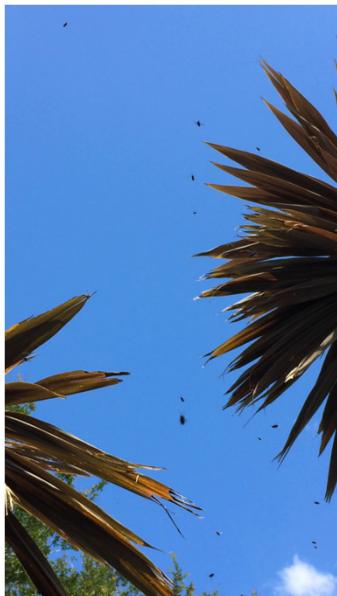
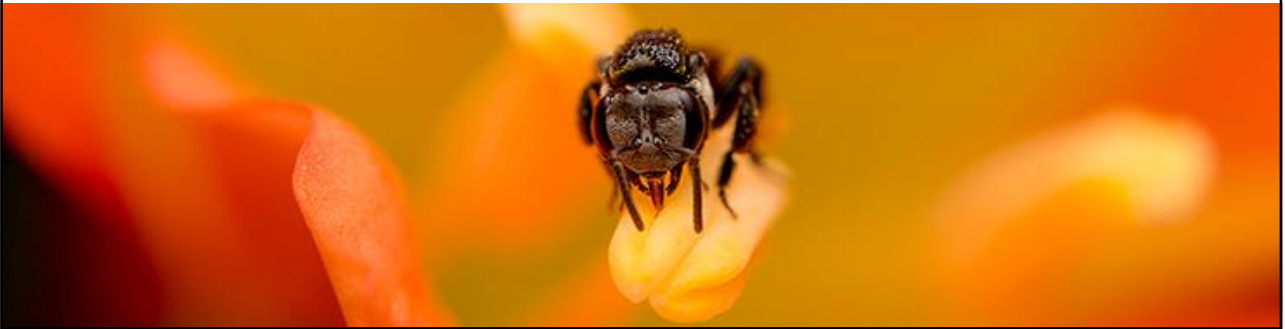


# Fighting swarms and tolerance to crowding in Australian stingless bees



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# Fighting swarms



*Tetragonula* sp.

*sensu* Wagner & Dollin (1982).

Fighting pairs one worker from defending colony and one from attacking colony



Gloag et al. 2008 *Ins Soc*; Cunningham et al. 2014 *Am Nat*.

## Why fight?

Build from scratch  
over many months,  
or....



Colony in need  
of 2<sup>nd</sup> home

Steal one  
ready-made



Gloag et al. 2008 Ins Soc; Cunningham et al. 2014 Am Nat.

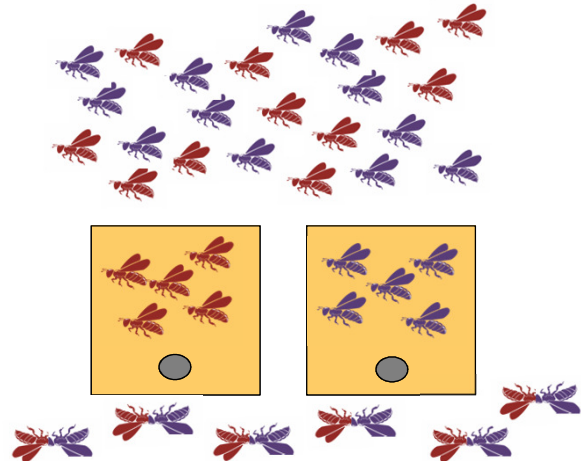
## Fighting swarms



- Swarm = Airforce of defending colony, intercept attackers on the wing
- Collateral damage common (20% fighting pairs are both defenders)

## True fights and Drift fights

- Entry of foreign workers triggers airforce
- Accidental drifters can trigger airforce (→ drift fight)
- <20 intruders in 1 hour sufficient for drift fight



Gloag et al. 2008 Ins Soc; Gloag & Mitchell, unpubl.

## No drift in natural nests



- Naturally-occurring nests in the bush: low density, variable entrance orientation, zero drifters.



Stephens et al. 2017, Biol J Linn Soc.

