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Attuning local and scientific knowledge in the context of global change: The case of heather honey production in southern France

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ABSTRACT

This paper addresses the assumption that combining scientific and traditional knowledge is a promising means to elaborate alternative ways of adapting to ongoing changes that are compatible with local values and priorities. To do this, we analyze a case study of the production of heather honey in southern France. Production of this very particular type of honey, which was formerly massively exported to Germany, has dramatically declined over the two last decades. In this study, we examined the respective views of different stakeholders — beekeepers producing heather honey, specialists of heather honey production, scientists — about the specific environmental, economic and social drivers of this decline in the sector of Mont Lozère, an important region of heather honey production located in the heart of the Cevennes National Park in southern France. From our results, we conclude that information held by these three groups of stakeholders is congruent and complementary. Together, their perspectives provide a more coherent picture of the drivers of change affecting the production of heather honey than any of the perspectives taken alone. We suggest that the consilience of these distinct kinds of expertise can foster the rehabilitation of this particular honey, whose production can provide benefits that are not only economic and ecological, but also in terms of perpetuating a biocultural heritage.

1. Introduction

It is nowadays widely admitted that the preservation of biological diversity can no longer ignore the cultural diversity that accompanies it — and sometimes safeguards it. Like the biotic resources they depend on, human societies are increasingly impacted by globalization, a dramatic driver of vulnerability of resources and societies to environmental change that decision-makers must come to grips with. However, rural societies are accustomed to confronting and responding to social and ecological change (including for instance, climate variability), adjusting their adaptive strategies accordingly. They may thus have underestimated sources of resilience against the challenges imposed by globalization. In this context, sociocultural approaches to analyzing biodiversity in the face of environmental changes are arousing increasing interest. These approaches focus on two main subjects of study. The first focuses on traditional ecological knowledge, i.e., the knowledge, beliefs, traditions, practices, institutions, and visions of the world that are elaborated by local communities as the result of their interactions with their biophysical environment (Toledo, 2002); the second emphasizes perceptions, i.e., the ways local people identify and interpret observations and concepts (Byg and Salick, 2009; Vignola et al. 2010 and Phillips, 2014). The use of traditional ecological knowledge is often recommended to reduce knowledge gaps in conservation and local perceptions are increasingly mobilized to achieve more effective ecosystem-based management (Berkes et al. 2000; Bérard et al. 2005; Biro et al. 2014).

Local perception and the related emergence of traditional ecological knowledge are generally linked to a particularly salient component of the environment, which is likely to shape the relationship between humans and their surrounding nature. We consider here the extended landscapes that adopt a remarkably pink color in summer over areas as large as several square kilometers in the Mont Lozère, France. This sudden shift in color is caused by the mass blooming of heather (*Calluna vulgaris* (L.) Hull, Ericaceae), a small but very extent shrub. Heather is known to

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produce a great quantity of nectar (Crane, 1976; Roberts, 1994; Beekman and Ratnieks, 2000), thus justifying beekeeping for the production of heather honey as a prominent extractive activity on this landscape. Heather nectar is the source of a very atypical honey, with unique organoleptic properties. Recently, heather honey beekeepers noticed a significant drop in honey production by bees. They are uncertain about the possible reasons for this decline, although many evoke changing climatic conditions. We explore various hypotheses in this paper, such as changes in climate, in pastoral practices. In addition to trying to determine the real causes of heather honey decline, we will also consider how the knowledge and practices of the local beekeepers have evolved and adjusted to ongoing change.

Besides continuously providing various goods (honey, wax, propolis, pollen, royal jelly, venom …) and environmental services through the pollination of countless angiosperms (Delaplane and Mayer, 2000; Johnson, 2010; Michener, 2000; Vaissière, 2002), *Apis* as well as stingless honeybees serve as sentinels of the environment and indicators of ecosystem health, in ways that no longer need to be demonstrated (Clément, 2009; Dounias, 2009; Haubruge et al. 2006; Kevan, 1999). Honeybees tirelessly alert us about subtle environmental alterations that we are unable to perceive directly by ourselves. Such high sensitivity to tiny modifications of their environment is certainly not specific to bees, but no other social insects have elaborated such uninterrupted and faithful relationships with humanity over the past 15,000 years. One of the reasons for continuing interest in investigating local beekeeping practices is the persistence today of a wide gradient of bee domestication. Honey-hunting societies throughout the humid tropics continue to explore natural ecosystems in search of wild honey, reminding us that honey has been for ages the only source of sugar immediately available from the wild (Anselot 1980; Crane, 1999; Paterson 2008). At the same time, in another part of the world, Californian beekeepers transport their rented frame hives of an introduced species on huge trucks for transhumance throughout vast mono-cropped and pesticide-saturated agro-industrial landscapes. In between these two extremes, there exists a continuum of beekeeping practices on honeybees and on the equally social and honey-producing stingless bees (Meliponines) that are diversely semi-domesticated. Several forms of beekeeping practices may even coexist in the same territory, mobilizing different sets of knowledge and know-how, and differing in their effects on local biodiversity.

