OP-158 [Bee Health]
Small hive beetle reproduction in association with honeybee colonies

Peter Neumann[1], Aura Palonen[1], Giuseppe Carullo[2], Giovanni Federico[3], Giovanni Formato[4], Jay Evans Evans[5], Francisco Posada Florez[5]
[1]Institute of Bee Health, Vetsuisse Faculty, University of Bern
[2]Azienda Sanitaria Provinciale di Reggio Calabria, Dipartimento di Prevenzione, UOC Servizio sanità animale (area A)
[3]Istituto Zooprofilattico Sperimentale del Mezzogiorno
[4]Istituto Zooprofilattico Sperimentale del Lazio e della Toscana "M. Aleandri"
[5]U.S. Department of Agriculture -Agricultural Research Service (USDA-ARS) Bee Research Laboratory, Beltsville, MD, USA

Small hive beetles (SHB), Aethina tumida, are parasites of honeybee, Apis mellifera, host colonies. SHB are known to display destructive mass reproduction on combs or cryptic low-level reproduction in debris. However, field observations indicate that SHB reproduction may not always fit these categories. Here, we show that reproduction in debris can be common and equal in numbers of larvae those on combs calling for a redefinition of SHB reproduction and respective field mitigation.

Numbers of SHB adults and larvae were measured in non-managed honeybee nests in Italy (Calabria) (n=9), as well as in managed Langstroth hives in Italy (Calabria) (n=50), the United States (Maryland) (n=30) and in Australia (New South Wales) (n=30). The data were combined with published data from traditional African bark hives from Benin (n=20). All data were gathered by visually screening the entire nest/hive for SHB adults and larvae. We tested whether the occurrence of debris reproduction (i.e. the presence of SHB larvae in the hive debris) or the number of SHB adults and larvae differed between the three types of honeybee colonies. Additionally, we tested whether the number of SHB larvae correlated with the number of SHB adults. The results show that debris reproduction occurs more rarely in Langstroth hives and when it does occur the Langstroth hives also have less SHB larvae. The data also show a positive correlation between the number of SHB adults and SHB larvae.

Since SHB infestation levels in Africa can match those in Australia or the US despite the apparent absence of destructive mass reproduction it seems apparent that the importance of debris reproduction has been severely underestimated. Indeed, thousands of larvae were found in the debris of a single feral colony in Italy. Further reproduction on combs is not necessarily destructive to the colony. In conclusion, it seems overdue to change terminology into comb and debris reproduction of SHB respectively. Further, beekeepers are kindly advised to limit debris or to use mashed bottom boards to limit SHB numbers.

Small hive beetle reproduction in association with honeybee colonies

Aura Palonen[a], Giuseppe Carullo[b], Giovanni Federico[c], Giovanni Formato[d], Jay D. Evans[e], Francisco J. Posada-Florez[e], Jeff Pettis[f], Peter Neumann[a,*]

[a] Institute of Bee Health, University of Bern, **Switzerland**; [b] Azienda Sanitaria Provinciale di Reggio Calabria, **Italy**; [c] Istituto Zooprofilattico Sperimentale del Mezzogiorno, **Italy**; [d] Istituto Zooprofilattico Sperimentale del Lazio e della Toscana "M. Aleandri", **Italy**; [e] USDA-ARS Bee Research Laboratory, Beltsville, **USA**

* corresponding author: peter.neumann@unibe.ch

Lorenzo Langstroth

Small hive beetle reproduction

Mass reproduction	Cryptic low-level reproduction
1000's of larvae, often collapse of entire nest	Few larvae, no damage to nest, hard to notice by the beekeeper

Lundie 1940, Spiewok & Neumann 2006,
Neumann et al. 2016

Small hive beetle reproduction

Mass reproduction

A few dozen larvae in corner, e.g. frame too close to hive wall (ML, USA)

Cryptic low-level reproduction

Many larvae in the debris (NSW, Australia)

