

# 'Natural' selection for Varroa tolerance on 'islands'

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# Selection for varroa mite resistance:

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## ■ 'Artificial' selection:

- Several selections:
  - MHB (Spivak)
  - SMR (Harbo & Harris)
  - Primorsky (Rinderer)
- criteria:
  - Hygienic behaviour
  - grooming
  - Aggression towards mites
  - Mite behaviour?
    - Reproduction success
    - Entering of cells / phoretic

## ■ Natural selection:

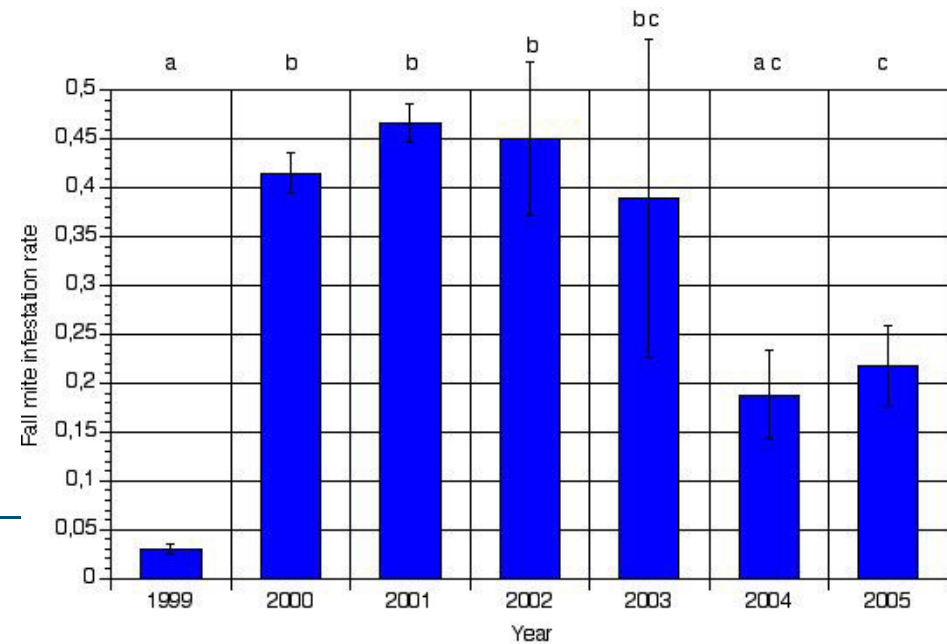
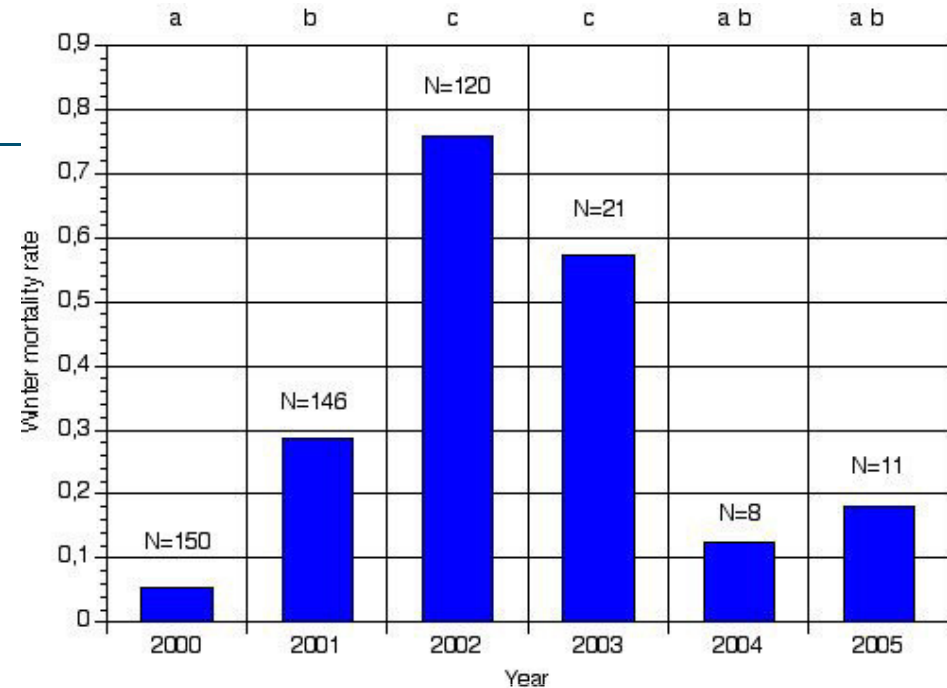
- examples:
  - Primorsky
  - Arnot forest (Seeley)
  - Le Mans & Avignon (LeConte)
  - Gotland (Fries)
    - offspring Gotland
    - (Bommarco; Locke)
  - Tiengemetten
    - offspring Gotland (bijen@wur) 2005
- criteria?



