# Asian honey bees in Australia

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*Transfer of parasites*

*Apis cerana*
Asian honey bee (AHB)

*Apis mellifera*
Western honey bee

*Transfer of disease*

*Apis cerana*

Native range

Invasive range

Russia
North Korea
Japan
South Korea
China
Afghanistan
Pakistan
Nepal
Bhutan
India
Bangladesh
Myanmar
Laos
Taiwan
Thailand
Cambodia
Vietnam
Philippines
Sri Lanka
Brunei
Malaysia
Indonesia
Timor-Leste
1970s
Papua New Guinea
Solomon Islands
Cairns
2007
Australia

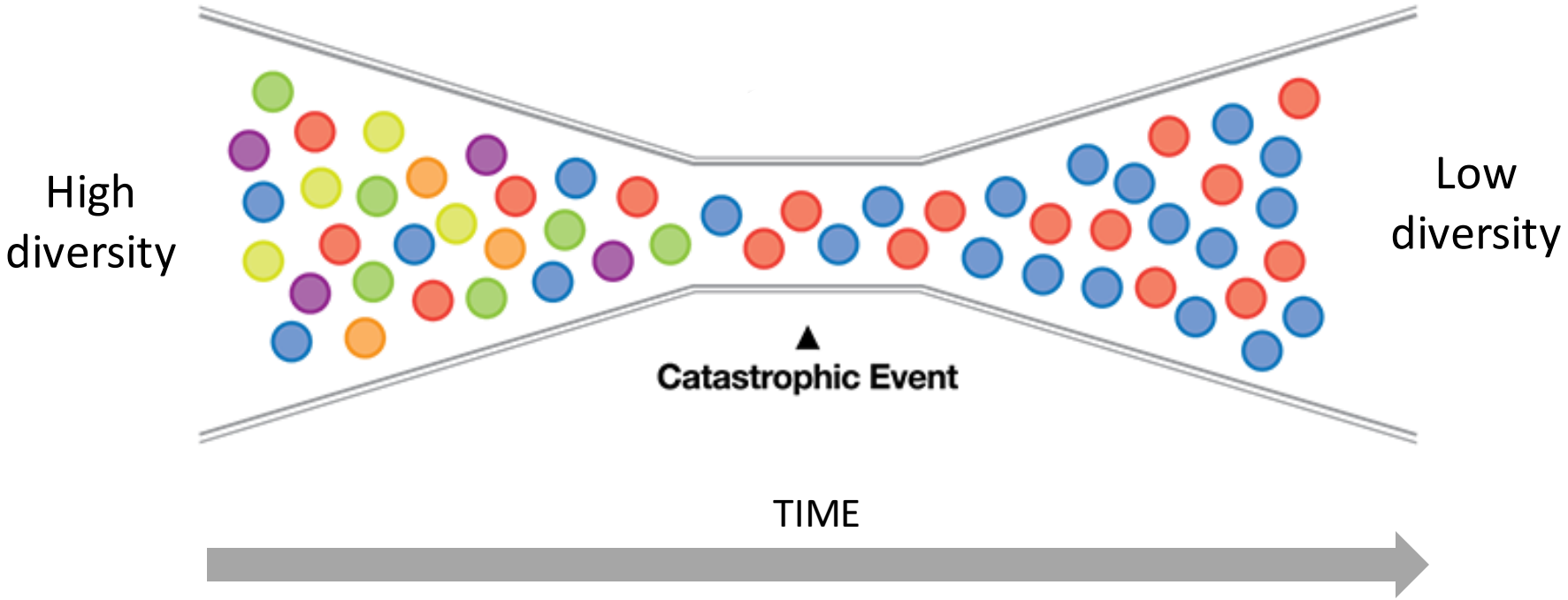
Hagan et al 2024; adapted from Koetz 2012

