In partnership with

SURVIVORS Workshop

Proceedings

Avignon, France, 5-6 April 2017

SURVIVORS WORKSHOP

Topic
- Launch of the Task Force

When
- 5-6 April 2017

Where
- Avignon (INRA), France

Schedule

05/04/2017

9:00-10:00	Inaugural and definition of Survivors
10:00-11:00	Short talks
11:00-11:30	**Coffee/snack break**
11:30-12:30	Speed talks: What do you know about surviving populations in your country/region?
12:30-13:00	Morning session wrap up – Map of known surviving populations
13:00-14:00	**Lunch**
14:00-14:15	The ethnography approach
14:15-15:15	What strategy to identify surviving populations?
15:15-16:00	Session wrap up – proposal for identifying surviving populations
16:00-16:30	**Coffee/snack break**
16:30-17:30	TF division of labor: Who does what to identify populations? Where and When?
20:00-	**Social dinner**

06/04/2017

9:00-9:30	Start with coffee
9:30-10:15	How to verify identified populations?
10:15-10:45	Brain storming on mechanisms for survival
10:45-11:15	**Coffee/snack break**
11:15-12:30	Future TF projects: pan-European Ring Test to investigate mechanisms for survival: Possible funding options
12:30-13:00	Workshop conclusions and agenda
13:00-14:00	**Lunch**

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Abstracts

Abstract

Selection for honey bee survival and vitality without Varroa mite control creates Varroa resistant populations

Blacquière; Tjeerd; Panziera; Delphine

Wageningen Plant Research WUR; Wageningen; The Netherlands

Since 2008 two populations of honeybee colonies have been subjected to natural selection pressure by the Varroa mite. From one of these populations 20 colonies have been separated from the beginning, and serve as a control group, in which the mite has been controlled twice a year. Mating of each population took place at a remote area, within the population. The colonies were selected for good growth, winter survival and spring development including reproductive output (male and female). After > five years of ongoing selection these populations show varroa resistance, proven by reduced colony losses, moderate varroa infestation levels and slow mite population growth, all in comparison to the control colonies.
Mechanisms involved in the resistance have been shown to include reduced mite reproduction (both fertility and fecundity impaired) and varroa sensitive hygienic behaviour. Grooming (of mites) behaviour had not increased, and none of the populations showed increased hygienic behaviour in response to pin-killed or freeze killed brood.
Apart from the two authors mentioned, Willem Boot, Johan Calis, Chula Hokahin, Arnout berendsen, Astrid Kruitwagen, Michiel Glorius, Thijs Gerritsen, Anne van Woerkom, Janse Heijn, Jolanda Tom & Janneke Elderson contributed to the research.

Abstract

Seasonal cycle of inbreeding and recombination in Varroa destructor

Alexis L Beaurepaire ; Klemens J Krieger ; Robin F A Moritz

Varroa destructor is the most devastating parasite of the Western honeybee, Apis mellifera. In the light of the arm race opposing the host and its parasite, the population dynamics and genetic diversity of these organisms are key parameters. However, the life cycle of V. destructor is characterized by extreme inbreeding due to full sibling mating in the host brood cells. We here present an equation reflecting the evolution of inbreeding in such a clonal system, and compare our predictions with empirical data based on the analysis of seven microsatellite markers. This comparison revealed that the mites perform essentially incestuous mating in the beginning of the brood season. However, this pattern changes with the development of mite infestation. Despite the fact that the overall level of genetic diversity of the mites remained low through the season, multiple inbred lineages were identified in the mites we sampled in June. As a response to the decrease of brood availability and the increase of the parasite population in parallel in the colonies, these lineages recombined towards the end of the season as mites co-infest brood cells. Our results suggest that the ratio of the number of mite per brood cell in the colony determines the genetic structure of the populations of V. destructor. This intracolonial population dynamics has great relevance for the selection of acaricide resistance in V. destructor. If chemical treatments occur before the recombination phase, inbreeding will greatly enhance the fixation of resistance alleles at the colony level.

Abstract

Estimating regional Varroa threshold levels across Europe

Meixner, Marina; Uzunov Aleksandar; Buechler Ralph

LLH Bee Institute Kirchhain, Germany

Observations on colony losses in different regions of Europe and data from previous experiments, such as the genotype-environment study, suggest that critical mite infestation thresholds for colony survival may vary substantially across Europe. However, few reliable datasets are available from most regions of Europe. As part of the breeding activities within the SMARTBEES project, data on colony size, infestation levels and survival of >800 colonies belonging to eight subspecies from all over Europe have been collected and are analyzed for mite infestation thresholds. In addition, systematic investigations have been initiated in several countries, where untreated colonies are closely monitored for several years, and data on mite infestation in brood and on adult bees are collected together with data on natural mite mortality, colony strength and survival. The data will contribute to the identification of regional Varroa thresholds as an essential prerequisite for the development and implementation of threshold-based treatment decisions and IPM strategies.