Neumann, unpublished observations

Small hive beetle reproduction

Mass reproduction

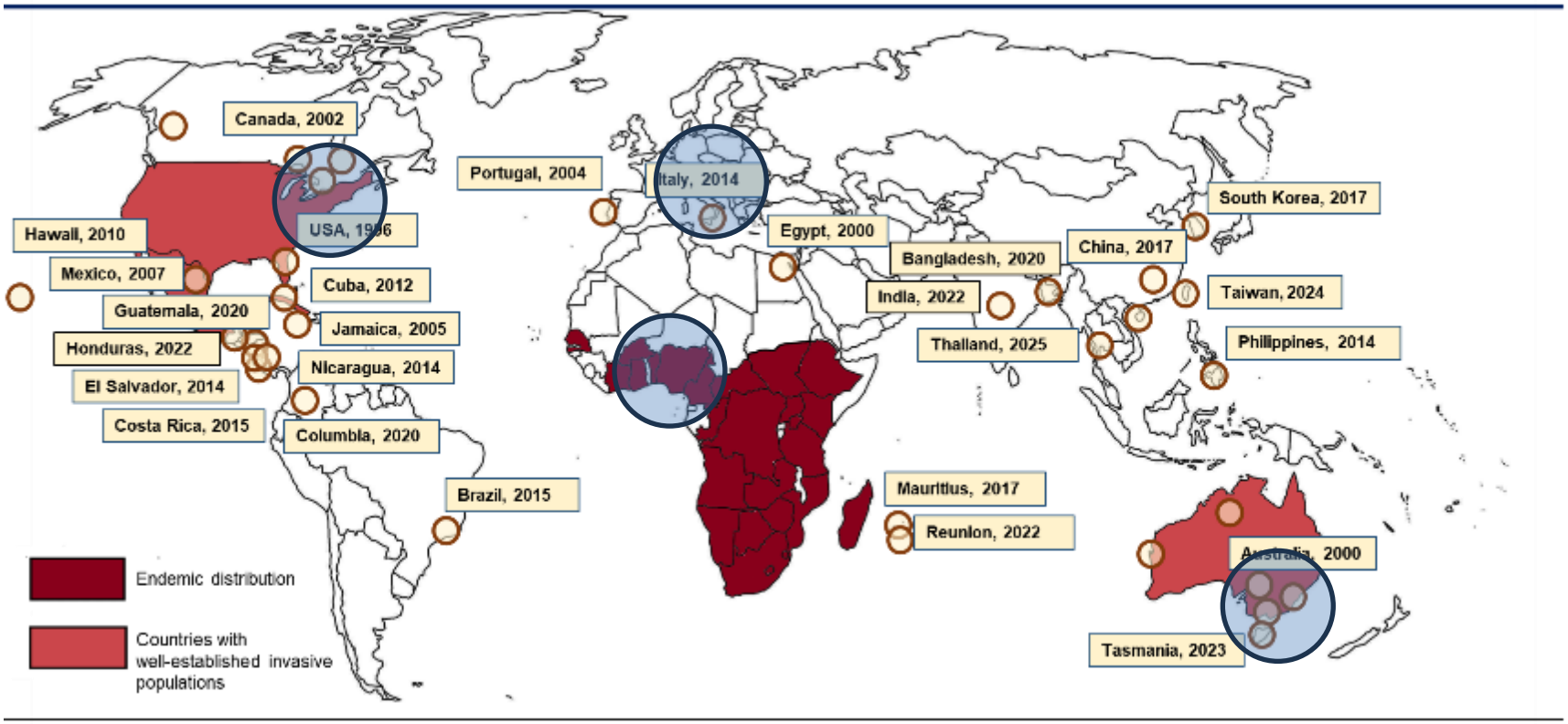
Cryptic low-level reproduction

Maybe we got something wrong…

How do small hive beetles reproduce?

