Survivors Task Force – Spring Workshop

Worchester College – OXFORD – UK

31.3/1.4.2023

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IBRA INTERNATIONAL BEE RESEARCH ASSOCIATION

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Survivors Task Force 2023 Spring Workshop

Location: Linbury room, Worcester College, Walton St, Oxford OX1 2HB, United Kingdom
Directions: Google Maps
Zoom link: https://nuigalway-ie.zoom.us/j/98851227181?pwd=U2lLTC8vS3hXQWZZQ2xiTlFUUmUwQT09

Day 1 Friday, March 31st 9:00 – 17:00

9:00 – 9:30 BST	Registration of participants	
9:30 – 10:30 BST	Welcome, communications, introduction of the agenda, round of introductions of the members	Raffaele Dall'Olio, Arrigo Moro
10:30 – 10:55 BST	Task Force Recapping Study (15' + 10' Q&A)	Fanny Mondet [online]
10:55 – 11:20 BST	Assessment of recapping behavior in four honey bee species in Thailand (15' + 10' Q&A)	Sanchai Naree, Guntima Suwannapong [online]
11:20 – 11:40 BST	Break	
12:10 – 12:35 BST	Honey Bee Watch: Survivors Reporting and Monitoring (15' + 10' Q&A)	Steve Rogestein
14:00 – 14:25 BST	Study of surviving populations of *A. m. iberiensis* in Spain (15' + 10' Q&A)	Melanie Parejo [online]
12:35 – 14:00 BST	Lunch Break	
14:00 – 14:25 BST	Natural selection to solve the 'varroa problem': a SWOT analysis (15' + 10' Q&A)	Matthieu Guichard
14:25 – 14:50 BST	Outside the Box: diversity and adaptation of free-living Irish honeybee colonies (15' + 10' Q&A)	Alex Valentine
14:50 – 15:15 BST	The wild honey bee colonies of Blenheim (15' + 10' Q&A)	Filipe Salbany
15:15 – 15:35 BST	Break	
15:35 – 16:00 BST	Free-living honey bee colony custodians in Ireland: building a national network for nests monitoring (15' + 10' Q&A)	Arrigo Moro
16:00 – 16:25 BST	Colony health monitoring: experiences from the B-GOOD project (15' + 10' Q&A)	Raffaele Dall'Olio
16:25 – 16:45 BST	Closing of Day 1	Raffaele Dall'Olio, Arrigo Moro

Day 2 Saturday, April 1st 9:00 – 12:00

9:00 – 9:15 BST	Arrival of the members	
9:15 – 9:30 BST	Introduction of topics for discussion	Raffaele Dall'Olio, Arrigo Moro
9:30 – 10:30 BST	Open group discussion	
10:30 – 10:45 BST	Break	
10:45 – 11:45 BST	Open group discussion	
11:45 – 12:00 BST	Closing of workshop	Raffaele Dall'Olio, Arrigo Moro

List of Abstracts

Abstract Title:

Colony health monitoring: experiences from the B-GOOD project

Abstract Authors:

Raffaele Dall'Olio

Authors Affiliations:

BeeSources, Beekeeping Consultancy, Bologna – ITALY
BGOOD partner (H2020 GA817622)

Abstract Text:

As the 4-year Horizon2020 BGOOD (Giving Beekeeping Guidance by cOmputatiOnal-assisted Decision making, https://b-good-project.eu/) Research and Innovation Project is entering its final year, a large amount of field and sensors' data have been collected using the BEEP (https://app.beep.nl/) base system in apiaries from many European countries, progressively implemented through a 3-Tiers approach (Tier1: 3years – Institute apiaries – 64 colonies from 8 countries; Tier2: 2years – selected beekeepers – 120 colonies from 5 countries; Tier3: 1year – open call EU beekeepers – 174 colonies). Protocols and sensors were optimized to collect colony health information to be included in a larger dataset, also including other sources of information, with the overall aim to pave the way towards healthy and sustainable beekeeping within the EU. A key to healthy beekeeping is the Health Status Index (HSI), inspired by EFSA's Healthy-B toolbox, that BGOOD is contributing to make it operational. Here we provide an overview on the current state of the art of the project, including also major issues faced, with a peculiar emphasis on the innovations generated within the project (sensors, assays, monitoring protocols, etc…) that might also be suitable for the study of 'Survivors' and 'Free Living' honey bee colonies.

