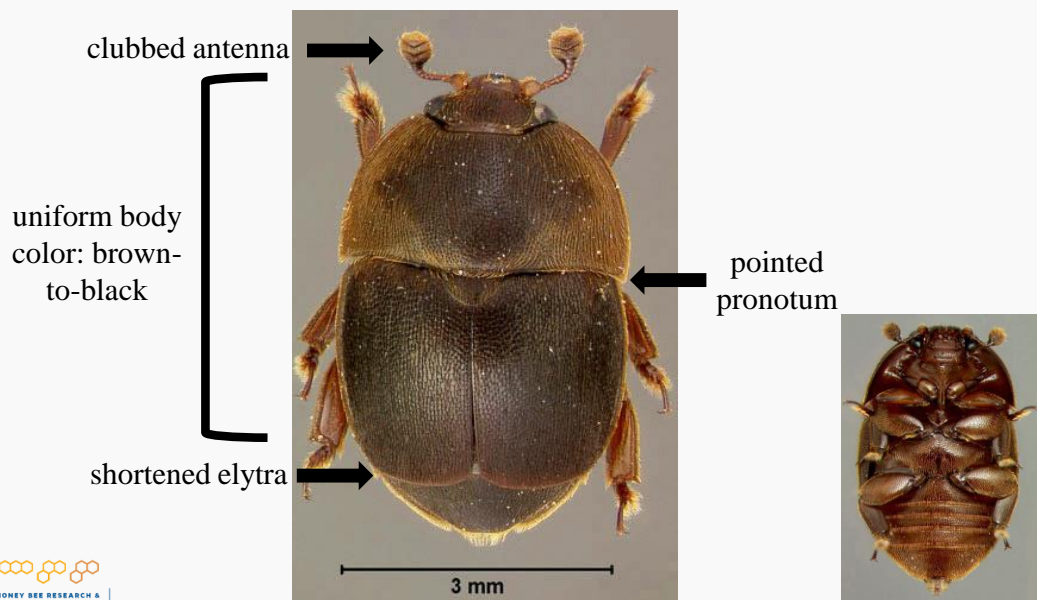


Small Hive Beetles: past experiences and future perspectives

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Gahan Endowed Professor of Entomology
University of Florida
Entomology and Nematology Department

The Small Hive Beetle: *Aethina tumida* (Coleoptera: Nitidulidae)





Glischrochilus fasciatus



Lobiopa insularis

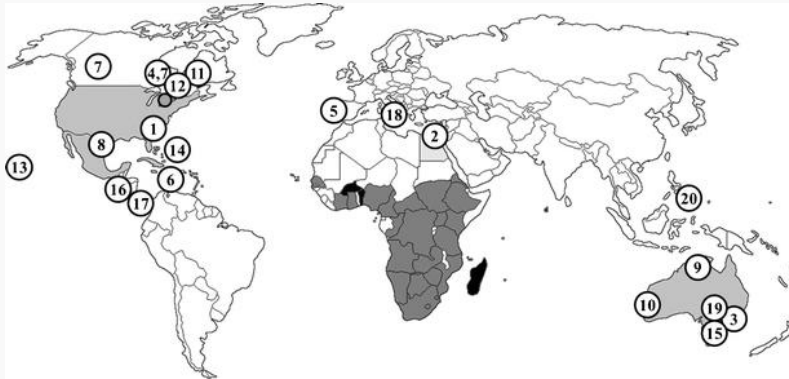


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Ellis et al. 2008, J. Apic. Res. <http://dx.doi.org/10.1080/00218839.2008.11101456>