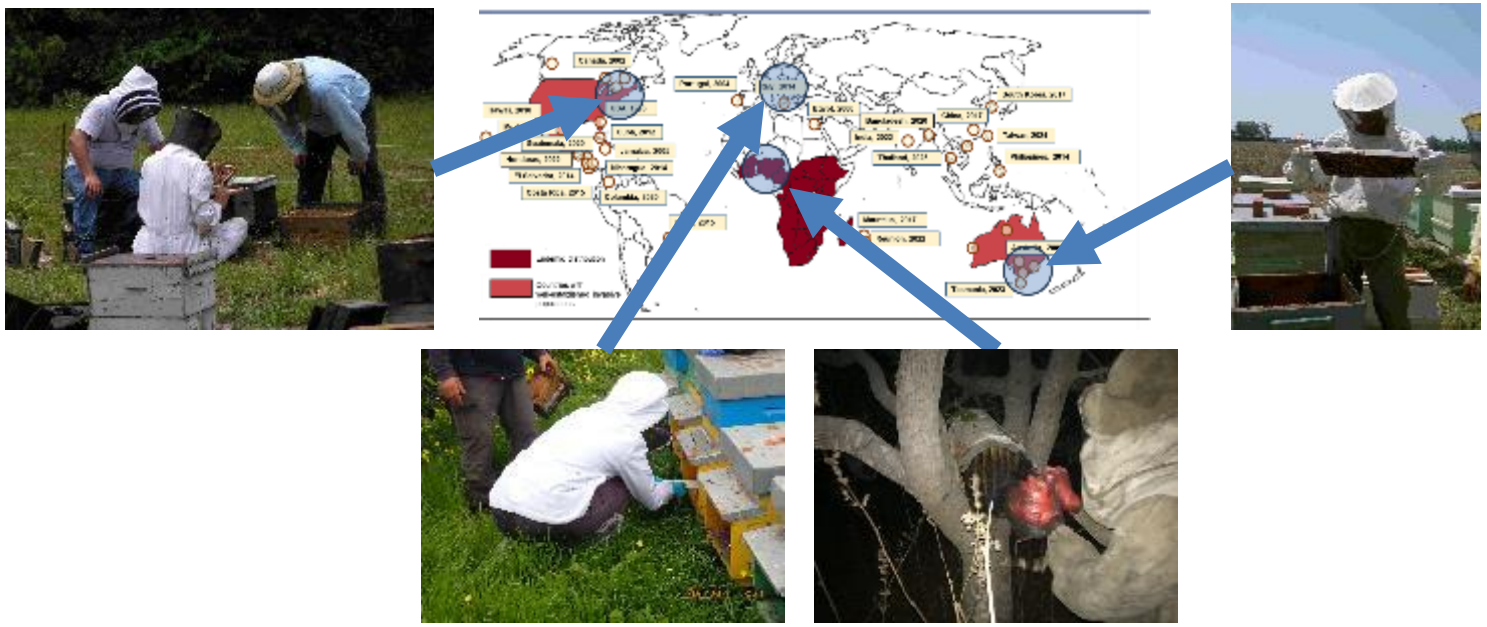
Lundie 1940, Spiewok & Neumann 2006, Neumann et al. 2016

Sampling



Current distribution of smal hive beetle (SHB) Neumann et al., 2016; Lee et al., 2017; Toufailia, 2017; Muli et al., 2018; Ouessou Idrissou et al., 2019; Liu et al., 2021; National Phytosanitary Diagnosis Laboratory, Columbia 2021; Laboratorio de diagnóstico zoosanitario MAGA Guatemala 2021; OIE WAHIS, 2022 & 2024; General Biosecurity Direction, 2023; Orozco, 2024; Hossain et al., 2024; Maheshwari, 2025, Beaurepaire et al., under consideration

Sampling

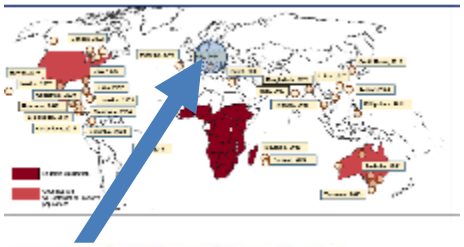


Careful visual screeening of the entire nest for SHB larvae and adults (20-60 min pending nest size)