# Islands: Gotland

## ■ Fries: Gotland

- 150 colonies from EU
- Colony winter mortality
- % varroa infestation
  - Less brood
  - Less entering of cells by mites
- Gotland offspring on Tiengemeten
- New experiment: AWD
  - 70 colonies, 'Dutch mix'
  - 50: selection
  - 20: control (treated)



# Gotland → Biesbos → Tiengemeten 2005 vv



- Sept 2005: 18 queens
  - 17 accepted
  - 2006: 11 left
  - May 06: EFB
    - In Gotland, not in control
  - Gotland:
    - Fewer mites in brood
    - More mites on bees
  
    - Cause?
      - selection?
      - EFB?
- summer 2006: stop exp.



# Pilot: Biesbos

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## ■ Daughter colonies 2007:

- 26 colonies, mixed:
  - offspring Gotland
  - offspring control
- Mites killed July 2007
- Sept: 16 colonies wintered:
  - Sept: 5 mites /100 bees

## ■ 2008 survivors:

- 12 colonies:
  - **offspring GL: 9 (/9)**
  - **control: 3 (/7)**

■ “Conclusion”: too interesting to stop! So: →

■ Tiengemeten (island)

■ Unfortunately:

- no control group , without varroa selective pressure



# Autumn 2008

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- We know noothing!
- However: curious



# Approach new trial: AWD, something different

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## ■ 2008: 50 young colonies

- Young queen
- 2-3 combs with brood & bees
- added sugar paste
- no varroa treatment
  - assess varroa infestation

## ■ Control: 20 colonies

- similar
- during mating different place
- with varroa control (2X)

## ■ 2008:

- selection: end of summer:
  - size: big enough to over winter
  - % mite infestation
- selection: spring:
  - growth of colonies
  - production of drone brood
- half May: ~ 20 combs:
  - remove queen
- after 14 days: split colonies
  - 2-3 combs, one virgin queen
- → AWD:





→ AWD:

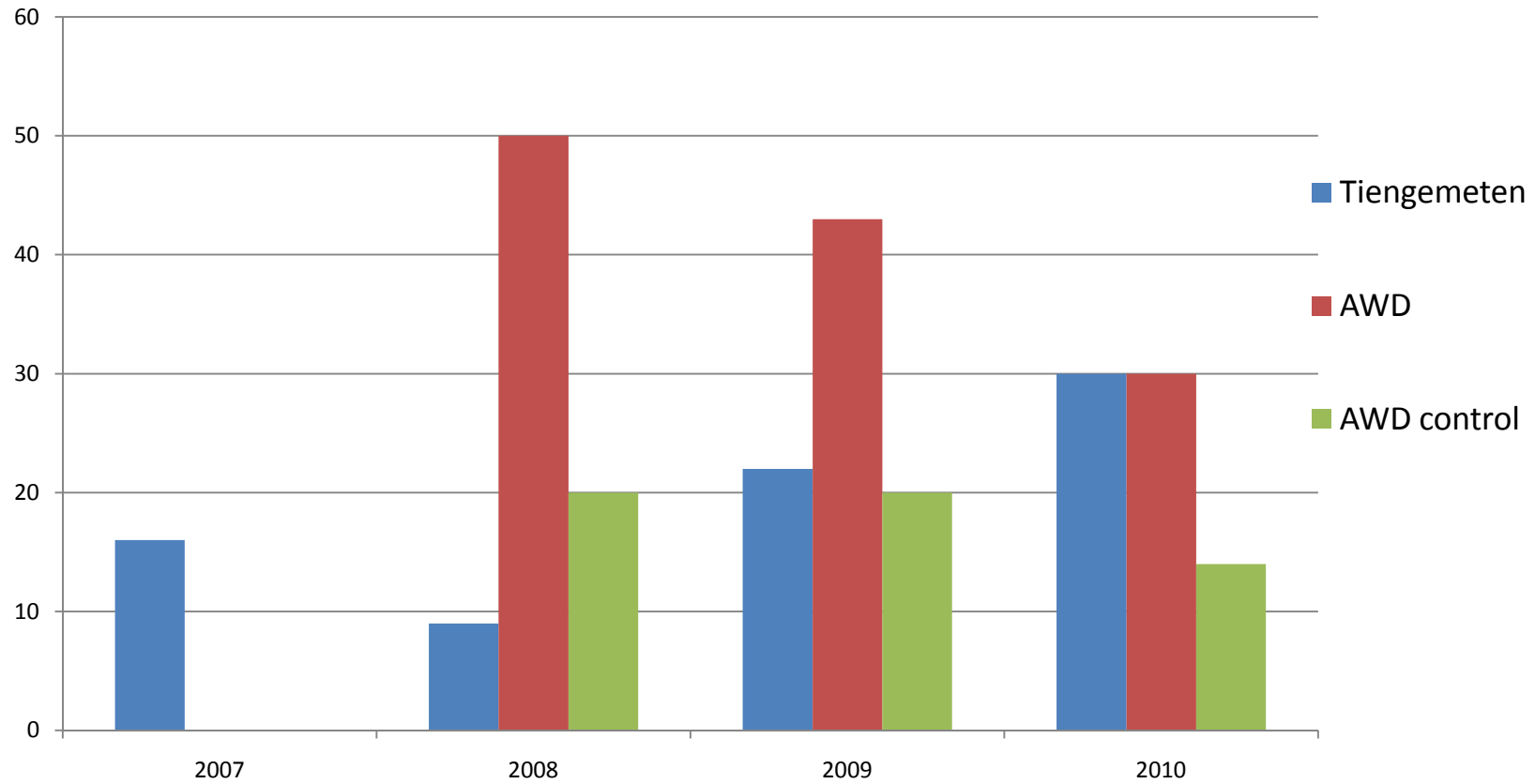
- queen mating
  - own drones
  - select successful colonies
  - placing in Lelystad
- Next years:
    - repeat procedure:
  - Controls: same, but:
    - mite control in July and Dec/Jan (oxalic acid).