# *Apis cerana* (tropical strains)

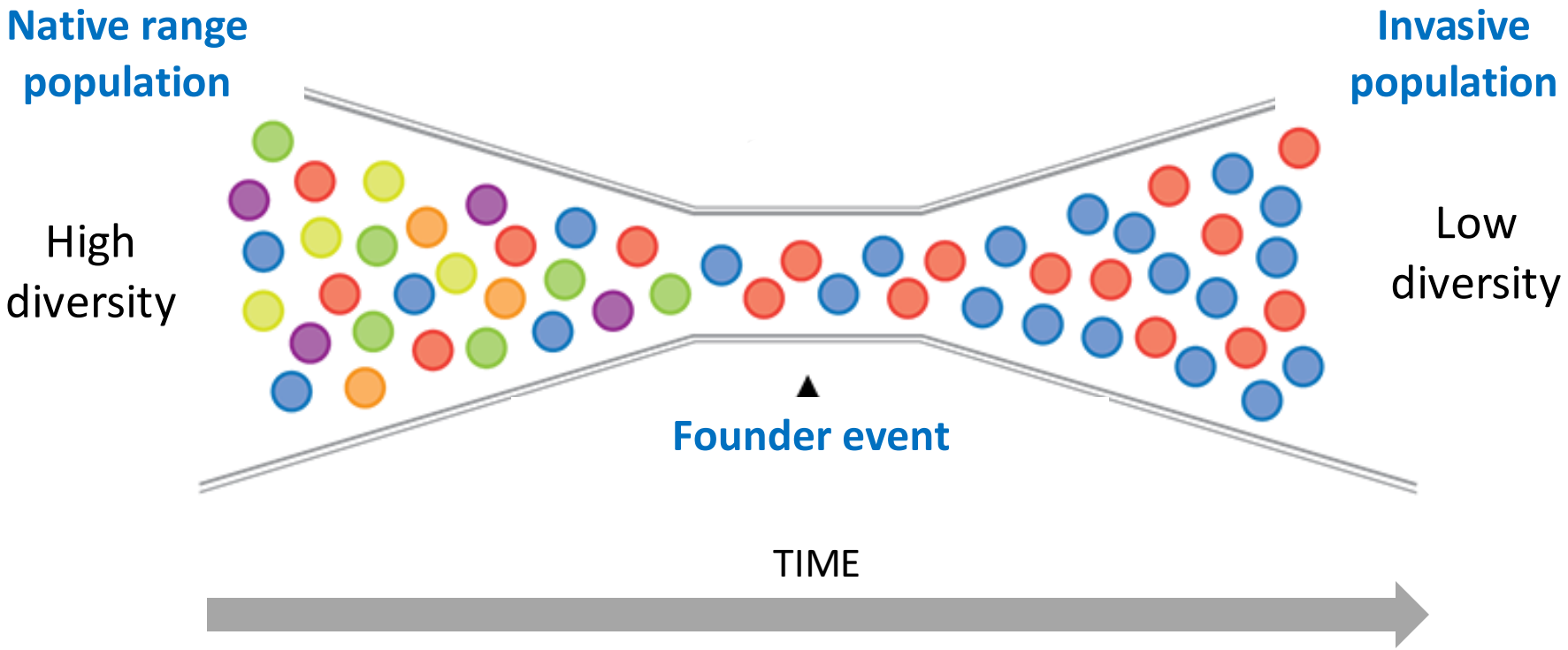
- Generally small colonies (~ 6000 workers)
- Swarm often
- Low honey stores
- High tendency to abscond
  - seasonal absconding
  - emergency absconding