Australia, Italy & USA: **Langstroth hives**
Calabria, Italy: 9 **non-managed** & 160 managed colonies; NSW, Australia: 30 managed colonies; ML, USA: 30 managed colonies; **Benin:** 20 managed colonies in **traditional bark hives** (from Ouessou Idrissou et al. 2019); **total <u>N=249 colonies</u>**

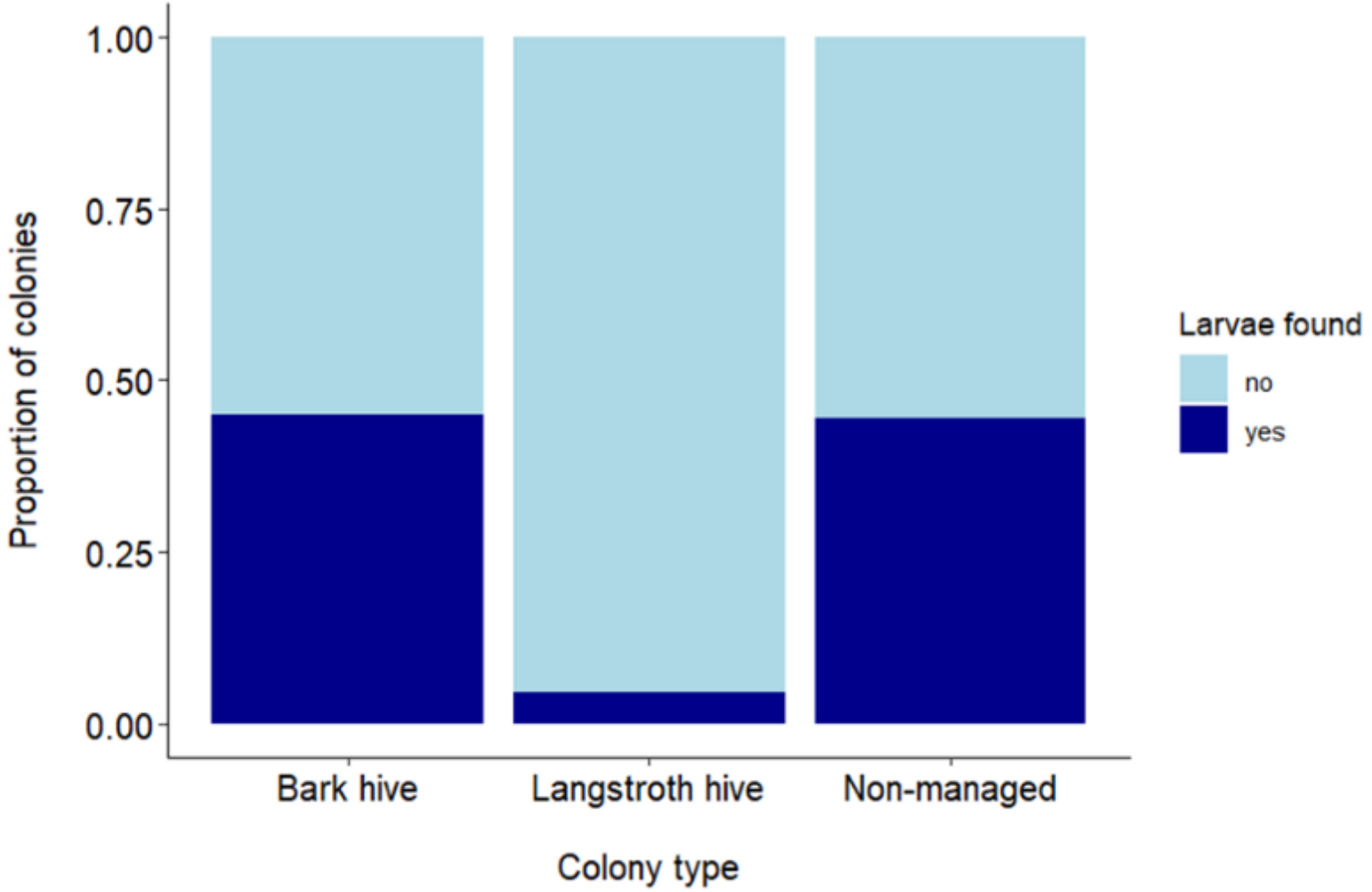
Neumann et al., 2013; Cornelissen & Neumann, 2018; Palonen et al. 2025