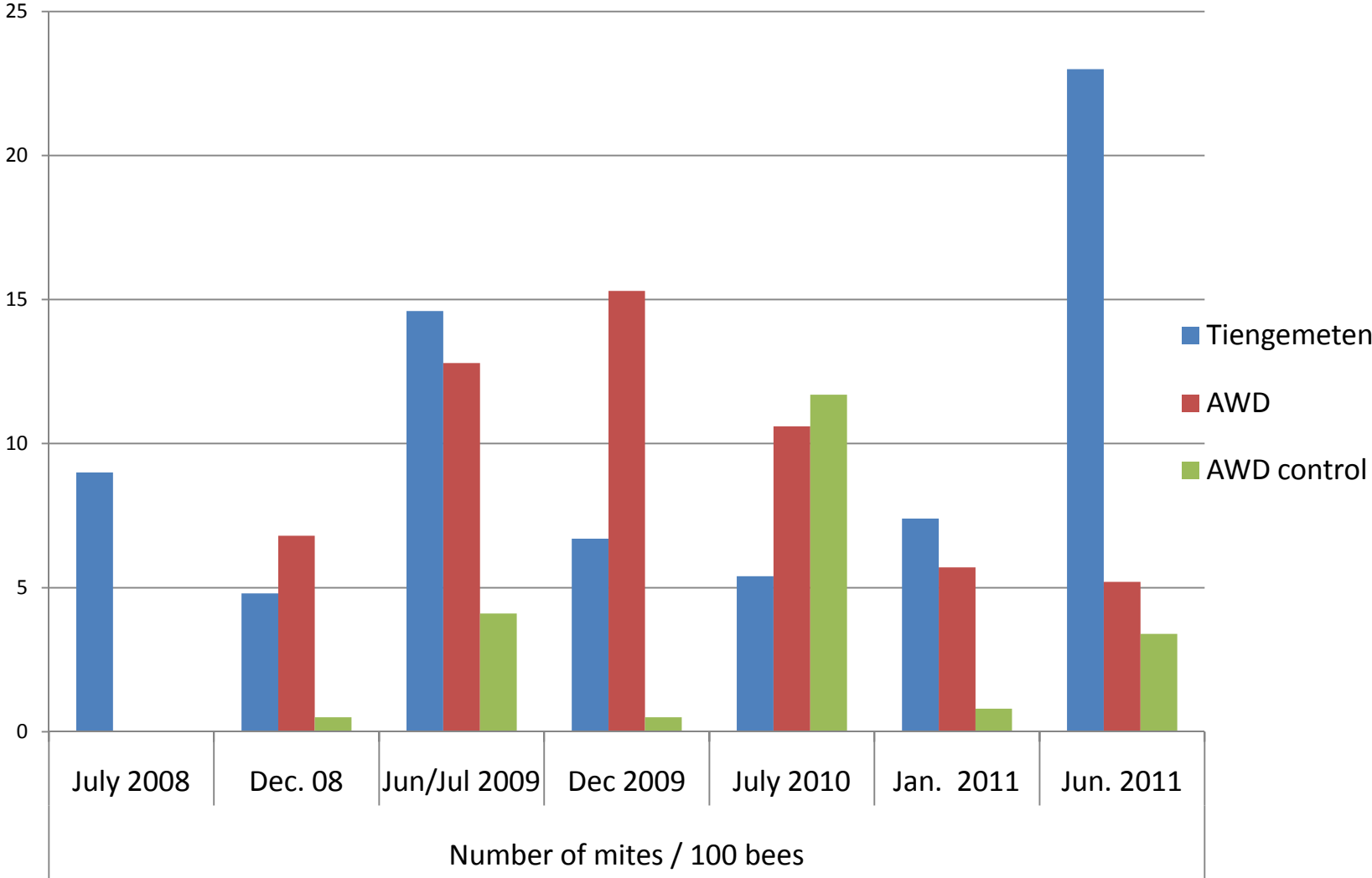


# N colonies for wintering (Oct)

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# Mite infestation



# Conclusions so far:

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## ■ Colonies develop well

- faster growth of bee population than mite population
  - Some periods yes; some periods no
- great losses of colonies:
  - overwintering losses
  - some colonies: no growth in spring
  - some/ many colonies do not produce drones: → out
  - failing queens
  - drop out of young colonies during summer (few)
  - selection in autumn: colony size and health

## ■ Selection?

- differences Tiengemetten (Gotland vv) /AWD / controls?
- if so: through which mechanism?



# New experiment 2011: Michiel Glorius

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## ■ Spring 2011:

- Using the 2010 queens (removed anyhow) of successful colonies
  - Growth, drone production
- Introduce in 'clean' colonies
  - Empty frame in center
  - After 7 days: → larvae →
  - Heavily infested colony (mite shower)
  - after 2 days: → nurse colony
  - After 10 days: freezer

## ■ After defrosting:

- Reproduction mite: yes / no
- Offspring per mother mite
- Male present / absent
- Developmental stages (Martin 1994)
- Delayed egg laying: yes/ no



	Fecundity	Infertility	Male absent	Delayed Laying
Lelystad	1.92	0.06	0.16	0.10
SEM	0.11	0.02	0.03	0.02
P	< 0.001	0.220	0.003	0.757
Tiengemetten (GL)	2.02	0.09	0.14	0.06
SEM	0.08	0.01	0.02	0.01
P	< 0.001	0.003	< 0.001	0.184
Control	2.49	0.03	0.06	0.09
SEM	0.10	0.01	0.02	0.02



# Conclusion

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