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Competition for floral resources between honey bees and wild bees: a social-ecological approach based on commons theory.

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There has been important debate about the place of beekeeping in natural protected area due to the existence of exploitative competition between honey bees and wild bees. This issue has recently emerged in the field of bee biology and conservation science (Decourtye et al. 2019). As a first step towards solving this issue, one needs to clarify how floral resources may actually be shared between honey bees and wild bees. Generally speaking, floral resources appear to be the central component of a complex social-ecological systems, i.e., a network of interdependent stakeholders that interact ecologically and socially. While previous studies have focused on the ecological aspects of exploitative competition between honey bees and wild bees, social-ecological perspectives have not been addressed so far.

In an attempt to fill this gap, the present study explores the novel idea of viewing floral resources as common goods resources through the lens of social and ecological sciences. To do so, we draw on a framework based on the seminal work of Elinor Ostrom on common-pool resources and collective action (Barnaud et al. 2018). Ostrom investigated the formal and informal rules that govern resource exploitation so as to identify the key principles to achieve sustainable management of common resources through collective organization (Ostrom 2008). We applied this framework to the so-called bee social-ecological system, which refers to the triple interaction system between humans, wild and honey bees and their floral resources. We hypothesized that redefining the components of the bee social-ecological system and their interdependencies would help pave the way towards conflict resolution among stakeholders. In particular, we expected the bee social-ecological system approach would allow identify the human factors leading to, or hindering, the conciliation of wild bee conservation and honey production in a natural protected area.

We carried out our study within the area of the Cévennes national Park, southern France. Each year, beekeepers migrate an ever-increasing number of honey bee colonies into this protected natural area, which offers prized honey from mountain flowers and chestnut trees, among others. We conducted 34 standardized semi-structured interviews of professional and recreational beekeepers in order to understand stakeholders' own perception of the interactions among bees, floral resources and human activities. Our study was organized around three main questions: (i) what are the characteristics of the local bee social-ecological system, and in particular who are the key stakeholders and what are their social and ecological interdependencies, (ii) how floral resources and social interdependencies are perceived among stakeholders, and (iii) what are the critical issues one needs to address to invent new forms of collective governance of floral resources.

Interviews have shown that while competition between honey bees and wild pollinators is hardly noticed by beekeepers, the view of floral resources as a common good is more established from the perspective of intra-specific competition i.e., competition among honey bees themselves. However, beside some informal rules exist to promote floral resource sharing, our survey shows the absence of collective organization among beekeepers. Uncertainties about the abundance, depletion threshold and the harvesting rates of these resources by bees are obstacles to the coordination of the actors. Still, the intra-specific competition issue has recently raised concerns among beekeepers and encouraged some of them to envision new forms of spatial organization.

To help alleviate the uncertainties about resource production and competition risks, we currently carry out complementary ecological field surveys. We assess bee foraging success following the method of Henry and Rodet (2018), i.e. measuring harvested material in honey bee and wild bee nectar crops and pollen sacs. Our field data may allow us to better understand possible competition thresholds and thus to provide more informed guidance to stakeholders. Furthermore, while Henry and Rodet (2018) have demonstrated an increased risk of competition with closer proximity of productive apiaries in a homogenous landscape context, our current field study is intended to further ascertain this pattern in the context of a more diversified, heterogenous landscape area.

In response to the challenge of solving the bee competition issue in the context of natural protected areas, we propose here an interdisciplinary approach based on the concept of commons. Putting together social and ecological aspects of the problem, we hope to contribute to the emergence of operational resource sharing solutions, stemming from the local networks of productive beekeepers themselves. It appears now crucial to develop new forms of governance of floral resources that will reconcile beekeeping and the conservation of wild bees, in conjunction with agriculture and land managers who largely shape these resources.

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