Non-managed colony in Italy



(a) opened barrel; b) upper half of the barrel filled with combs and lower half with debris; (c) workers on combs; (d) >10'000 (!!) small hive beetle larvae in debris

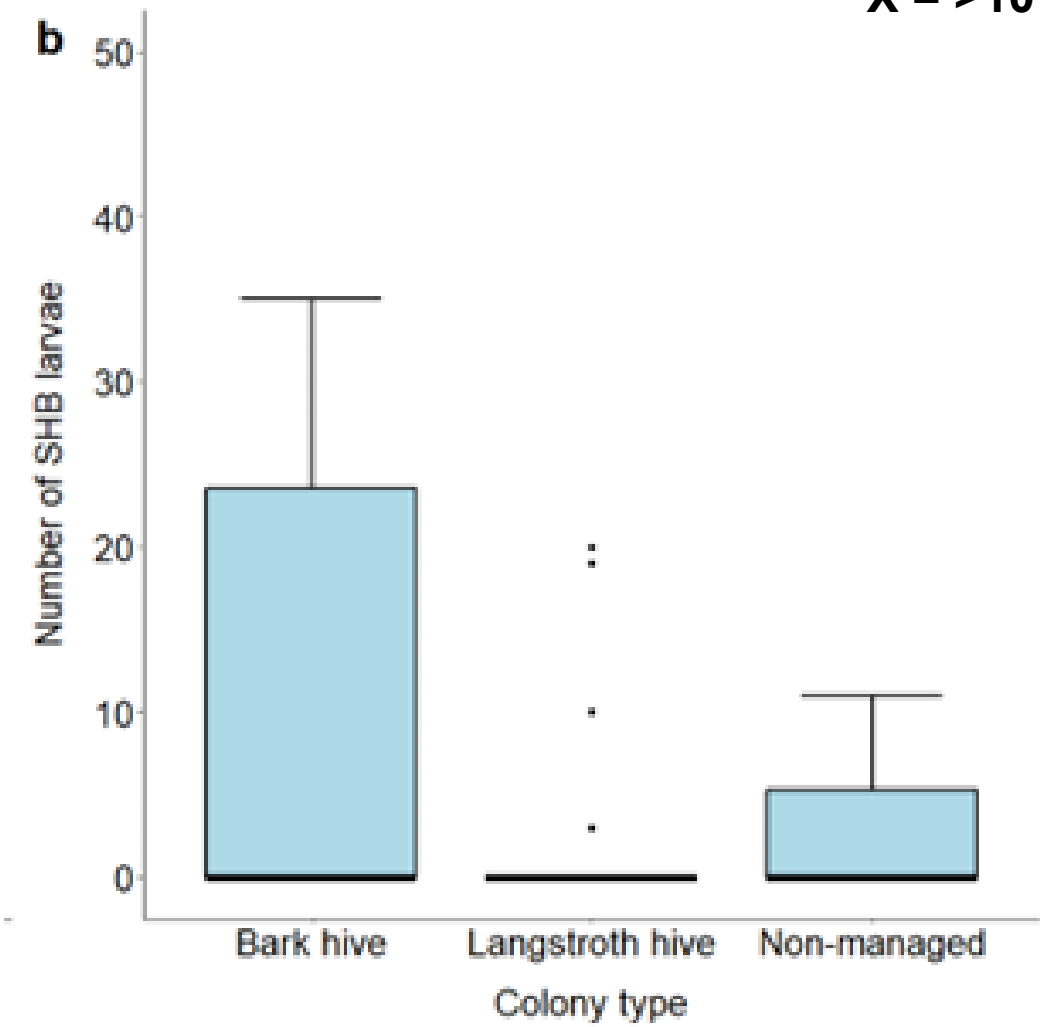
Results



More non-managed nests and colonies in bark hives had SHB larvae compared to colonies in Langstroth hives

