MEETING MINUTES

4th COLOSS Small Hive Beetle Taskforce Meeting Gainesville, October 8- 10 2018

Meeting Report


1881


Ecological and Behavioral Studies of the Small Hive Beetle, Aethina tumida Murray
EXIT

Pictures from top to bottom: Audrey Sheridan presenting at the TF meeting; Jamie Ellis giving a tour of the facilities; Training on SHB Control by Humberto Boncristiani; Visiting D&J Apiaries (Pictures by Bram Cornelissen); Group picture (picture by Branden Stanford)

NOTES

The following was discussed. Tasks (we're a taskforce;-) are indicated below with participants for every TASK indicated in yellow.

Immediate goal (1 – 2 years)

TASK A: Ring test molecular diagnostic tool(s)

Diagnostics team COORDINATOR: Peter; Hemma (represents EU reference lab as well), Bram, Peter, Jamie, Giovanni, Marc S., Jorgé, Jay Evans? Christian Pirk? Someone from Australia (Peter to ask)? Brazil - David? Mexico (David to negotiate)? S. Korea (Jamie)? China (Peter to negotiate)? Kenya (Baldwyn)? Peter to PCR samples from Africa, James (Virginia), Andy Cline (Jamie will negotiate to include him and possibly include more *Aethina* species in the test), University of Guelph? (Paul Kozak, Ontario Provincial Apiarist can coordinate

Note: possibly happening already in Italy and EU Reference Laboratory?

- PCR test (Peter will coordinate): (1) how to get a good DNA sample from colonies (bees, debris, from flowers, from other bees; what matrix is best to sample; how sensitive is the test?), (2) test a variety of molecular markers, (3) test a variety of SHB sources, (4) make sure test is robust enough to limit false positives/negatives (by including other *Aethina* species)
- Ring Test (Peter will lead, participants at least those highlighted in yellow above):
    - #1 get primers right (see lab list above) (Which primer set? Peter's team will test the existing primer sets to move a few forward for the ring test.)
    - #2 determine where SHBs and other nits will be sampled (provide a timeline for the beetles to be sent to Peter who will blind the samples and send them to those participating in the ring test).
    - All beetles sent to Peter's group who will distribute beetles out to ring test participants.
    - Should include eggs, larvae, pupae and adults
    - Additional studies once appropriate primer set has been identified (opportunity for joint student/post doc project; Bram to talk to Giovanni about this as Giovanni's team may be working on this; can host in multiple labs)
        - #3 sensitivity of the primers (how many beetles in a hive does it take to yield a positive hit?)
        - #4 what matrix to sample (adult workers, hive debris, brood, wax, pollen, other bee species at flowers on which honey bees forage, flowers, etc.)
    - qPCR or LAMP onsite (Bram will ask)
    - Elisa test (Peter to ask Vita Europe and VETO Pharma, Jamie ask Vita N. America about this if such a thing is happening at the moment.)

TASK B: "Tools for Small Hive Beetle Management"

TEAM: Mary (Coordinator) /James/Jon/WinDi (survey lead)/Akinwande tag team, Peter, Mike, and Jamie will serve in advisory capacity

Much like that produced by the Honey Bee Health Coalition for *Varroa* [including SHB-related info that we feel is most valuable to beekeepers needs to be consolidated into a single source (we need to decide what is important for beekeepers to know) – integrate a "plan of action"], determining efficacy and scalability of a particular SHB control/management/diagnostics/etc. Check regional management strategies.

- Work with WinDi to make SHB surveys cohesive
- What is alarming and what is not (i.e. what is "normal" or acceptable when SHBs are present?)
- List of control options (in and outside hives, i.e. honey houses), inviting international colleagues to say what they do/do not use and how they rate them (least effective, moderately effective, highly effective) - Survey concerning what IPM measures people are already using to control/manage SHBs, perception of the control methods (potentially will need IRB approval) – could be pilot tested in the U.S. and made available for other countries interested in collecting similar data
- Seasonal chart discussing SHB population dynamics over time, etc. (much like that in the *Varroa* doc)
- Conditions that make SHBs worse (hot/humid climates, secondary diseases/pests, hive style, etc.)
- Ask Honey Bee Health Coalition about reviewing final document
- Projected timeline: 1 year (outline of survey by Christmas)
- Integrating this into a "Tools for small hive beetle management"

TASK C: Determine in-hive trap efficacy

TEAM Jamie (Coordinator through Humberto) can lead it, James, Charlie, David, Akinwande, Audrey, Mary, Giovanni, someone from Australia.

