

## **Risk indicators affecting honeybee colony survival in Europe: one year of surveillance**

Marie-Pierre Chauzat<sup>\*1,2</sup>, Antoine Jacques, EPILOBEE consortium, Marion Laurent, Stéphanie Bougeard, Pascal Hendrikx and Magali Ribière-Chabert

\*Corresponding author:

<sup>1</sup>Unit of coordination and support to surveillance, ANSES, Scientific Affairs Department for Laboratories, Maisons-Alfort, France

<sup>2</sup>Unit of Honeybee Pathology, ANSES, European Union and National Reference Laboratory for honeybee health, Sophia Antipolis, France

email: Marie-pierre.CHAUZAT@anses.fr

**Table S1:** The 138 variables of the EPILOBEE database

BEEKEEPER table

Variables	Definitions
Surname	Surname of the beekeeper.
Name	Name of the beekeeper.
Postal_adress	Postal address of the beekeeper home.
Zipcode	Zip code of the beekeeper home.
City	City of the beekeeper home.
Tel	Phone number of the beekeeper.
Fax	Fax number of the beekeeper.
E.mail	E-mail address of the beekeeper.
Identification	National identification of the beekeeper.
Age	Age of the beekeeper.
Activity	Typology of the beekeeper activity.
Beekeep_for	Years of experience of the beekeeper in beekeeping.
Org_member	Was the beekeeper member of a regional / national beekeeping organization?
Qualif	Did the beekeeper have any formal qualification in beekeeping?
Training	Has the beekeeper attended any beekeeping and/or bee health training in the last 3 years?
Continue	Did the beekeeper plan to continue his / her bee activity for more than 2 years?
Follower	In case the beekeeper planned to leave his/her apiary, was anybody likely to take over his/her apiary?
Coop_treat	Was the beekeeper part of a cooperative treatment against varroa with neighboring beekeepers?
Apiaries	Total number of apiaries owned by the beekeeper.
Bee_population_size	Total number of colonies owned by the beekeeper.
Country	Country where the apiary was located.
Nuts1_apiary	Regional division (at the Nuts 1 level) where the apiary was located.
Nuts2_apiary	Regional division (at the Nuts 2 level) where the apiary was located.
Nuts3_apiary	Regional division (at the Nuts 3 level) where the apiary was located.
LAU	Local Administrative Unit where the apiary was located.
Lat	Latitude of the apiary location.
Long	Longitude of the apiary location.
Migration	Did the apiary migrate at least one time during the past seasonal period, before the winter period of after the winter period?
Apiary_size	Total number of colonies in the apiary randomly selected.
Breed	Which was the honeybee strains/subspecies of honeybees in the apiary?
Production	Production targeted by the beekeeper.
Env_farmland	Was there a farmland environment surrounding the apiary?
Type_farmland	Type of the farmland environment surrounding the apiary.
Env_orchads	Was there an orchards' environment surrounding the apiary?
Specie_orchards	Specie of orchards surrounding the apiary.
Env_flora	Was there a floral environment surrounding the apiary?
Env_wood	Was there a wooded environment surrounding the apiary?
Env_town	Was there an urban environment surrounding the apiary?
Env_indus	Was there an industrial environment surrounding the apiary?
Env_other	Was there another environment surrounding the apiary?
Apiarist_book	Had the beekeeper an apiarist book?
Queen_import	Was the queen imported from outside of Europe?
Queen_import_or	Country of origin of the queen
Queen_import_or2	Second country of origin of the queen

Harbor	Was the apiary located near an international harbor?
Airport	Was the apiary located near an international airport?
Other_risk	Another risk that could have affected the apiary.
Participate	Did the beekeeper participate in EPILOBEE second year?

#### COLONY table

Variables	Definitions
Field_ID	Field identification of the selected colonies.
Reason	Whether the colony was randomly selected or part of extra sampling.
Year	Year of the EPILOBEE program.

#### DISEASE table

Variables	Definitions
Suspected	The disease suspected on the field by the bee inspector.
Remark	Remark on the disease suspected.
Date	Date of the visit.

#### HEALTH table

Variables	Definitions
Type_event	Which type of event was experienced in the apiary before the first visit of EPILOBEE program?
Other	Other types of event than the ones listed that were experienced in the apiary before the first visit of EPILOBEE program.
Disease_event	Which disease was suspected for the event experienced in the apiary before the first visit of EPILOBEE program?
Other_D	Other disease than the ones listed that was suspected for the event experienced in the apiary before the first visit of EPILOBEE program.
Percent_affected	Percentage of the colonies affected by the event.
Lab	Were laboratory analyses performed?
Conclusion	Results of the laboratory analyses on the disease affecting the apiary.
Other_C	Other results of the laboratory analyses than the ones listed.
Treatment	Treatment/sanitary measures applied to the apiary

#### MANAGEMENT table

Variables	Definitions
Management	Main management objective of the beekeeper.
Swarm_bought	Number of swarm(s) bought by the beekeeper.
Swarm_or	Country of origin of the swarm(s) bought.
Swarm_produced	Number of swarm(s) produced by the beekeeper.
Queen_bought	Number of queen(s) bought by the beekeeper.
Queen_or	Country of origin of the queen(s) bought.
Queen_produced	Number of queen(s) produced by the beekeeper.
Date_action	Date of the actions of management
Colonie_divided	Number of colonies divided by the beekeeper in the apiary.
Colonie_naturally	Number of colonies that have naturally swarmed.
Colonie_merged	Number of colonies merged by the beekeeper in the apiary.