Abstract Title:

Outside the Box: diversity and adaptation of free-living Irish honeybee colonies

Abstract Authors:

Alexandra Valentine, Stephen Smith, Vickie Heshaw, Kenneth Sandoval, Arrigo Moro, Keith Browne, Grace McCormack

Authors Affiliations:

University of Galway

Abstract Text:

With the discovery of a free-living pure population of Apis mellifera mellifera (Amm) across Ireland in 2018, little else is known about this important cohort. My PhD project aims to dramatically increase the amount of knowledge on these surviving honeybees with particular focus on their distribution, population structure (including introgression) and fitness in comparison to the managed beekeeping cohort, including habitat use and impact of habitat on colony traits. Infrared thermography (IRT) will also be used to depict the size of free-living colonies in a variety of habitat spaces in 3D form, and used along with investigations of disease and phenotypic and genotypic approaches, to study adaptation locally and in the wild. Museum specimens will be included to identify the impact of commercial beekeeping and natural selection on the genotypes and phenotypes of modern free-living and managed specimens. To date approx. 130 honeybee colonies have been sampled to include both managed and free-living representatives and from a range of habitat types (trees, roof cavities; rural and urban settings). All samples come with a set of specific metadata that includes information on habitat, location, survival, and aggression. Honeybee samples come from three main areas in Ireland, (NW Donegal, West Galway, and SE Wexford) and include comparative sets of data for disease screening (new colonies, established colonies, managed colonies). Sampled bees are chilled on collection, frozen and freeze dried prior to DNA extraction. Bees are photographed for colour & size assessment and wings removed for geometric morphometrics. Colony-level genomes are generated by Novogene via a pool-seq approach using 30 individual workers. Evidence of introgression is apparent in all areas examined and in both free-living and managed cohorts but is still very low showing the impact of importations but consistent with the healthy state of Amm here in Ireland. These preliminary results will be presented along with patterns of habitat and survival. Whilst still in its early stages, my project will provide deep insights into mechanisms of survival of free-living Amm in Ireland in the presence of varroa providing information for beekeepers on how to manage bees in the local environment without the heavy reliance on chemical treatments to control disease. This work will also shed light on patterns of geneflow and reproductive strategies of locally adapted Amm, and the relative fitness of imported and hybridised bees on the Island of Ireland.

Abstract Title:

Natural selection to solve the 'varroa problem': a SWOT analysis

Abstract Authors:

Matthieu Guichard (1), Benjamin Dainat (1), Vincent Dietemann (1)

Authors Affiliations:

(1) Agroscope, Swiss Bee Research Centre

Abstract Text:

Honey bees, Apis mellifera, of European origin are major pollinators of crops and wild flora. Their endemic and exported populations are threatened by a variety of abiotic and biotic factors. Among the latter, the ectoparasitic mite Varroa destructor is the most important single cause behind colony mortality. The selection of mite resistance in honey bee populations has been deemed a more sustainable solution to its control than varroacidal treatments. Because natural selection has led to the survival of some European and African honey bee populations to V. destructor infestations, harnessing its principles has recently been highlighted as a more efficient way to provide honey bee lineages that survive infestations when compared with conventional selection on resistance traits against the parasite. However, the challenges and drawbacks of harnessing natural selection to solve the varroa problem have only been minimally addressed. We argue that failing to consider these issues could lead to counterproductive results, such as increased mite virulence, loss of genetic diversity reducing host resilience, population collapses or poor acceptance by beekeepers. Therefore, it appeared timely to evaluate the prospects for the success of such programs and the qualities of the populations obtained. This led to a recently published review in Ecological Applications (DOI: 10.1111/eva.13533) in which, we not only reflected on the theoretical aspects of host-parasite relationships but also on the currently largely neglected practical constraints, that is, the requirements for productive beekeeping, conservation or rewilding objectives. In this presentation, we summarize this review with a SWOT analysis of the implementation of natural selection honey bee selection programs and propose perspectives to overcome the limitations identified. To optimize natural selection-based programs, we suggest designs based on a combination of nature-driven phenotypic differentiation and human-directed selection of traits. Such a dual strategy aims at allowing field-realistic evolutionary approaches towards the survival of V. destructor infestations and the improvement of honey bee health.

