

Vers la construction d'une analyse globale du déclin des abeilles intégrant les multiples facteurs explicatifs

Axel Decourtye



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Les pressions s'exerçant sur les abeilles

Pratiques agricoles

- Organisation des cultures mellifères dans temps et espace (masse florale, rotations, intercultures)
- Itinéraires (pesticides, fertilisants, pâturage, fauche/broyage)

Pratiques des collectivités territoriales

Habitats semi-naturels

- Organisation dans temps et espace
- Gestion

- Intoxication
- Disponibilité des ressources dans temps et espace (alimentation, nidification, refuge)

Climat

- Parasites
- Pathologies
- Prédateurs

Chez *Apis mellifera*

- Génétique
- Pratiques apicoles

- Performances individuelles et collectives (survie, fitness, allocation des ressources)
- Productions apicoles
- Abondance et diversité spécifique
- Risque d'extinction



Disciplines et leurs produits

Ecotoxicologi

Epidémiologi

Ecologie

Ethologie

Sciences de l'ingénierie

e

e

Agronomie

Exposition, mode d'action, toxicité, risque des xénobiotiques

Répartition, fréquence, gravité des pathologies

Gestion du territoire

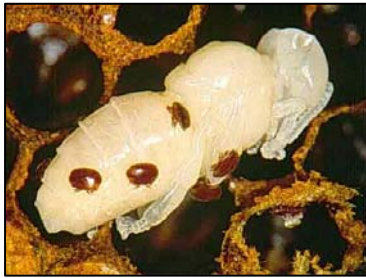
Quels liens de cause à effet ?



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Le déclin dû à un effet boule de neige ?



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Etudes des facteurs de pression en interactions



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PLoS BIOLOGY

Unsolved Mystery

What's Killing American Honey Bees?

Benjamin P. Oldroyd

On February 22, 2007, many Americans woke up to media reports that something was awry with their honey bees. A significant proportion of American beekeepers were complaining of unusually high rates of colony loss as their bees broke from their overwintering clusters. Loss of some colonies (say 10%) in early spring is normal and occurs every year. In 2007, however, losses were particularly heavy and widespread—beekeepers in 22 states (including Hawaii) reported the problem. Some beekeepers lost nearly all of their colonies. And the problem is not just in the United States. Many European beekeepers complain of the same problem. Moreover, beekeepers and researchers do not understand the specific causes of the losses.

Is There a Real Problem?

Were the losses in 2007 within the normal range, or is there something new afoot in the bee industry? If there is something new, what is it? Is it indicative of a general toxic overload of agricultural ecosystems, or a problem confined to the bee industry? Should beekeepers be worried? Should we be worried? The US House Agriculture Committee is sufficiently worried to be holding hearings into the matter, as well they might. Honey bees are essential pollinators: in 2000, the value of American crops pollinated by bees was estimated to be \$14.6 billion [1].

The syndrome is mysterious in that the main symptom is simply a low number of adult bees in the hive. . . There are no bodies, and although there are often many disease organisms present, no outward signs of disease, pests, or parasites exist.

Here, I try to get to the bottom of the unsolved mystery of colony collapse disorder (CCD)—the official description of a syndrome in which many bee colonies died in the winter and spring of 2006–2007.

What is CCD?

The syndrome is mysterious in that the main symptom is simply a low number of adult bees in the hive. (This is a bit like going to a previously well-populated hen house and finding hardly any hens.) There are no bodies, and although there are often many disease organisms present, no outward signs of disease, pests, or parasites exist. Often there is still food in the hive, and immature bees (brood) are present. The cause of the loss of bees seems to be the sudden early death, in the field, of large numbers of adult workers [2].

Unsolved Mysteries discuss a topic of biological importance that is poorly understood and in need of research attention.



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Figure 1. A Colony of Honey Bees Affected by CCD

Note the small number of adult workers relative to the large amount of brood.
(Photo: Keith Delaplane)

Curiously, the dead colonies tend to be left alone by the two cleptoparasites that normally infest dead honey bee colonies: the wax moth *Galleria mellonella* and the small hive beetle *Aethina tumida*. Could this be due to some toxic residue in the dead colonies? Perhaps this was a contributing factor, but more likely the time of year meant that there were few cleptoparasites about—their abundance is seasonal.

Were the Losses Unusual?

Some winter losses are normal, and because the proportion of colonies dying varies enormously from year to year, it is difficult to say when a crisis is occurring and when losses are part of the normal continuum. What is clear is that about one year in ten, apiarists suffer unusually heavy colony losses. This has been going on for a long time. In Ireland, there was a "great mortality of bees" in 1950, and again in 1992 and 1995 [3]. One of the most famous events was in the spring of 1906, when most beekeepers on the Isle of Wight (United Kingdom) lost all of their colonies [4]. American beekeepers also suffer heavy losses periodically. In 1903, in the Cache valley of Utah, 2000 colonies were lost to a mysterious "disappearing disease" following a "hard winter and cold spring" [5]. More recently, there was an incident in 1995 in which Pennsylvania beekeepers lost 53% of colonies [6].

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Abbreviations: CCD, colony collapse disorder; GM, genetically modified

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POLINOV (CAS DAR 2010-2012)

Objectif : Conception et évaluation de systèmes de culture innovants conciliant les enjeux de protection des abeilles et de durabilité de l'agriculture



Sous-objectif : Concevoir un outil d'évaluation multicritères

Cahier des charges des SdC



Méthode d'évaluation multicritères *a priori*

Sous-objectif : Conception - évaluation des SdCi

Description SdC actuels



Proposition des SdCi



Evaluation et sélection des SdCi

Sous-objectif : Diagnostic des SdC actuels sur la zone Plaine & Val de Sèvres

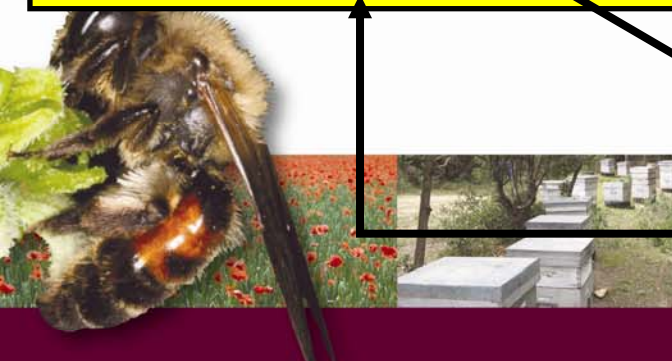
Protocoles



Bases de données (biologiques, paysagères, des pratiques)



Synthèses d'expérimentations



UMT PrADE

Questions pour la recherche

Diffusion de l'information

Transferts



ACTA
ADAPI
ITSAP

Diagnostics
Impact des pressions
Approches intégratives

UMR 406
Biologie
Ecologie
Ecotoxicologie



Solutions techniques

Amélioration des connaissances



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Merci !



http://www.avignon.inra.fr/les_recherches__1/liste_des_unites/abeilles_et_environment



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