Global distribution and reported introductions of small hive beetles up to November 2015. Please refer to Neumann and Elzen (2004) and Neumann and Ellis (2008) for further references up to December 2008. Endemic distribution range in sub-Saharan Africa (*dark grey areas*), countries with well-established invasive populations (USA, Mexico, Cuba, Jamaica, Australia (*medium grey areas*), Canada (only Essex county, Ontario, Dubuc 2013; P. Giovenazzo, personal communication, *dark grey circle*) and not well established ones (Egypt, light grey area); new records in endemic range (*black areas*: Benin, Mensah et al. 2007; Burkina Faso, M'Peindagha Bongho 2009; Madagascar, Rasolofoaivao et al. 2013) and introductions (*white circles*) are shown: (1) 1996, Charleston, South Carolina, USA, (2) 2000, Itay-Al-Baroud, Egypt, (3) 2001, Richmond, NSW, Australia, (4) 2002, Manitoba, Canada, (5) 2004, Lisbon, Portugal, (6) 2005, Jamaica (FERA 2010), (7) 2006, Alberta and Manitoba, Canada, (8) 2007, Coahuila, Mexico, (9) 2007, Kununurra, North Australia (Annand 2008), (10) 2008, Perth, Australia (R. Spooner-Hart, N. Annand, personal communication), (11) 2008, 2009, Quebec, Canada (Dubuc 2013), (12) 2008, 2013 Ontario, Canada (Giovenazzo and Boucher 2010; Dubuc 2013), (13) 2010, Pana'ewa, Big Island, Hawaii (Robson 2012), (14) 2012, Cuba (Peña et al. 2014), (15) 2012, Naracoorte in Eastern South Australia (R. Spooner-Hart, N. Annand, personal communication); (16) 2013, El Salvador (Arias 2014), (17) 2014, Nicaragua (Gutierrez 2014; Calderón Fallas et al. 2015), (18) Sovereto, Calabria, Italy (Mutinelli 2014; Mutinelli et al. 2014; Palmeri et al. 2015), (19) 2014, Renmark, Australia (R. Spooner-Hart, N. Annand, personal communication), (20) 2014, Lupon, Philippines (Brion 2015).

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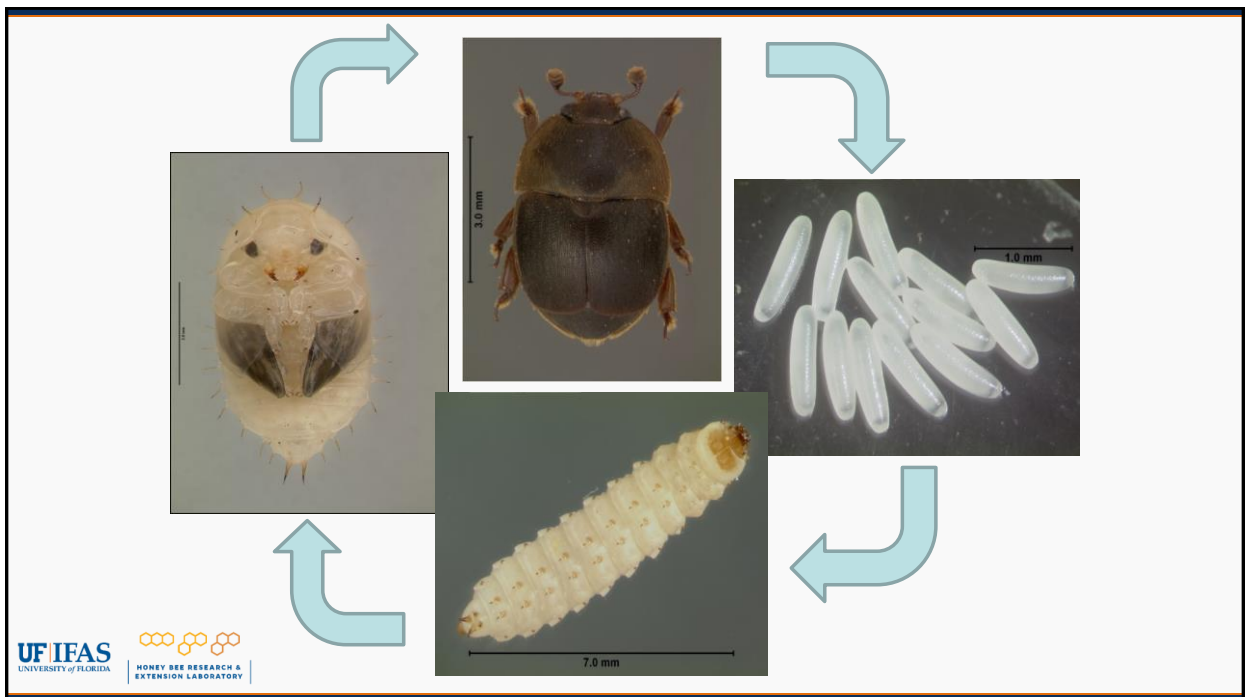
HONEY BEE RESEARCH &
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Neumann, P., Pettis, J.S. & Schäfer, M.O. Apidologie (2016) 47: 427. <https://doi.org/10.1007/s13592-016-0426-x>

