GUEST EDITORIAL



An update on the COLOSS network and the "BEEBOOK:

I B R A

standard methodologies for Apis mellifera research"

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The international research network COLOSS (Prevention of honey bee COlony LOSSes)[†] was established to coordinate efforts towards improving the health of western honey bee (*Apis mellifera* L.) populations at a global level by: 1. developing standards for monitoring and research on colony losses; 2. identifying the underlying factors and mechanisms responsible for colony losses; 3. explaining and preventing large scale losses of colonies; and 4. developing emergency measures and sustainable management strategies (Neumann and Carreck, 2010). To meet these goals, COLOSS has developed into a network that currently is composed of more than 300 academic and government researchers, extension personnel, veterinary officials and students from 59 countries (Fig. 1). After four years of activity, the

network (which is structured into four working groups: 1. Monitoring and Diagnosis; 2. Pests and Pathogens; 3. Environment and Beekeeping; and 4. Diversity and Vitality) has organized eight conferences, 28 workshops, 29 Short-term Scientific Missions, and three training schools, and has contributed to over 130 publications in peer-reviewed scientific journals[‡] and to dissemination of results for the EU Seventh Framework Programme-funded research consortia BEEDOC[§] and STEP[∞]. COLOSS promotes networking among Early Stage Researchers (i.e. those holding a PhD for fewer than ten years). At the beginning of 2012, approximately 50% of COLOSS members belonged in this category, many of whom were graduate students, thus ensuring a strong honey bee research foundation for the future.



Fig. 1. At the beginning of 2012, the research network COLOSS (Prevention of honey bee COlony LOSSes) consisted of over 300 members from 59 countries, represented in red.

Table 1. Tentative chapter topics and authors^{*} of the COLOSS "BEEBOOK: standard methodologies for *Apis mellifera* research"; edited by Dietemann, V; Ellis, J D; Neumann, P.

Торіс	Senior author	Co-authors
Section 1 – <i>A. mellifera</i> research methodologies		
Behaviour	Scheiner, R	Abramson, C I; Brodschneider, R; Crailsheim, K; Farina, W; Fuchs, S; Grünewald, B; Hahshold, S; Karrer, M; Koeniger, G; Koeniger, N; Menzel, R; Mujagic, S; Radspieler, G; Schmickl, T; Schneider, C; Siegel, A J; Szopek, M; Thenius, R
Chemical ecology	Torto, B	Nazzi, F; Soroker, V; Gonzansky, T; Le Conte, Y; Carroll, M; Duehl, A; Fombong, A
Molecular biology	Evans, J D	Chen, Y P; Cornman, R S; de la Rua, P; Foret, S; Genersch, E; Gisder, S; Jarosch, A; Kucharski, R; Lopez, D; Lun, C M; Moritz, R F A; Maleszka, R; Muñoz, I; Pinto, M A; Schwarz, R
Physiology & biochemistry	Hartfelder, K	
Toxicology	Medrzycki, P	Aupinel, P; Schur, A; Colin, M E; Costa, C; Belzunces, L; van der Steen, J; Sgolastra, F; Giffard, H; Girolami, V; Dupont, T; Porrini, C; Chauzat, M -P; Pistorius, J; Delso, N S; Ellis, M; Le Conte, Y; Wallner, K; Johnson, R
Cell culture	Genersch, E	Gisder, S; Hedtke, K; Hunter, W; Möckel, N; Müller, U
Colony strength	Delaplane, K	van der Steen, J
Endosymbionts	Aebi, A	Özkirim, A; Vasquez, A ; Olofsson, T
In vitro rearing of larvae	Crailsheim, K	Aupinel, P; Behrens, D; Brodschneider, R; Genersch, E; Riessberger-Gallé, U; Vollmann, J
Maintaining adults <i>in vitro</i>	Williams, G R	Alaux, C; Csáki, T; Doublet, V; McMahon, D P; Murray, T E; Natsopoulou, M E; Neumann, P; Oliver, R; Paxton, R J; Shulter, D; Tanner, G; Brodschneider, R
Miscellaneous techniques	Human, H	Pirk, C W W; Brodschneider, R; Dietemann, V; Ellis, J; Jaffe, R; Koehler, A; Fui, Z; Rose, R; Tanner, G; Vejsnæs, F; Williams, G R
Section 2 – <i>A. mellifera</i> pest & pathogen research methodologies		
Epidemiology of pests & pathogens	vanEngelsdorp, D	Lengerich, E; Spleen, A; Dainat, B; Cresswell, J; Baylis, K; Nguyen, B K; Le Conte, Y; Saegerman, C
Estimating colony losses	van der Zee, R	Gray, A; Holzmann, C; Pisa, L; Nguyen, B K; Adjlane, N; Brodschneider, R; Chlebo, R; Coffey, M F; Kence, A; Kristiansen, P; Mutinelli, F; Peterson, M; Soroker, V; Topolska, G; Wilkins, S
Acarapis woodi	Sammataro, D	De Guzman, L; George, S; Ochoa, R
Aethina tumida	Neumann, P	Ellis, J D; Tanner, G; Williams, G R
<i>Ascophaera apis</i> & <i>Aspergillus</i> spp.	Jensen, A B	Flores, J M; Spivak, M; Vojvodic, S; Palacio, A; Aronstein, K
Galleria mellonella	Ellis, J D	
<i>Melissococcus plutonius</i> & associates	Forsgren, E	Budge, G; Charrière, J-D; Hornitzky, M
Nosema apis & Nosema ceranae	Fries, I	Chauzat, M-P; Chen, Y P; Doublet, V; Genersch, E; Gisder, S; Higes, M; McMahon, D P; Martín-Hernández, R; Natsopoulou, M E; Paxton, R J; Tanner, G; Webster, T C; Williams, G R
Paenibacillus larvae	de Graaf, D C	Alippi, A M; Antúnez, K; Aronstein, K; Behrens, D; Budge, G; De Koker, D; De Smet, L; Evans, J D; Foster, L; Fünfhaus, A; Garcia-Gonzales, E; Gregorc, A; Human, H; Murray, K D; Nguyen, B K; Poppinga, L; Spivak, M; vanEngelsdorp, D; Wilkins, S; Genersch, E
Tropilaelaps spp.	Anderson, D	
Varroa spp.	Dietemann, V	Nazzi, F; Martin, S; Locke, B; Delaplane, K; Wauquiez, Q; Anderson, D; Frey, E; Ziegelmann, B; Odemer, R; Rosenkranz, P
Viruses	de Miranda, J	Blanchard, P; Budge, G; Chejanovsky, N; Chen, Y P; De Graaf, D C; De Smet, L; van der Steen, J; Ribière, M; Genersch, E
Section 3 – <i>A. mellifera</i> breeding methodologies		
Breeding & ecotypes	Meixner, M	Pinto, M A; Bouga, M; Kryger, P; Ivanova, E; Fuchs, S
Instrumental queen insemination	Cobey, S W	Tarpy, D R; Woyke, J
Queen rearing & selection	Büchler, R	Andonov, S; Bienefeld, K; Costa, C; Hatjina, F; Kezic, N; Kryger, P; Spivak, M; Uzunov, A; Wilde, J