Results

X = >10'000



Both bark hives and non-managed nests had a higher number of SHB larvae compared to Langstroth hives

Discussion

1. Importance of SHB debris reproduction has been underestimated for >20 years

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2. SHB debris reproduction can be common and occur at large magnitude

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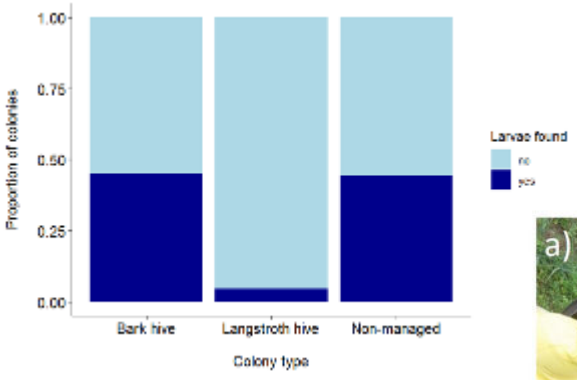

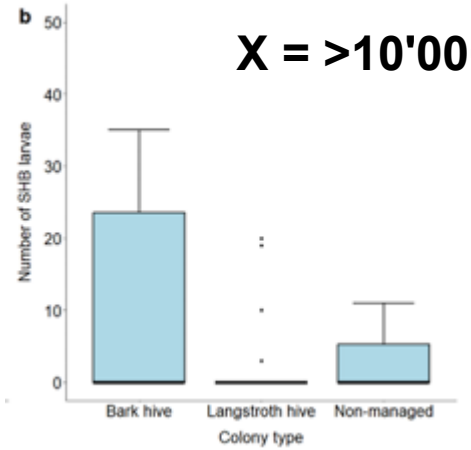

X = >10'000

More debris = debris reproduction more likely and at higher magnitude

Discussion

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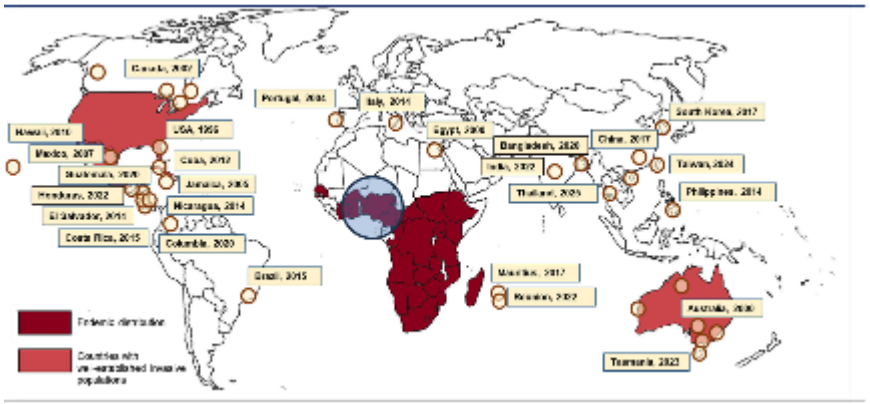

Debris reproduction alone sufficient to explain SHB population size in Africa (mass reproduction extremely rare)

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3. Need to change terminology according to location and damage to colony

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2. SHB debris reproduction can be common and occur at large magnitude

3. Need to change terminology according to location and damage to colony

4. **Debris reproduction** (instead of cryptic low-level reproduction) and **Comb reproduction** (instead of mass reproduction)

5. Debris reproduction should be considered to limit impact of this pest

Take hive message

No debris = no SHB debris reproduction

1. Keep your bottom boards tidy!

2. Prefer to use movable frame hives

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Agroscope

"Turning trash into gold" [old SHB saying]

Prof. Dr. Peter Neumann, peter.neumann@unibe.ch