Abstract Title:

Study of surviving populations of A. m. iberiensis in Spain

Abstract Authors:

Melanie Parejo1, Luis Javier Chueca1, Xose Manuel Durán2, Egoitz Galartza3, Iratxe Zarraonaindia1,4

Authors Affiliations:

1 Applied Genomics and Bioinformatics, Department of Genetics, Physical Anthropology and Animal Physiology, University of the Basque Country (UPV/EHU), Leioa, Spain
2 Galician beekeeping organization MENA, Spain
3 Basque beebreeding organization ERBEL, Spain
4 IKERBASQUE, Basque Foundation for Science, Spain

Abstract Text:

Honey bee populations capable of surviving untreated varroa infestations have been described in some regions of Europe and recent research has provided information on the underlying mechanisms in several subspecies of honey bees. In Spain, in the case of the Iberian honey bee, Apis mellifera iberiensis, a long-term varroa resistant population has not yet scientifically been documented, but the beekeeper association MENA has identified putative varroa resistant populations in Galicia that have (co-)evolved with the parasite without chemical varroa treatments. The MENA association is embracing the concept of natural selection based on the idea to recreate natural conditions that may facilitate resistance to varroa. This includes, amongst other, an adapted hive type targeted to hinder the reproduction of the parasite by physical means (reducing distance between the frames, arrange the brood chamber in “hot” disposition, i.e. frames perpendicular to hive entrance, and no added wax template). Scientific research in other populations so far has pointed to multiple traits that may vary among environments, subspecies, and management types that work together to provide resistance to varroa. A thorough evaluation of the putative resistant colonies in Galicia is needed. To this end, we have recently started a two-year national research project (ECOAPI), where we will evaluate and identify Varroa resistance in native colonies of Apis mellifera iberiensis, and study the factors (environment, genome, microbiome) and mechanisms (social immunity, management) that enable Varroa resistance and survival. We set up an experiment comparing and testing the putative resistant lines with a commercial line in three different locations and using different hive types. We will monitor the colonies for two seasons, evaluate varroa infestation, performance, and the recapping trait, as well as take samples for genetic and microbiota analyses. We hope that with the ECOAPI project we will be able to gain insights on the mechanisms behind the resistance and contribute to the knowledge of surviving colonies worldwide.

LIST OF PARTICIPANTS:

			31,03	1,04
	Alexandra	Valentine	Y	Y
In person	Arrigo	Moro	Y	Y
	Matthieu	Guichard	Y	Y
	Paul	Honigmann	Y	Y
	Raffaele	Dall'Olio	Y	Y
	Shamshair	Ahmad	N	N
	Steve	Rogenstein	Y	Y
	Vincent	Douarre	Y	Y
	Maria	Bru	Y	Y
	Sandra	Mustafa	Y	Y
	Filipe	Salbany	Y	Y
	Francis	?	Y	Y
Online	Stephen	Martin	Y	N
	Melanie	Kirby	N	N
	Alexis	Beaurepaire	Y	N
	Jovana	Bila Dubaic	Y	Y
	Melanie	Parejo	Y	N
	Sanchai	Naree	Y	N
	Guntima	Suwannapong	Y	N
	Rosa Maria	Lícon Luna	Y	Y

GROUP PICTURE (Image credits: Paul Honigmann)

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