Summary of Findings in the U.S. and RSA

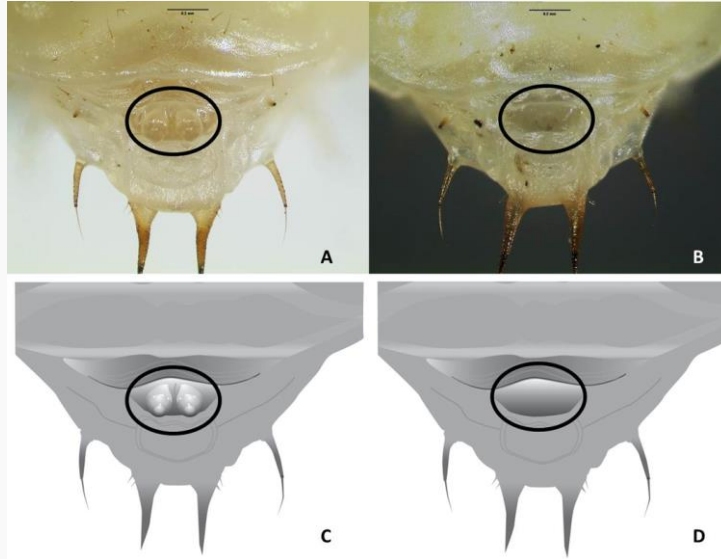
	African	European
Honey:	_____	_____
Brood Area:	_____	↓
No. of Adult Bees:	_____	↓
Pollen Area:	↓	↓
Avg. Flight Activity:	_____	↓

Ellis et al. 2003, Apidologie, <https://doi.org/10.1051/apido:2003038>



Sexing Small Hive Beetles:

female



male

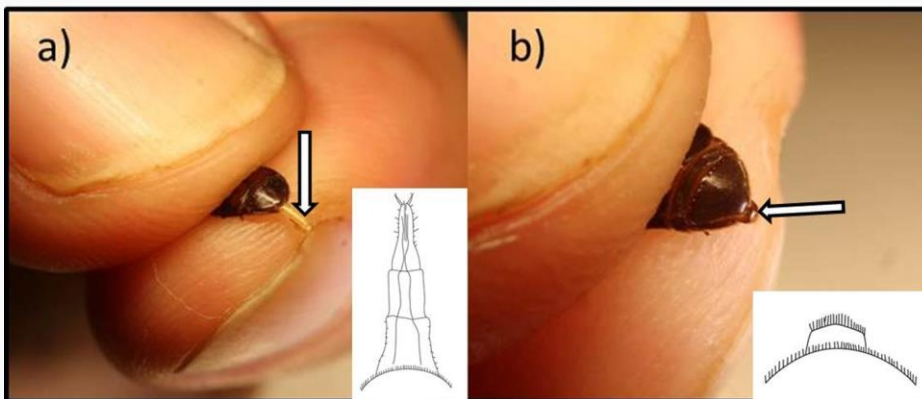


Neumann et al. 2013, J. Apic. Res. <http://dx.doi.org/10.3896/IBRA.1.52.4.19>

Sexing Small Hive Beetles:

