STINGLESS BEE PESTS AND DISEASES

WITHIN COLONY PARASITES OF STINGLESS BEES IN AUSTRALIA

- native hive syrphid fly
- native hive phorid fly
- introduced small hive beetle
- native hive/pollen beetles
- mites
- soldier fly
HIVE SYRPHID FLY *Ceriana ornata*

- Common in stingless hives being manipulated, esp. during splitting for propagation. Adults attracted to hive stores
- Will also enter weak or dead hives
- Lay eggs on hive structures, or in hive external cracks/joins after hive splitting, honey removal

- Larvae hatch from eggs burrow through gaps in propolis
- Maggot-like, 2 posterior spiracles
- Feed on hive stores, gradually destroying hives, slime out in severe cases
- Pre-pupal larvae leave hive to pupate in soil, or pupate in hive

**Pre-pupal stage**

**Larvae in stingless bee hive structures**
- Larvae hatch from eggs burrow through gaps in propolis
- Maggot-like, 2 large posterior spiracles
- Feed on hive stores, gradually destroying hives, slime out in severe cases
- Pre-pupal larvae leave hive to pupate in soil, or pupate in hive

Syrphids pupating in stingless bee box

Management: Protect against infestation by taping up hive cracks/seams after splitting or opening
**HIVE PHORID FLY** *Dohrniphora trigoniae*

- Hump-backed small flies, run rather than fly when disturbed
- Enter hives through the entrance esp. if weak hives, or during hive manipulation
- Larvae small, maggot-like, feed on stores. Pupate in hive
- Protect hives by reducing size of hive entrances, and using traps

A. Phorids outside hive entrance

B. Phorid (and small ant!) trap
**SMALL HIVE BEETLE** *Aethina tumida*

- Will infest stingless bee hives, but less frequently infested than *Apis mellifera*. However, unlike *A. mellifera*, most stingless bees are kept under climatic conditions suitable for SHB populations.

- Mainly enter weak or dead stingless bee hives.

- Adult beetles enter usually around dusk.

- Lay eggs in crevices and corners.

- Larvae have distinct head and 3 pairs of thoracic legs.

- Consume stores, cause fermentation and “slime outs”.

- Larvae leave hive to pupate in soil.

- SHB management similar for honeybees. Reduce entrance size, beetle attractants outside hive, trays to trap emerging pre-pupae, but not use of in-hive traps.

- Check hives, especially after catastrophic event, e.g. extreme temperatures, pesticides exposure etc. for SHB.
**NATIVE HIVE BEETLES, SAP BEETLES** *Carpophilus* spp., *Brachypeplus* spp.

- Same family as small hive beetle, but smaller and more elongated
- Scavengers, feeding primarily on pollen stores
- Not major pests

Native sap beetle from hive

**POLLEN MITES**

- Mites are common inhabitants of nests of colonial and solitary bees, including stingless bees
- Most common are scavenger pollen feeders, such as *Tyrophagus* spp. (stored product or mould mites), or generalist predatory mites which feed off them or use pollen as an alternative food source
- They rarely become a problem and should be regarded as part of the tapestry of life in bee nests
- However, some can cause allergenic responses in susceptible people

*Tyrophagus putrescentiae* in a stingless bee colony
PREDATORS/PARASITES OF FORAGING STINGLESS BEES OUTSIDE HIVES

- Native predatory sand wasp
- Stingless bee braconid wasp parasitoid
- Ants
- Spiders
- Vertebrates

PREDATORY SAND WASP *Bembix* spp.

- Hover around hive entrances, and capture emerging bees
- Most species are said to prefer male bees
- Take bees back to their nest in soil to feed their larvae
- No real management strategy, other than to swat them or capture them with sweep nets from hive entrances, but unlikely to threaten hive viability
SPIDERS

- Predate on foraging bees in flowers or webs near hives
- Minor problem

Flower spider
(Image: David Gray, Australian Museum)

VERTEBRATES

- Range of vertebrate species that predate on pollinators in general, including stingless bees
- These include birds, reptiles and amphibians
- However, minor pests, rarely impact stingless bee colonies

Cane toad waiting for a tasty morsel to emerge
(Image: Russell Zabel)
Tangle-Trap® on hive posts to restrict ant movement

Taping and locking hives after manipulation (such as splitting) to prevent syrphid and phorid attack
Many stingless bees modify their hive entrances to defend colonies against predators and parasites. *T. carbonaria* reducing entrance to better protect it

*Austroplebeia australis* with full curtain and partial curtain at entrance at night and times of inactivity (Megan Halcroft)
Stingless bees in tropical areas often modify their entrances especially to protect against weaver (green) ant and other aggressive species

Tetragonula iridipennis (India)

Propolis plug inserted as management practice to reduce hive entrance size after hive manipulation
STINGLESS BEES CAN DEFEND WITHOUT STINGS

Immobilising and imprisoning SHB (Halcroft et al. 2011)

SHB

A. australis worker with resin

Small hive beetle imprisoned
DISEASES OF STINGLESS BEES

• December 2012, Jenny Shanks first observed symptoms in hive of *Tetragonula carbonaria* on WSU Hawkesbury campus, Richmond NSW

• Recorded a range of symptoms in larvae, brood, hive structures and bee behaviour

• SYNDROME: a condition characterized by a set of associated symptoms (but colloquially called *Shanks disease* or *Shanks Brood Disease [SBD]*)

• Isolated, identified and confirmed pathogenicity of the bacterium *Lysinibacillus sphaericus*
Confirmed the causal agent in other *T. c.* hives and also in *Austroplebeia australis* located >20km from WSU.

**In common with AFB**
- Spore-forming, Gram+ rod
- Infects larvae
- +ve matchstick test
- Isolated from hive stores

**Different to AFB**
- +ve catalase test
- Toxin not yet detected

**HEALTHY (a) AND UNHEALTHY (b) BROOD IN *T. carbonaria* hive** (Shanks *et al.* 2017)
**SYMPTOMS OF INFECTED LARVAE**  
(Shanks *et al.* 2017)

Unhealthy larvae (indicated by red circle) detected and removed from brood cells and deposited on surrounding structures (Jenny Shanks PhD thesis)
*T. carbonaria* workers taking out the garbage from trash piles inside the hive (this includes infected larvae)

Brood cells completely dismantled after contents have been removed (Jenny Shanks PhD thesis)
IMPLICATIONS OF BROOD DISEASE

More widely distributed than originally thought

Detected in 3 species of stingless bees

Implications for stingless bee hive management, include movement of colonies and sanitary practices during colony manipulations (e.g. sterilising hive equipment and irradiating dead hives)

May support a case for the contentious issue for registration of managed stingless bee hives, if the disease problem gets worse

Comparison of brood comb composition (LC-MS) between *T. carbonaria* and *A. mellifera*, 2015 (Jenny Shanks PhD thesis)
Stingless bees have some similar and some different parasites and predators to *A. mellifera*
CONCLUSIONS

Stingless bees have some similar and some different parasites and predators to *A. mellifera*

Hives should be especially protected during manipulations such as hive splitting (propagation) and honey extraction

There is currently limited information on stingless bee diseases, but it seems to appear there are less diseases than in honeybees
CONCLUSIONS

Stingless bees have some similar and some different parasites and predators to *A. mellifera*

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This may be because they are less “domesticated” than other managed eusocial bees

Maybe also because greater incorporation of antimicrobial plant resins into their hive structures
CONCLUSIONS

Despite being stingless, they are able to effectively protect their nest entrance and disable intruders.

As stingless beekeeping increases, there may be a need to develop pest and disease management practices more closely resembling those for *A. mellifera*.
THE END