create a list of available traps, determine which to test, standardized protocol(s), various attractants, various killing agents (checkmite, Apithor, etc.) multiple lab involvement, etc.]; traps can be used for diagnostic purposes and for management purposes; this, then, is a "management" test: aka "Ackbar test" (it's a trap!). Factors to consider (Stepwise):

- Factors being tested: (1) trap type bait (using beetle blasters/beetle jails in preliminary work to determine efficacy of following baits: oil, soap water, apple cider + killing agent (UF will do pilot study with apple cider + killing agent to determine which to use), Charlie's bait))…one of the baits will be moved forward for each trap type, (2) trap type (beetle blaster vs beetle jail UF preliminary work)…move forward with the group: three traps will move forward to the group test (beetle blaster/beetle jail, microfiber cloth, beetle barn), (3) location of trap in hive, (4) bee metrics (some estimate of bees/brood, comb area (allowing us to determine bees/comb ratio)): dependent variables = no. beetles in trap, no. beetles in hive (used to calculate trap efficacy)
    - Season
    - Microenvironment (shade/rainfall/etc.)
    - Hive types
    - List minimum requirements for participation (must have beetles, must have a minimum number of colonies to participate, etc.)
    - In immediate future, we draft the intro to the ms in which we outline the factors that may affect trap efficacy (season, microenvironment, hive type,

etc.). This will help us have the same vision and can serve as the ms intro later.

TASK D Review article predictive markers for colony collapse due to SHBs (potential triggers/predictive markers)

TEAM: Bram (Coordinator), Peter, WinDi, Jamie, Charlie, James

- (1) What predisposes a colony to host beetles (i.e. what attracts SHBs to colonies vs apiaries) and (2) what predisposes colonies to collapse
- Colony phenotype (comb:bee ratio, queen status, etc.)
- Quantitative differences between bee type (how subspecies interact with the beetles)
- Disease/pest pressures
- Environment (humidity, rainfall, temperature, sun/shade)
- Beetle-related factors (presence of other beetles in hives, aggregation pheromones, etc.)
- Seasonal effects
- Management
- Interactions between factors?

Other Research needs:

No Task Force coordinated actions on these, but possibly interesting for multi/bi-lateral research endeavours.

- (1) Applied research needs [such as field research of new control/management techniques (focusing on traps that have a long life, low propolis, determining efficacy, etc.), monitoring for SHBs (both within and outside of hives) so that one can know if treatment is necessary, etc., determining what projects are necessary, such as product efficacy, etc.];
  - External trap for SHBs (for diagnostics and for management of SHBs)
  - Sentinel hive research
  - Compound specific to SHBs (perhaps dsRNA, Bt, etc.)
  - Novel control strategies (hive agitation, etc.)
  - Pheromone lures
- (2) Basic (aka "Fundamental") research projects needed in order to address knowledge gaps related to SHBs (examples: how to know when colonies are tolerant of or resistant to SHBs)
  - Reproductive activation/biology [triggers that lead to reproduction (including mass reproduction), do females mate with multiple males, multiple times, what causes females to oviposit, etc.]
  - SHB dispersal and flight capacity (Bram et al. is working on this)
  - Which life stages overwinter (pupae?)
  - Many chemical ecology-related questions (what attracts SHBs to hives (such as weak vs strong hives, etc.)?), Peter/Yves, Christian Pirk, Charlie all working on chemical ecology topics. Need to collaborate to synergize and avoid overlap.
  - Consequences for other bee species (Apidae, meliponini, bombus, etc.)

Regulation-related efforts

A. Policy leaflet – what should one do when SHB is new to an area? Review of regulations related to SHB invasion. Recommendations we make regarding how to handle a SHB invasion. Have to convince governments that COLOSS is the appropriate authority (that COLOSS is the appropriate authority). – summarize for Bee World (Bram/Marc/Peter; David to do pre-review prior to submission, possibly coordinate with EU reference lab)
B. Request to update OIE chapter on SHBs (Peter/Jamie to ask Marc)

Long-term goal (5+ years)

A. Update SHB BEEBOOK chapter with new/updated methods (when updates/improvements are necessary)

TASKFORCE ORGANISATIONAL ACTIONS:

- Develop an annotated bibliography (Endnote, Google Drive, Zotero https://www.zotero.org/, Password Protected?) WinDi (Completed Oct 10th 2018
- a picture database of SHBs (see COLOSS website, bugwood, www.flickr.com/bijenonderzoek (others can link their SHB albums here: ***) WinDi
- Update webpage **(BRAM)**

NEXT ANNUAL COLOSS MEETING (incl. SHB Task Force Session): 8-7 SEPT 2019 Montreal, CAN.