*Topic and author lists may be subject to change. Contributing authors are ordered according to contribution or alphabetically.

When recent global increases in western honey bee colony losses were recognized, it became apparent that research performed in various laboratories around the world could not be directly compared, thus seriously hindering our understanding of the phenomenon of colony losses. As a result, COLOSS has placed a strong emphasis on the standardization of western honey bee research methodologies. Examples include the COLOSS Questionnaire, a standardized winter colony loss survey now used in 24 countries from Europe, North America, and Asia (Nguyen, *et al.*, 2010; van der Zee *et al.*, 2012), as well as a pan-European study on genotype-environment interactions in western honey bee colonies (Meixner *et al.*, 2010). Additionally, an idea emerged during a 2009 COLOSS workshop in Switzerland to standardise western honey bee research methodologies worldwide in the form of a manual.

Inspired by the so-called "Red Book" for molecular biology studies of the fruit fly (Drosophila melanogaster) (Lindsley and Grell, 1968), the BEEBOOK will serve as a manual of western honey bee research methodologies. It will be composed of 29 peer-reviewed chapters authored by more than 160 leading honey bee experts (Table 1), and is expected to be completed by late 2012. It will be published as a special issue of the Journal of Apicultural Research in both hard copy and Open Access electronic formats. The former will serve as a companion to researchers performing studies related to honey bees in the laboratory and in the field and will ensure ease of access to scientists in developing countries lacking dependable internet access. The latter will enable quick and efficient global distribution of the methodologies to relevant stakeholders, as well support dissemination of rapidly evolving methodologies between hard copy editions of the manual as the scientific community takes advantage of web-based crowdsourcing (Hogue, 2011): an open call to researchers to provide updates to the work.

Since 2007, COLOSS has developed into an internationally recognized network for western honey bee health. Members of the network will continue to invest in COLOSS's legacy efforts, including the *BEEBOOK*, monitoring colony losses globally, and global networking, to adequately address the complex issues of western honey bee colony mortality.

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