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Lack of knowledge or loss of knowledge? Traditional ecological knowledge of population dynamics of threatened plant species in East-Central Europe

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ABSTRACT

Use of traditional ecological knowledge (TEK) is often recommended to relieve knowledge deficit in conservation. However, studies on traditional knowledge of threatened species are scarce, especially in Europe. Twenty-three interviews about 20 threatened plant species (name, habitat, flowering time, human use, population trends, causes of decline or growth) were conducted in each of the two contrasting landscapes, traditional in Romania (Gyimes), abandoned in Hungary (Zala). Amount of knowledge relevant to conservation was less than expected. Habitat and flowering time was known the best, and causes of population decline and growth the least. Better known plants had richer TEK on their dynamics (65% of species in Gyimes, and 35% in Zala). We documented many cases of positive and negative effects of manuring, fertilization, eradication, grazing, mowing, picking, drought, succession, and abandonment. Most knowledge originated from personal experience, and shared knowledge seemed to be limited. Knowledge deficiency may be explained by the stability of the landscape, and the ignorance of many threatened species by locals in Gyimes (lack of knowledge), and by the abandonment of traditional land use and ignorance in Zala (loss of knowledge). We argue that substantial TEK on threatened species may be expected for those species that have been utilized as a resource or have hindered the utilization of a resource. We argue that TEK can provide relevant information to conservation less at the population, and more at the habitat and landscape level.

Introduction

While species diversity of ecosystems has been declining worldwide, the number of threatened species has been on the rise. For effective protection of threatened species, direct management of species is or would be needed in many cases. In other instances, indirect conservation (e.g. habitat management) may be more rewarding. Tremendous amount of information is needed owing to the large number of species and the diversity of their habitats. Indeed, knowledge on the ecology and demography of species is the highest ranked need among the needs of conservation practitioners in terms of useful scientific information (Braunisch et al. 2012).

To relieve knowledge deficit in conservation and for a better ecosystem-based management the use of traditional ecological knowledge (TEK) is often recommended (Berkes et al. 2000; Glasenapp & Thornton 2011; Mascia et al. 2003; Pierotti & Wildcat 2000; Turner et al. 2000). Traditional ecological knowledge is defined as a cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment (Berkes et al. 2000). Indeed, in many cases TEK provided or could provide considerable levels of relevant ecological knowledge for conservation (e.g. Fraser et al. 2006; Gagnon & Berteaux 2009; Gilchrist et al. 2005; Huntington 2000; Ziembicki et al. 2013). These studies found that TEK contributed to the knowledge base required to achieve effective conservation for fish, bird and mammal species (e.g. local population sizes, population viability, feeding habits, breeding areas, migration patterns, past range and occupied habitats). Experiences show that TEK is relevant mainly at a smaller

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spatial and longer temporal scale, than related scientific studies (Gagnon & Berteaux 2009). Negative results were also published. Gilchrist et al. (2005) documented cases where TEK was of little usable information or locals held misconceptions.

With regard to the application of TEK in conservation, it is noticeable that most data are related to animals, and plant species have been studied much less frequently. Schmidt and Ticktin (2012) found that harvest of *Syngonanthus nitens* (golden-grass, a plant used for handicrafts in Brasil) according to traditional management had no negative impact on population dynamics (compared to non-traditional harvests), thus conservation management of the species can be based on local knowledge and management. Donovan and Puri (2004) studied TEK related to *Aquilaria* spp., a resin producing tree in Borneo. The Indonesian Penan people recognize the complexity of resin formation that involves several organisms (the tree, fungi, and possibly an insect). The traditional knowledge documented in their study can help develop sustainable management systems for this traditional resource and its natural habitat in Borneo and identify promising areas for future research. Newmaster et al. (2011) collected TEK related to endangered seagrasses living in fragile ecosystems in India. The complex classification of seagrass diversity considers the unique role of seagrass species in marine ecosystems and the related knowledge of their possible uses. This classification and the related knowledge were found to be highly valuable for conservation and restoration plans. Turner et al. (2000) report on the sustainable use of several plant species of British Columbia. They studied the sustainable resource management, and were not concerned with their direct conservation aspects, although the long-term sustainable use of species harvested in large amounts calls for this. Albuquerque et al. (2009) studied 166 plant species in Brazil, and developed an index (LCPI: Local Conservation Priority Index) based on citation richness of local use of the species, degree of attention (frequency of the species in homegardens) and relative density of the species in the surrounding natural environment.