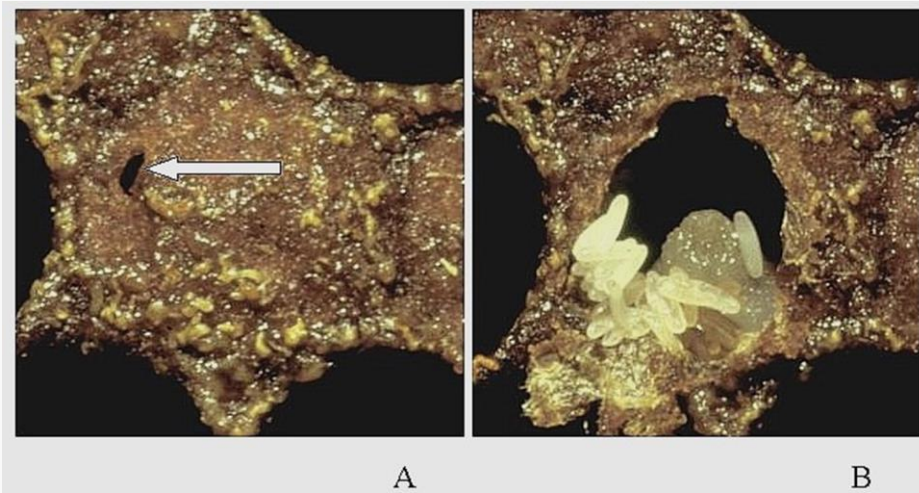
female

male



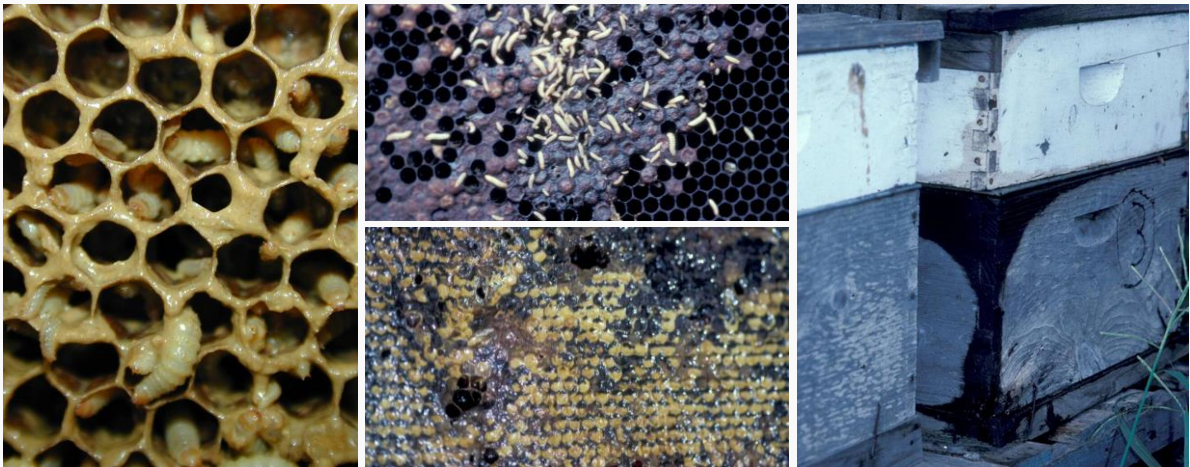
Neumann et al. 2013, J. Apic. Res. <http://dx.doi.org/10.3896/IBRA.1.52.4.19>

Small Hive Beetle Oviposition



Ellis et al. 2003, J. Apic. Res, <http://dx.doi.org/10.1080/00218839.2003.111010891>

Damage Caused by Small Hive Beetles





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Ellis et al. 2002, J. Econ. Ent., <https://dx.doi.org/10.1093/jee/95.5.902>



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Ellis et al. 2004, Env. Ent., <http://dx.doi.org/10.1603/0046-225X-33.4.794>

The Spread of Small Hive Beetles

- Adult beetle flight
- Beekeeper-assisted colony migration
- Transportation of hive products
- Package bees
- Soil?
- Swarms?
- Absconding?