# Good stowaways!


# Genetic bottlenecks



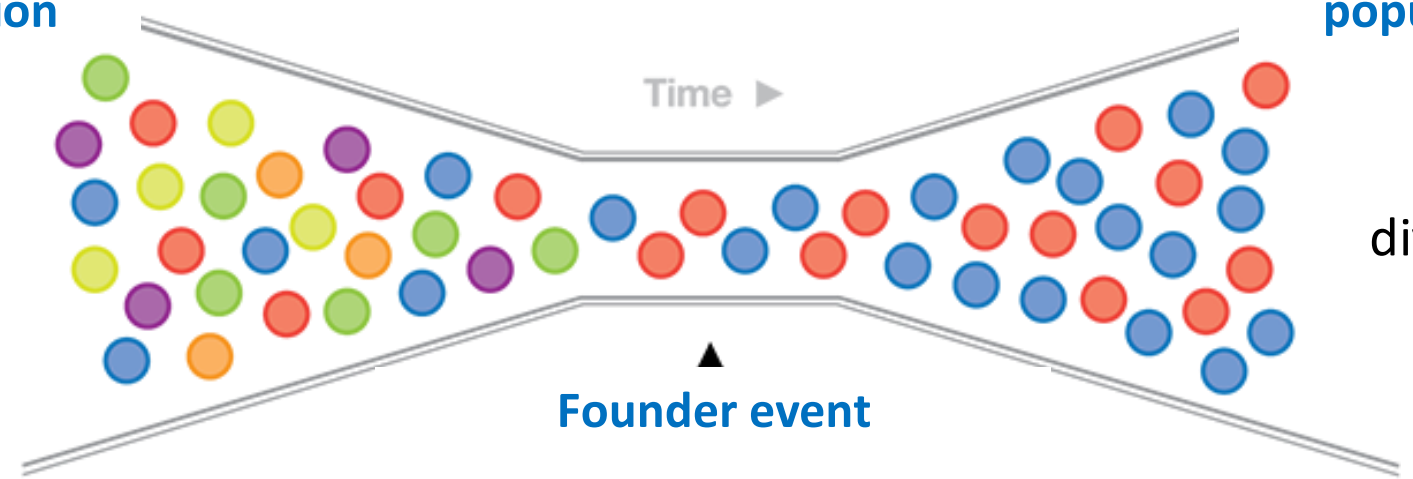
# Genetic bottlenecks



# Genetic bottlenecks

**Native range population**

High diversity



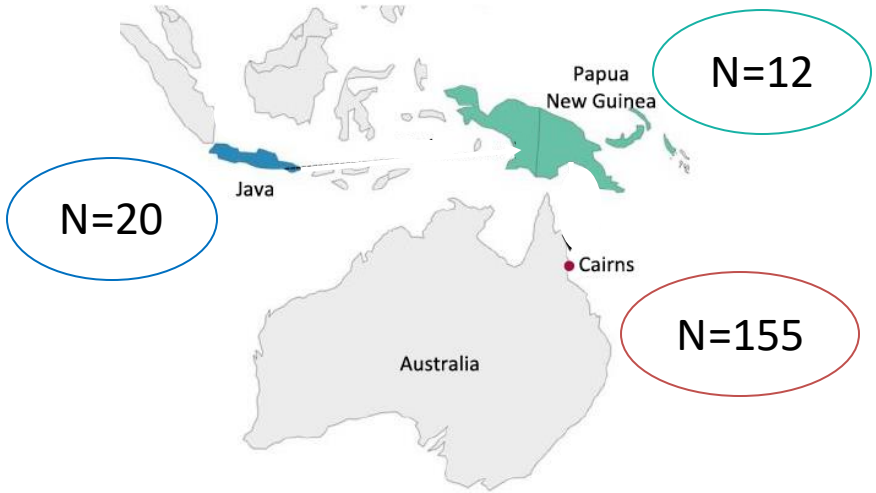

**Invasive population**

Low diversity