Local beekeepers all possess empirical knowledge about bees and their productions (Dounias and Michon, 2013). Through their regular observation of the activity of bees, traditional beekeepers have elaborated an extensive knowledge of local climate variability and change as part of their traditional ecological knowledge, which is acquired and transferred through generations (Berkes et al. 1995, 2000). They could play a prominent role in monitoring the incidence of global change on local biodiversity, in places where this incidence is insufficiently assessed by the scientific community (Dounias, 2009). This local ecological knowledge is a lever for community resilience to respond to the multiple stressors of global environmental change (Gómez-Baggethun et al. 2013). Eliciting local ecological knowledge and perceptions of traditional beekeepers should help to analyze environmental crises about which bees can warn us. It is notable that in most attempts to apply traditional ecological knowledge as indicators of ecosystem health and environmental change, data concern animals, whereas plant species figure much less frequently (Biro et al., 2014). The originality of our study is the investigation of a triple interaction among beekeepers, honeybees and heather. Ecological interactions between species are often more threatened than species themselves (Janzen, 1974), and thus may be more sensitive indicators of ecosystem health and environmental change.

The goal of this paper is to address the assumption that combining scientific and traditional knowledge is a promising means to elaborate alternative ways of adapting to change that are compatible with local values and priorities (Boissière et al. 2013). To do this, we investigated the production of heather honey in southern France. This very particular type of honey, which was formerly massively exported to Germany, has been dramatically declining over the past two decades. We identify the specific environmental, economic and social drivers of this decline in the sector of Mont Lozère — a spot of heather honey production that is located in the heart of the Cevennes National Park in southern France (Fig. 2) — and use this case study to compare (i) the knowledge of beekeepers who produce heather honey, (ii) the knowledge of specialists of heather production, and (iii) the scientific literature. We then examine whether the combination of these diverse kinds of expertise opens pathways that would contribute to the rehabilitation of the heather honey chain.

2. Material and methods

2.1. Heather and heather honey

Heather, *Calluna vulgaris*(L.) Hull (Ericaceae) (Fig. 1) is the single species of its genus. It is a small shrub 20–100 cm in height that is found throughout Europe. Heather grows preferably on poor and acid soils and grows best in full sun (Rayner, 1913; Gimingham, 1972; Webb, 1986, 1998). Leaves are scaly, small (2–4 mm long), sessile (Fig. 1) and densely intricate over four rows. Flowers are 3–4 mm long and are grouped in racemes; they are pale purple to pink and the corolla is bell-shaped (Webb, 1986) (Fig. 1). Heather blooms from July to October depending on the region, and may produce such considerable amounts of nectar (Roberts, 1994; Beekman and Ratnieks, 2000) that Crane (1976) classifies it as highly bee-foraged: a single bee colony is said to produce 100–200 kg of honey per visited hectare.

Among all the different types of honey that are produced throughout Europe, heather honey is certainly the most atypical. Its unique flavor and its physical properties make it quite special. Its water content is very high, up to 23%, whereas values in other types of honey never exceed 19–20% (Huchet et al., 1996). Heather honey has an unusual viscosity that complicates honey extraction: it is a thick gel under static conditions, but it becomes fluid when stressed mechanically (a physical property called thixotropy: Pryce-Jones, 1936; Louveaux, 1966). The use of a specific instrument, locally called a 'picoteuse' (Fig. 1), is required: it consists in a brush composed of numerous plastic needles ('picots' in French, thus the local name of the instrument) that bore the honeycomb seals, enhance the fluidity of the viscous honey contained in the combs, and expel it. A 'picoteuse' is sold by only few companies specialized on beekeeping supply and is relatively expensive, costing between 2000 and 4000 €. Beyond these particularities, the recent history of the decline in export of heather honey to Germany, where it is highly valued, is also unusual.

2.2. Study site

This study focuses on the sector of Mont Lozère, in the French territorial administrative unit called 'département de la Lozère'. This sector was chosen because sources detailed of information were available about the recent local history of the production of heather honey. Mont Lozère (Fig. 1) is also part of the 'central core' ('zone cœur') of the Cevennes National Park and is located in a Natura 2000 site (Fig. 2). In these protected sites, questions about the link between the conservation of biodiversity and the