# Tolerance to crowding

Prevailing wisdom: **minimize drift to minimize drift fighting**



Use same tricks used for honey bees:

- Different colours/patterns
- Different orientations
- Different heights

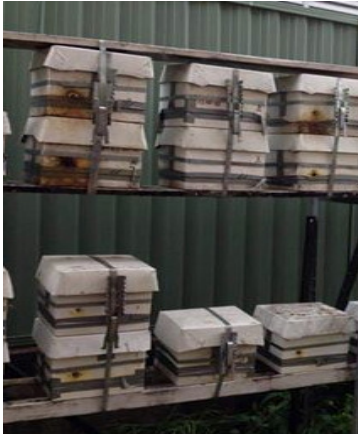


# Tolerance to crowding

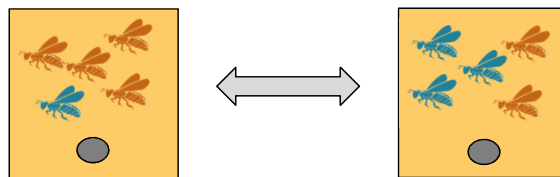


*T. carbonaria* hives (photo credit?)

# High drift between neighbours



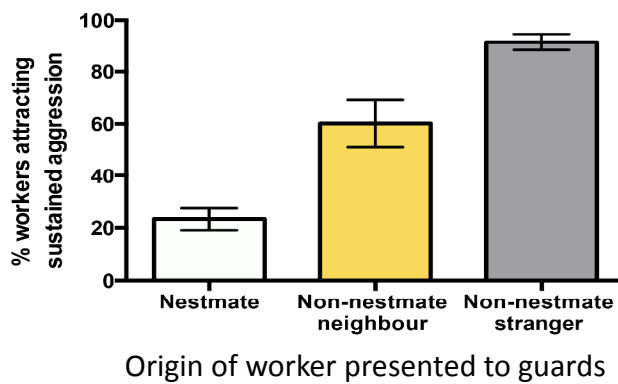
When crowded, up to 40% of all foragers exiting hives originated in other colonies (similar % to other managed social bees).



Stephens et al. 2017, Biol J Linn Soc.

# High drift between neighbours

Guards tolerate foreign workers from nearby, but not faraway, colonies

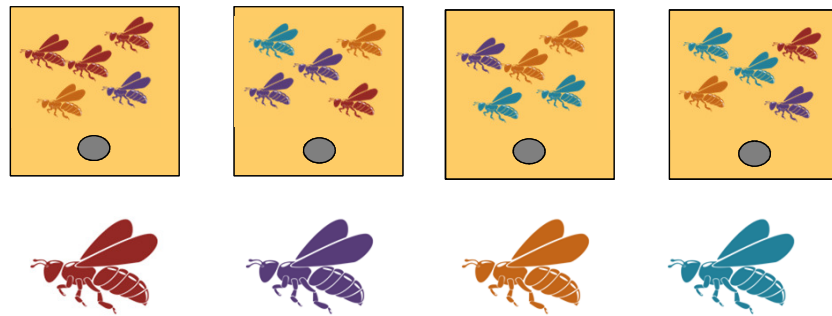


Add chilled bee and see what happens

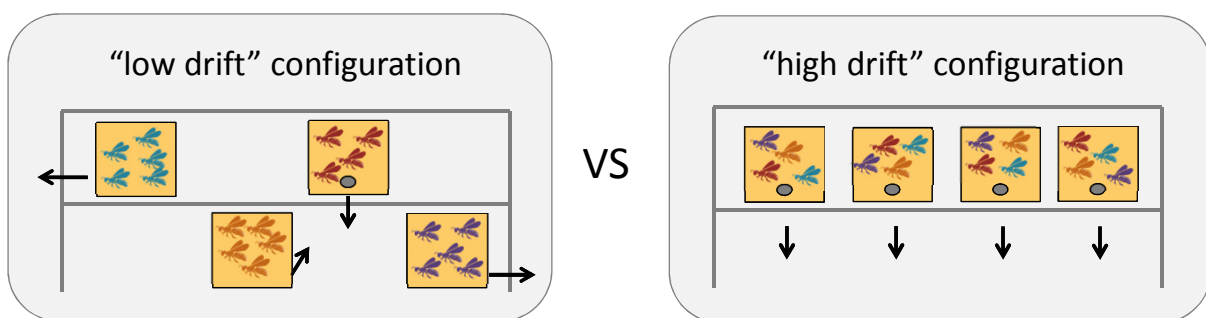
Stephens et al. 2017, Biol J Linn Soc.

## Crowded bees make recognition errors (good news for beekeepers)

So, **maximize drift to minimize drift fighting?**



## Field tests of crowding tolerance



- Phase 1: Compare health/growth after 6 months.
- Phase 2: Compare incidence of drift-fighting after relocation.

Bueno, Heard et al., unpublished data

## What about minimizing *true* fights?

- Possibly mitigate by dividing colonies before they get too strong (but attackers are wild colonies?)
- Crowded colonies may be less likely to attempt usurpations of each other



## Tolerance to honey bee neighbours?

- *T. carbonaria* will defend nest from honey bees if needed, but not by deploying airforce







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