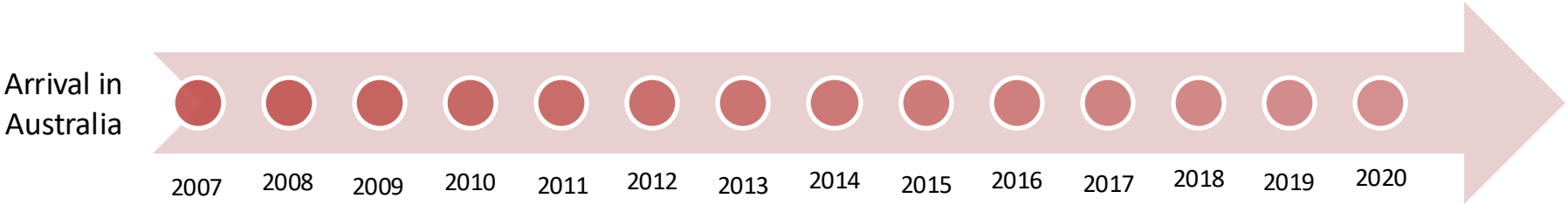
**Founder event**

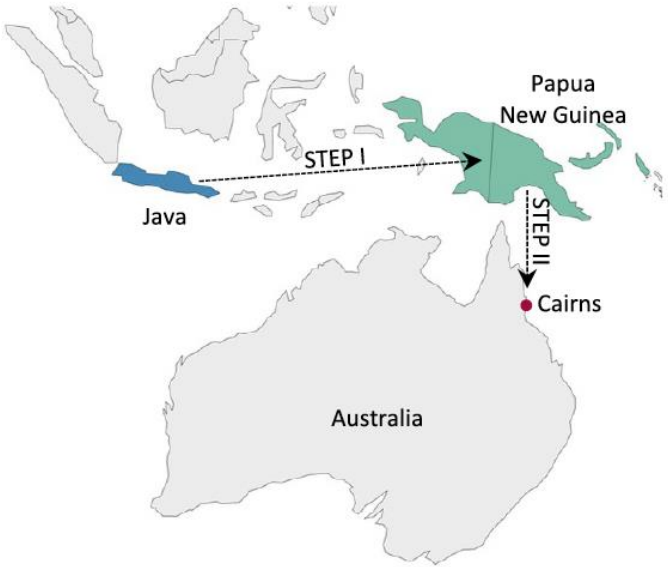
→ reduced adaptive potential
→ inbreeding depression

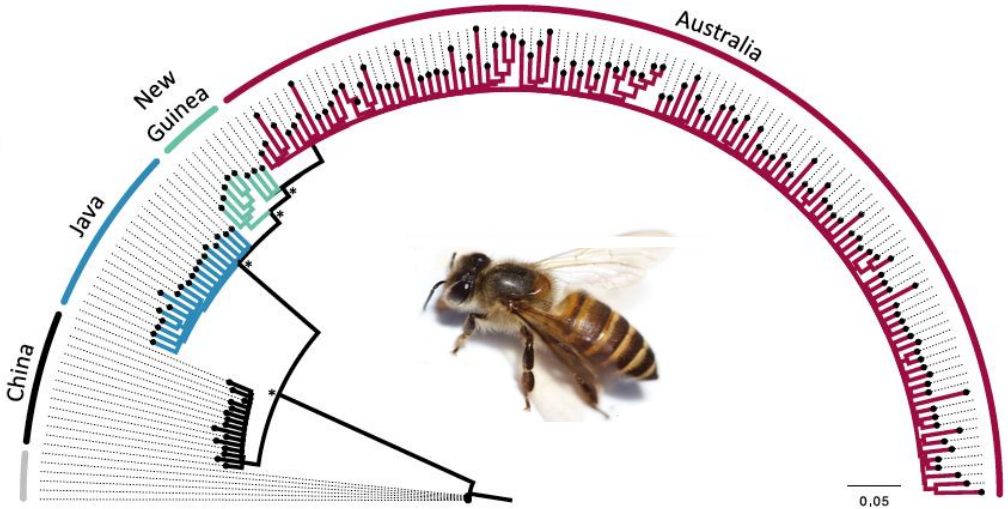
# The Cairns population: genomic time-series