Abstract

Reproductive parameters of female Varroa destructor in artificially and naturally infested honeybee brood cells

Claudia Häußermann; Bettina Ziegelmann; Rosalie Munz; Peter Rosenkranz

Apicultural State Institute, University of Hohenheim,Germany

During reproduction of Varroa destructor in Apis mellifera worker brood up to five eggs are considered as the normal “reproductive program” (Garrido and Rosenkranz 2003, Martin 1994). However some female mites remain unfertile and do not reproduce at all. Infertility rates vary between 5 and 18 % (Fries et al. 2011). In our study we wanted to update data on reproductive parameters of V. destructor in worker brood. Therefore we did an extensive screening of brood cells infected naturally and artificially with V. destructor (> 700 brood cells in total). We compared several reproductive parameters like the infertility rate and the number of offspring per mother mite in naturally and artificially with V. destructor infected honeybee brood cells. Our results show that artificial infestation is a suitable method to measure reproductive parameters of V. destructor with only slight differences to naturally with Varroa mite infested brood cells.

Workshop Summary

- **Welcome** by Yves Le Conte and Fanny Mondet (Local organisers)

- **Introduction by Peter Neumann**

Update on situation of surviving colonies in Europe
Definition of survivors: a population of European honey bee subspecies, *Apis mellifera*, (managed, feral or wild) surviving > 10 years without any varroa treatment

> 10 years	gold standard
> 5 years	silver standard
> 3 years	candidates
Identification:	Articles in beekeeping journals
	Questionnaires
	Personal knowledge

Mechanisms
Action plan

- **Short talks by several people**

- **Discussion**

Varroa is considered a pest → you have to treat! (In Germany, it is illegal no to treat)
We must make sure that claims are made anonymous
A colony is not immortal
What is the unit? The nest, the colony, that apiary, the queen, the population
Check Seeley and Oldroyd for natural rates of colony life expectancy
We have to work with veterinary services
Brood removal method is becoming more and more popular (ex in Belgium). Does this mimic swarming
Importance of the presence of cavity nests in the environment
Check Coloss monitoring survey: look for beekeepers that don't treat and have low losses
Mechanisms can change over time (cf South America had low mite reproduction in the 90's but now it is normal again)

- **Definition of Survivor**

European honey bee subspecies – but possibility to include outgroups (e.g. Africanized…)
Surviving varroa (may die from something else)
No varroa management strategy

- **The Anthropology approach** – *Dorothée Dussy*

Combine objective and subjective data
Identify practices that may be helpful to survive varroa
Discussion: We need to find a way not to miss any candidate

- **To do list**

Strategies to identify candidates (managed, feral):
1. First layer
    - Personal contacts *(each member of TF)*
    - Coloss call: ask Coloss members *(Peter and Fanny write a proposed email),* first personal contact and then email (+www).

- Questionnaires, with national contact points (to contact beekeeping journals and get answers back – could be authors on papers). What is the motivation? Join the network of Survivors, with the aim to make bees more tolerant to varroa. Calls in September-October (after beekeeping season).
- Coloss data mining from monitoring group *(Angela)*

2. Data collection
3. Subjective map of survivors (for spring 2018)

- **Tjeerd's proposal: generating survivors ourselves**

Start selection efforts now, to get gold standards in 10 years
Need of isolated apiaries, at least for the candidates.
2 apiaries: 10 controls (treated), 20/25 candidates
Get colonies from different beekeepers, but from a local area.
Protocols to be sent by Tjeerd and Peter

- **Verifying survivors**

Ask questions to the beekeepers who replied, in order to classify the answers (5 questions max – *Raffaele*)
Depending on local resources and number of candidates, visits to the beekeepers (interviews, phone calls…).
Pay attention to records
Aim = objective map of survivors

- **Fund raising**

Behind the scene actions EU, ERA-NET, (Swiss) Foundations *(Fanny and Peter* – 1 page)
Mac Arthur, Bill Gates, Black box and maybe even understanding the mechanisms

- **Next meeting**

Bern, Switz

Participants

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