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Rearing Small Hive Beetles

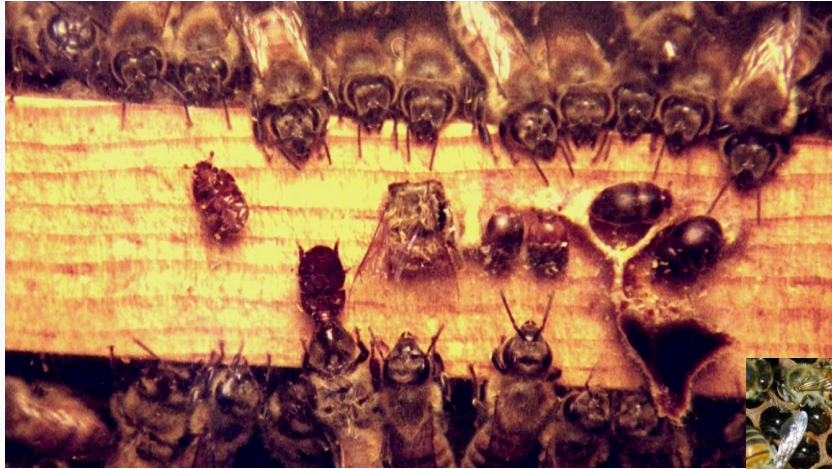


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Neumann et al. 2013, J. Apic. Res, <http://dx.doi.org/10.3896/IBRA.1.52.4.19>

Small Hive Beetle Confinement Behavior



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Ellis 2005, Bee World, <http://dx.doi.org/10.1080/0005772X.2005.11417312>

Who are the Guard Bees?

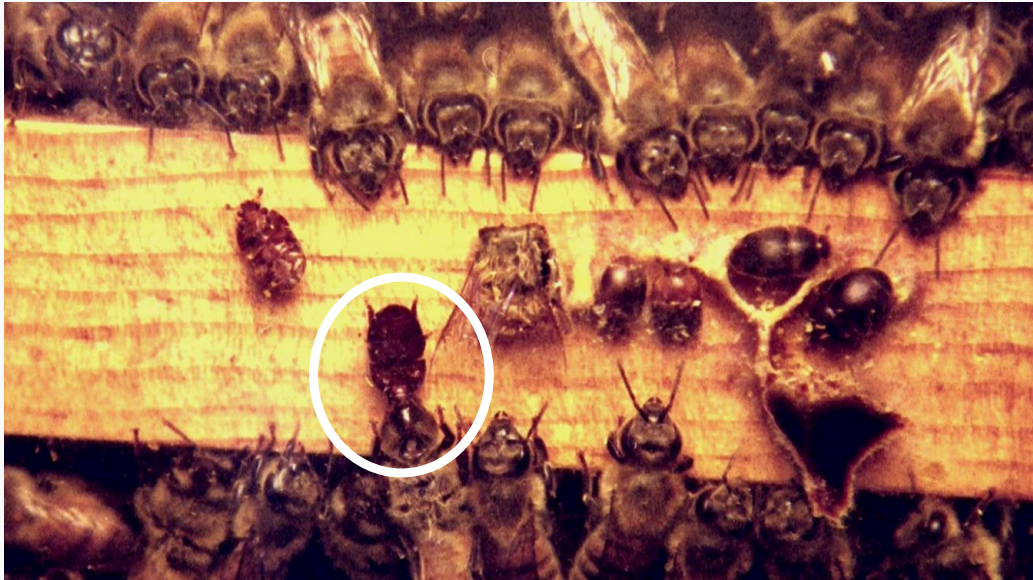
	Cape Honey Bees	European Honey Bees
Beginning Guard Age (days)	20.6 a	18.6 a
Duration of Guard Behavior (days)	1.4 a	2.4 b

Ellis et al. 2003, J. Apic. Res., <http://dx.doi.org/10.1080/00218839.2003.11101085>

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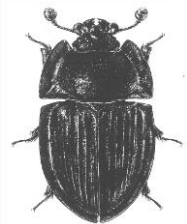


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Amphotis marginata



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Ellis et al. 2002, Naturwissenschaften, <http://dx.doi.org/10.1007/s00114-002-0326-y>