Sampling on Java, Indonesia, 2018



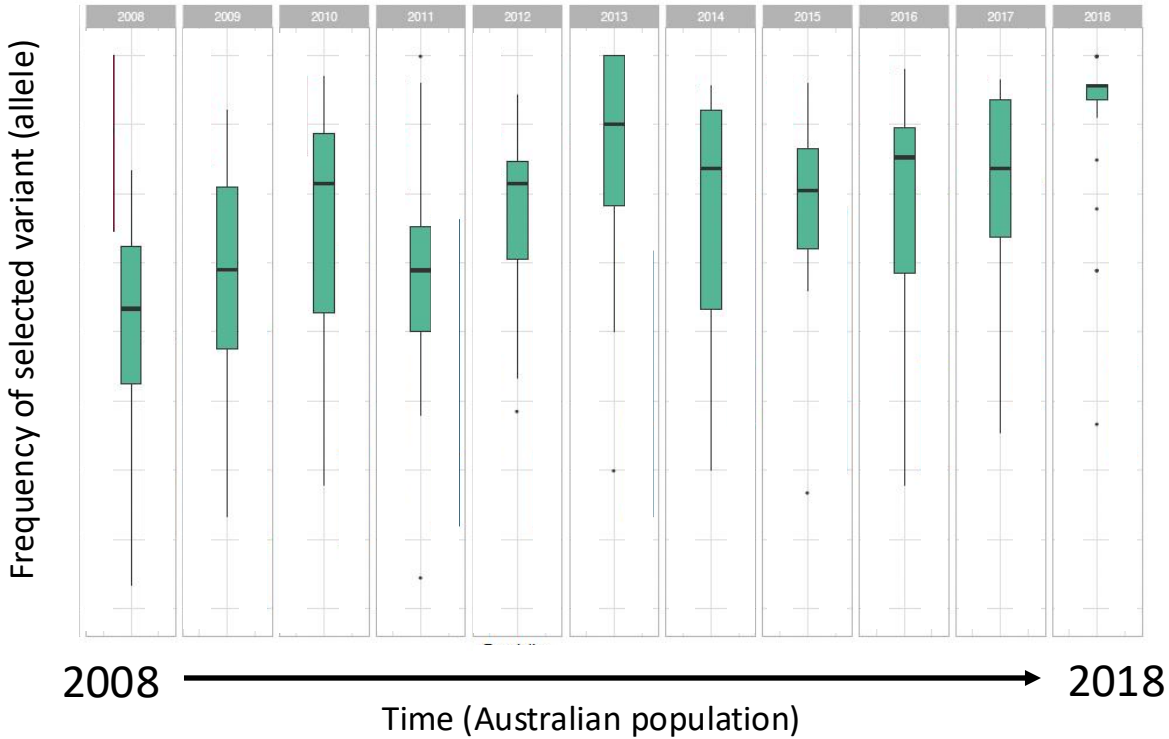



- Single incursion: **one founding colony** (mated queen and her workers)
- Low genetic diversity and genetically distinct to Javan and New Guinean populations

Dogzantis et al 2024

# Genomic evidence of rapid adaptation




Adaptation at genes associated with reproduction and foraging behaviour

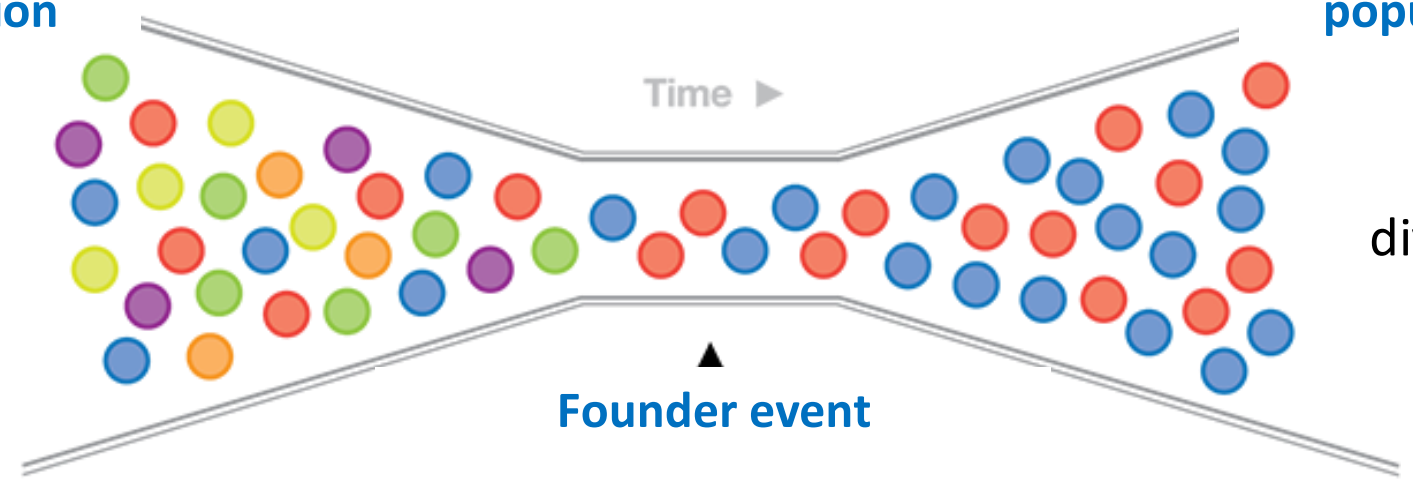
+ many genes with unknown function!

Dogzantis et al 2024

# Genetic bottlenecks

**Native range population**

**Invasive population**




High diversity

Low diversity

**Founder event**

= inbreeding depression ?