NEXT SHB TASK FORCE MEETING: 9-10 OCTOBER, Lamezia Terme, ITA

Program

Mo 8th October 2018

09:00 – 09:30	Registration and coffee
09:30 – 09:40	*Jamie Ellis* – a word of welcome
09:40 – 09:50	*Bram Cornelissen* - State of the Task Force - Objectives / program updates
09:50 – 10:40	*Amanda Hodges* – Invasive Alien Species and the principles of invasion dynamics
10:40 – 11:00	*Coffee Break*
11:00 – 11:30	*Peter Neumann / Marc Schäfer* - Tackling small hive beetle in the early stages of invasion
11:30 – 12:00	*Jamie Ellis* – Tackling Small Hive Beetle after establishment
12:00 – 13:30	Lunch Break
13:30 – 13:50	*David deJong* - Small hive beetle impact on beekeeping with Africanized bees in Brazil and Mexico
13:50 – 14:10	*Charles Stuhl* - Attract-and-Kill Bait for the Small Hive Beetle
14:10 – 14:30	*Audrey Sheridan* – Ecological and behavioral studies of the SHB
14:30 – 14:50	*Karsten Stief* – Developing and testing a larvae trap
15:10 – 15:30	*Giovanni Formato (skype)* - TBA
15:30 – 15:45	coffee
15:45 – 17:00	*Bram Cornelissen* - Discussion: Best practice solutions for tackling SHB (incl. Skype w Italy)
17:00 – 18:00	Tour of the facilities

Tue 9th October 2018

09:00 – 10:45	Practical training sessions
10:45 – 11:00	Coffee Break
11:00 – 13:00	Practical training sessions continued / small group work sessions
13:00 – 14:30	Lunch Break
14:30 – 17:30	Small group work sessions
17:30 – 20:00	Social dinner: Fish Fry at the lab

Wed 10th October 2018

9:00 – 12:00	General Discussion: present meeting results: work sessions / future plans
12:00 – 13:30	Lunch Break
13:30 – 17:00	Visit to professional beekeeper

Participants list

Name	EMAIL	Affiliation	Country
Akinwande Kyode Lawrence	akinkay20032001@yahoo.com	Federal University of Technology, Akure, Nigeria	Nigeria
Hemma Koeglberger	hemma.koeglberger@ages.at	AGES Institute for seed and propagating material	Austria
Peter Neumann	peter.neumann@vetsuisse.unibe.ch	Institute of Bee Health, Vetsuisse Faculty, University of Bern	Switzerland
David DeJong	ddjong@fmrp.usp.br	University of Sao Paulo	Brazil
Bram Cornelissen	Bram.cornelissen@wur.nl	Wageningen University & research	Netherlands
Marc Hendriks	marc.hendriks@wur.nl	Wageningen University & Research	Netherlands
Audrey Sheridan	as526@msstate.edu	Mississippi State University	USA
Karsten Stief	karsten.stief@gmx.de	Veterinaeramt Heidenheim, Felsenstr. 36, 89522 Heidenheim Germany	Germany
Bryan Smith	bryan.smith@ars.usda.gov	USDA-ARS	USA
Charles Stuhl	charles.stuhl@ars.usda.gov	USDA-ARS	USA
Humberto Boncristiani	humbfb@gmail.com	University of Florida	USA
Malcolm Sanford	beeactor@apisenterprises.com	Apis Enterprises	USA
Mary Reed	mary.reed@tamu.edu	Texas Apiary Inspection Service	USA
James Wilson	keepbees@vt.edu	Virginia Tech	USA
Chris Maund	chris.maund@gnb.ca	New Brunswick Department of Agriculture, Aquaculture and Fisheries (DAAF)	Canada
MIchael Hood	mhood@clemson.edu	Clemson University	USA
Jamie Ellis	jdellis@ufl.edu	University of Florida	USA
David Westervelt	david.westervelt@freshfromflorida.com	FDACS-DPI	USA
Brandi Simmons	brandi.simmons@freshfromflorida.com	FDACS-DPI	USA
Noble Egekwu	noble.egekwu@ufl.edu	University of Florida	USA
Cameron Jack	cjack@ufl.edu	University of Florida	USA
Gerbson Mendonca	g.mendonca@ufl.edu	University of Florida	USA
Branden Stanford	bstanford56@ufl.edu	University of Florida	USA
Windi Sanchez	wls0015@tigermail.auburn.edu	Auburn University	USA