Methods of Integration

Behavioral:

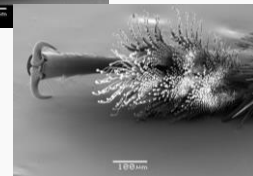
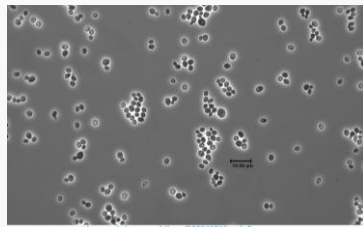
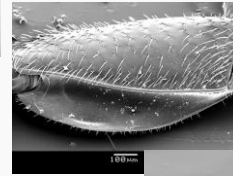
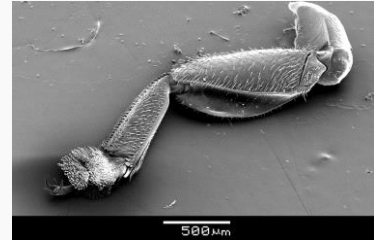
- Turtling
- Hiding
- “Begging” mimicry

Chemical:

- Yeast symbionts

Morphological:

- Grooved femora
- Flattened tibiae
- Tarsal setae
- Hardened, difficult-to-grip exoskeleton

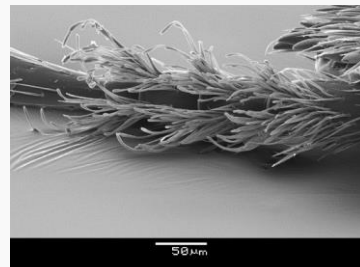
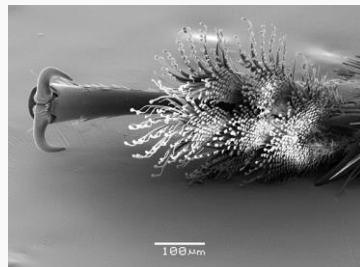
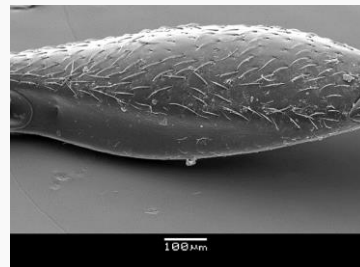
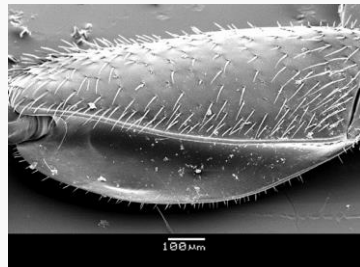


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Small Hive Beetle

Lobiopa insularis



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Hemisphaerota cyanea

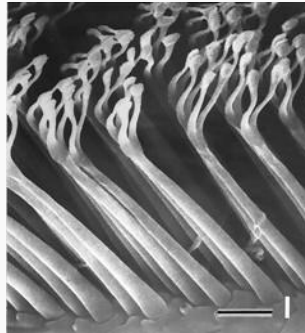


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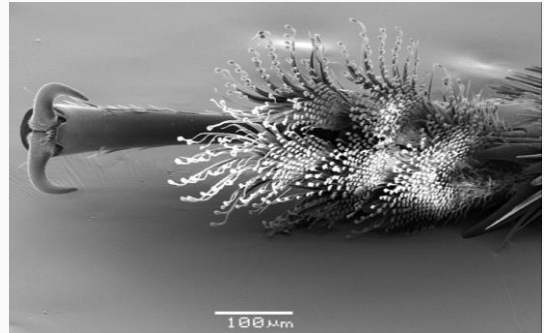