# Inbreeding is a problem for honey bees

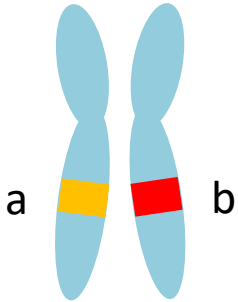
Because sex (male or female) is determined by zygosity at a single gene

Unfertilized egg (haploid)

Normal Male

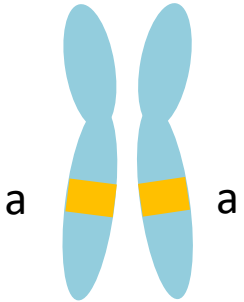

Fertilized egg (diploid)

Female

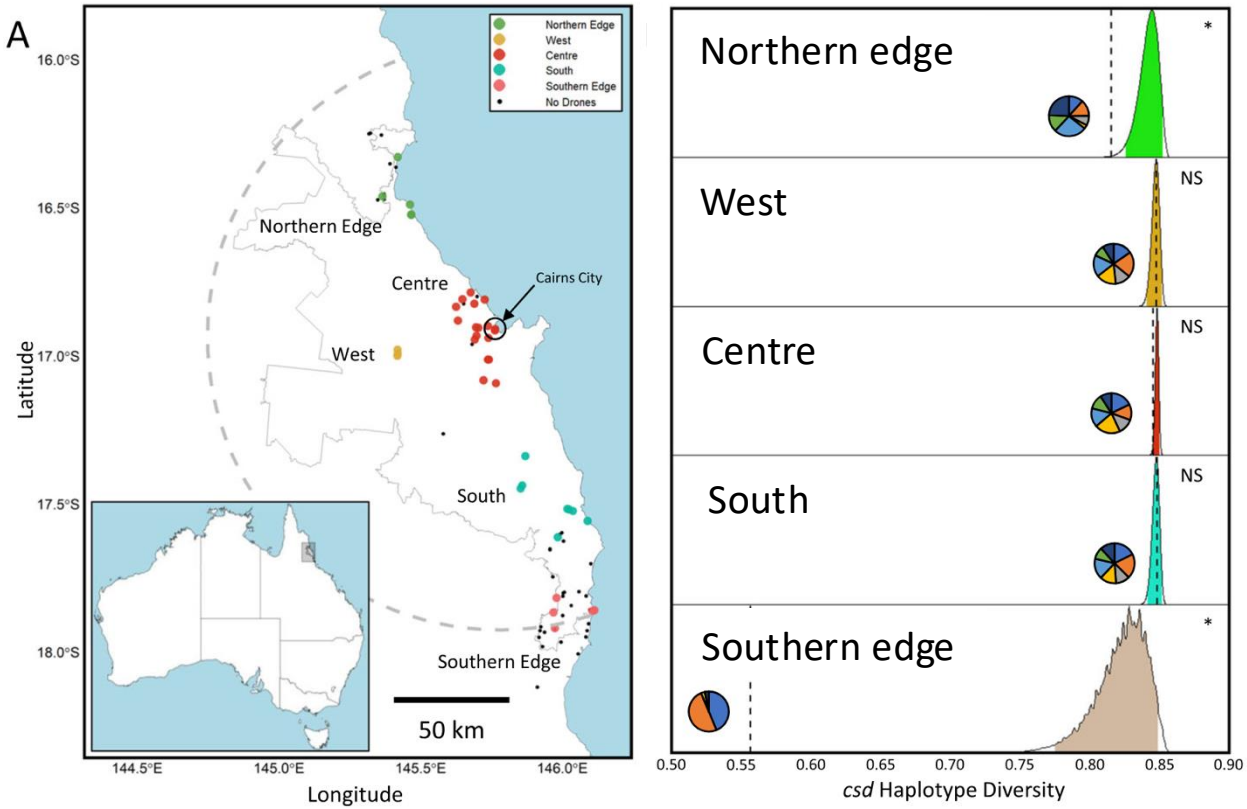




Diploid Male



# Inbreeding depression at range edges = slow rate of spread




Inbreeding depression

Inbreeding depression

Hagan et al 2024

# Biosecurity lessons from the Cairns *Apis cerana* incursion

- Single colony can found a new population
- Once established, populations will rapidly adapt (even if diversity low)
  - “Australia type”
- Inbred populations spread slowly
  - 2nd incursion may cause rapid expansion

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