#### MIGRATION table

Variables	Definitions
Start	Date for the start of the migration.
End	Date for the end of migration.
Place2	Regional division (at the Nuts 2 level) where the apiary was migrated.
Place3	Regional division (at the Nuts 3 level) where the apiary was migrated.
MidSeason_Target	What kind of nectar flow was targeted by the beekeeper during the past seasonal period?
Other	Other nectar flow than the ones listed targeted by the beekeeper during the past seasonal period
colonie	Percentage of the colonies that migrated.

#### RESULTS table

Variables	Definitions
Apiary	Was it an analysis for the whole apiary?
Lab_ID	Laboratory identification of the analyses.
Analysis	Disease targeted
Technique	Analytical technique used.
Result	Result of the analysis.
Detail	Details related to the result of the analysis.
Comment	Comments related to the result of the analysis.
Date	Date of the analysis.
Number_varroa	Number of varroa per 100 bees.
Number_nosema	Number of <i>Nosema</i> spores per bee.

#### SAMPLE table

Variables	Definitions
Reason	Type of sampling.
Nature	Nature of the sample.
DateV	Date of the visit.
Field_ID	Field identification of the samples.

#### STRENGTH table

Variables	Definitions
Dead	Was the colony dead?
Force	Strength of the colony (From 1-very weak to 5-very strong).
Date	Date of the visit.
Future	Other event explaining why the colony was not in the apiary anymore during the visit?
Type	Whether the colony was randomly selected or part of extra sampling
Varroosis	Was varroosis observed/diagnosed on the field?

#### SYMPTOM table

Variables	Definitions
Symptom	Symptoms observed on the field.
Remark	Remark on the symptoms observed

Date	Date of the visit.
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#### TREATMENT table

Variables	Definitions
Date_treat	Date of the treatment.
Name_treat	Commercial name of the treatment.
Ingredient	Active ingredient composing the treatment.
Posology	Dose rate of the treatment.
Duration	Duration of the treatment (in days).
Remark	Remark on the treatment.
Frequence	Frequency of the treatment (in weeks).
Treatment_correctly	Was the treatment was correctly applied?

#### VISIT table

Variables	Definitions
Date	Date of the visit.
Rank	Rank of the visit.
Inspected	Number of colonies inspected.
Visitor1	Surname of the bee inspector #1.
Visitor2	Surname of the bee inspector #2.
Km	Number of kilometers covered for the visit.
Time	Number of hours spent to visit the apiary.
Random	Number of colonies randomly selected at autumn visit.
Random_v1_rap	Reminder of the number of colonies randomly selected at autumn visit.
Alive_v2	Number of colonies still alive at spring visit.
Dead_v1_v2	Number of dead colonies between the autumn and spring visits.
Merged_v1_v2	Number of merged colonies between the autumn and spring visits.
sold_v1_v2	Number of sold colonies between the autumn and spring visits.
Divided_v1_v2	Number of divided colonies between the autumn and spring visits.
Alive_v3	Number of colonies still alive at summer visit.
Dead_v2_v3	Number of dead colonies between the spring and summer visits.
Merged_v2_v3	Number of merged colonies between the spring and summer visits.
sold_v2_v3	Number of sold colonies between the spring and summer visits.
Divided_v2_v3	Number of divided colonies between the spring and summer visits.
Previous_visit	Was the apiary located at the same place as the previous visit?
Moving_apiary	In case the apiary was moved since the previous visit, reasons of moving the apiary
During_visit	Total number of colonies in the apiary randomly selected during the visit.
Visited_apiary	Colony mortality rate according to the beekeeper since the last visit, in the apiary visited.
Farm_general	Colony mortality rate according to the beekeeper since the last visit, in her/his livestock in general.
Produce_v1_v2	Number of colonies divided [used to produce one or several swarm(s)] between the autumn and spring visits.
Produce_v2_v3	Number of colonies divided [used to produce one or several swarm(s)] between the spring and summer visits.

**Table S2:** Data cleaning steps and edits. Cleansing steps were implemented to discard invalid data. Edits were applied to keep as much data as possible in the statistical analysis. V1: visit 1, V2: visit 2, V3: visit 3

Cleaning steps	Removal of records when the number of randomly selected colonies at visit 1 was NA
	Removal of records when the number of randomly selected colonies at visit 1 was different from the number of randomly selected colonies reported at visit 2
	Removal of records when the number of living colonies at visit 2 was NA
	Removal of records when the number of living colonies at visit 3 was NA
	Removal of records when the number of dead colonies between v1 and v2 was NA
	Removal of records when the number of dead colonies between v2 and v3 was NA
	Removal of records when the number of randomly selected colonies at visit 1 was different from the addition of the number of colonies living at v2, the number of dead colonies between v1 and v2 and the number of colonies sold between v1 and v2
	Removal of records when the number of randomly selected colonies at visit 2 was different from the addition of the number of colonies living at v3, the number of dead colonies between v2 and v3 and the number of colonies sold between v2 and v3
	Removal of records when the number of colonies in the selected apiary during the visit was NA
	Removal of records when the number of colonies randomly selected was larger than the number of colonies in the apiary during the visit
	Removal of records when the beekeeper declared owning only one apiary and that the total number of colonies was different from the number of colonies in the selected apiary during the visit
	Removal of records when the beekeeper declared owning more than one apiary and that the total number of colonies was less than the number of colonies in the apiary during the visit
Edits	If the number of colonies sold between v1 and v2 was NA, then NA was replaced by 0
	If the number of colonies sold between v2 and v3 was NA, then NA was replaced by 0
	If the number of colonies randomly selected was equal to the addition of the number of living colonies at v2 and the number colonies sold between v1 and v2 and the number of dead colonies between v1 and v2 was NA, then the number of dead colonies between v1 and v2 was 0
	If number of living colonies at V2 was equal to the addition of the number of living colonies at v3 and the number colonies sold between v2 and v3 and the number of dead colonies between v2 and v3 was NA, then the number of dead colonies between v2 and v3 was 0