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Hemisphaerota cyanea



Small Hive Beetle

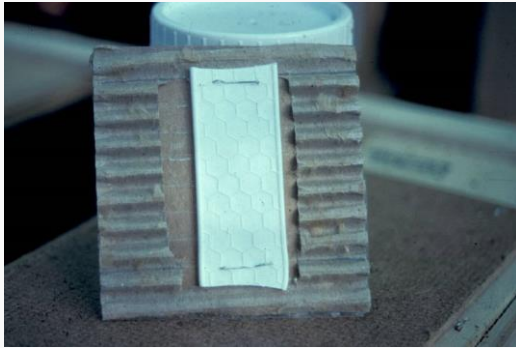


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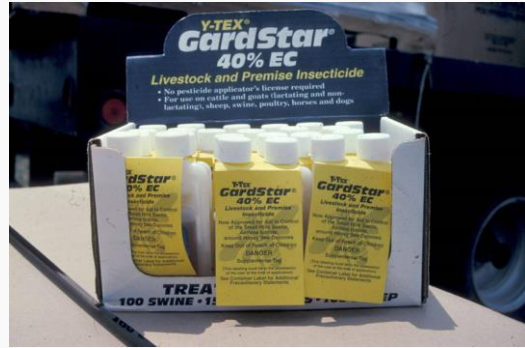


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Controlling Small Hive Beetles: Chemical Control Options



Checkmite+ (coumaphos)



GardStar (permethrin)

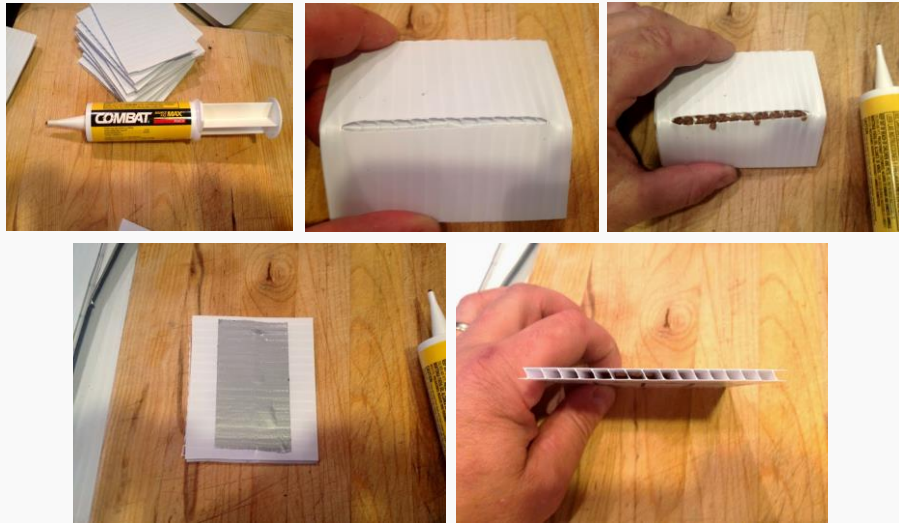
Controlling Small Hive Beetles: Off-Label Chemicals



MaxForce FC (fipronil)



Controlling Small Hive Beetles: Off-label Chemicals

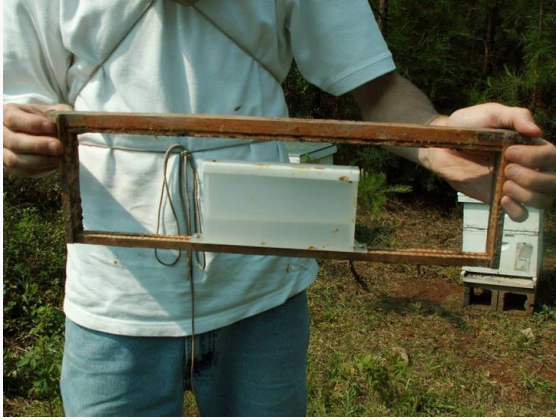


Combat MAX (fipronil)

Trapping Adult Beetles: Better Beetle Blaster



Trapping Adult Beetles: Hood Trap and Hive Bottom Trap



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Trapping Adult Beetles: West Beetle Trap and Beetle Jail Trap



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Dadant

Use Good Hive Equipment



Small colonies (nucs or mating nucs) are more vulnerable.



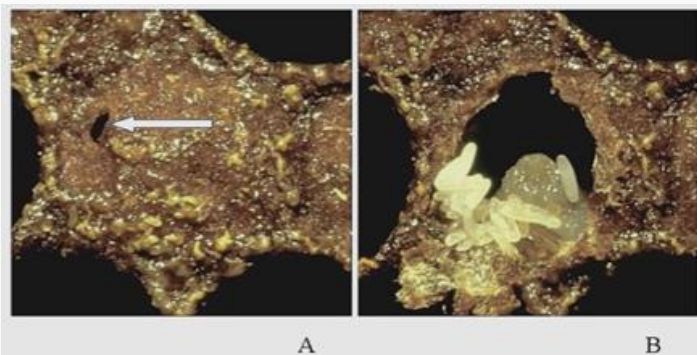
Keep Colonies Strong and Disease/Pest Free



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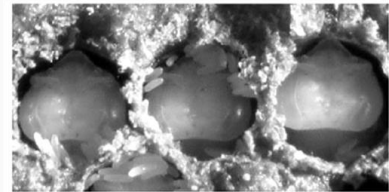
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Genetic Control

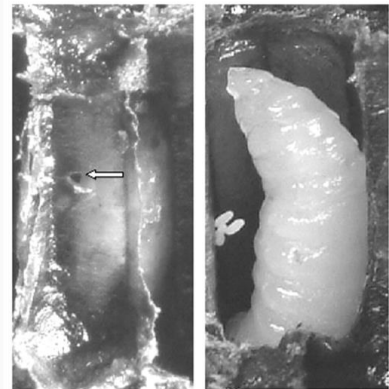


A

B



a



b

c

Ellis et al. 2003, J. Apic. Res, <http://dx.doi.org/10.1080/00218839.2003.111010891>

Ellis et al. 2003, Naturwissenschaften, <http://dx.doi.org/10.1007/s00114-003-0476-6>

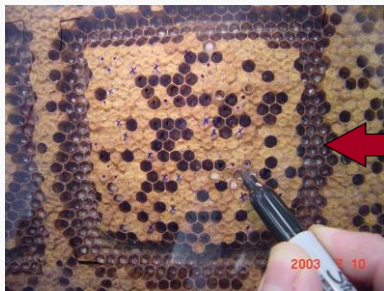
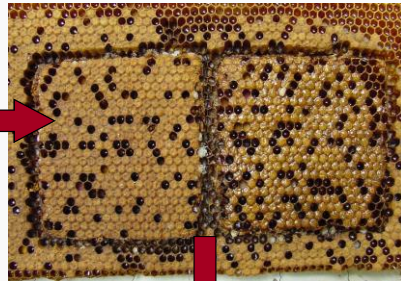
Ellis et al. 2004, Ann. Ento. Soc., [https://doi.org/10.1603/0013-8746\(2004\)097\[0860:HBOCAE\]2.0.CO;2](https://doi.org/10.1603/0013-8746(2004)097[0860:HBOCAE]2.0.CO;2)

Ellis et al. 2008, J. Apic. Res, <http://dx.doi.org/10.3827/IBRA.1.47.3.09>

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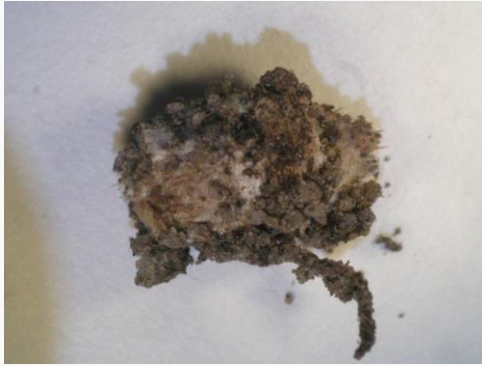
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Genetic Control



Biological Control

Fungal Pathogens



Ellis et al. 2004, Am. Bee Jour., 144(6): 486-488.

Nematodes



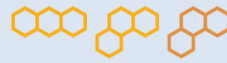
Ellis et al. 2010. J. Econ. Ent., <http://dx.doi.org/10.1603/EC08384>



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