There are only few examples in Europe for the application of TEK in conservation (see Hernández-Morcillo et al. 2014, for a recent review). For example, Carvalho et al. (2010) suggested to include people's perceptions and traditional ecological knowledge in general in landscape management and conservation. Roturier and Roué (2009) studied Sami herders' classification of reindeer winter pastures to improve cooperation with forest management. Molnár (2012) documented that traditional herders in Hungary use several traditional pasture management practices that could be included in conservation management of the steppes. Fernández-Giménez and Estaque (2012) suggested to use the extensive knowledge of Pyrenean pastoralist communities on the relationships between terrain, climate, vegetation and animal nutrition and behavior in pasture resource management. In the Cévennes mountains in France, local traditional ecological knowledge was collected and used in national park management and the planning of agri-environmental programs (Crosnier 2005). Poschlod and WallisDeVries (2002) emphasized the importance of traditional transhumant pasturing. They showed that besides the role of animals in preventing shrub invasion, sheep as seed dispersal vectors play an outstanding role in connecting populations of species-rich grasslands, and in the restoration of abandoned arable land. Studies that investigate or use TEK for the conservation of threatened plant species are, however, scarce in Europe.

Despite the increasing number of successful case studies Sutherland et al. (2004) do not mention traditional ecological knowledge among the sources of evidence-based conservation management, and practitioners also did not mention the need for knowledge transfer between traditional/local ecological knowledge and nature conservation management (Braunisch et al. 2012).

The goal of our study was to find out how much practical knowledge on plant species threatened in Central Europe may be gathered from local people living in a landscape. We studied an area outstandingly rich in TEK and another with average TEK in Romania and Hungary, respectively. We conducted 23 interviews about 20 plant species in each of the study areas. First we documented the familiarity to plant species, and recorded whether people know their name, habitat, flowering time and traditional human utilization. With these characteristics we quantified the richness of TEK associated with plant species. In the second part of our interviews we documented what local people know about the decade-scale population trends (changes in plant abundances) and the potential causes of population decline or growth. This is the sort of knowledge that is directly applicable to nature conservation.

Materials and methods

Study area

We collected TEK in two contrasting East-Central-European landscapes. The first is still managed by an agricultural community, whereas the agricultural community in the other became modernized in the last decades. Gyimes (Gyimesközéplok village, Eastern Carpathians, Romania) is a mountainous landscape (46°37′ N, 25°57′ E, 800–1500 m a.s.l.) The area is covered by a diverse mosaic of spruce (*Picea abies*) forests and species rich semi-natural grasslands (Babai 2013). The yearly mean temperature ranges from 4 to 6 °C, and the annual precipitation varies from 700 to 1200 mm. Zala is a hilly landscape in West-Hungary (46°56′ N, 17°04′ E, 200–300 m a.s.l.), which falls within the hornbeam-oak (*Carpinus betulus* and *Quercus petraea*) and beech (*Fagus sylvatica*) forest zones. Data were collected in 7 villages (Zalaszentgrót, Dötk, Csáford, Pakod, Batyk, Mihályfa, Zalavég). The climate is continental with an Atlantic influence in precipitation. The annual temperature ranges from 9 to 11 °C, precipitation is 750–800 mm.

Inhabitants in Gyimes are an ethnographically well-defined Hungarian ethnic group called 'Csángó'. The local community preserved a well-documented traditional culture and lifestyle, rich in archaic elements. The semi-subsistence farming system is dominated by animal husbandry. No wheat and only limited amount of fruit is produced. Collected wild plant resources are wood, hay, mushrooms, berries and medicinal herbs. 85% of people practice some sort of agriculture (Sólyom et al., 2011; Babai 2013). As socialist cooperatives were not established during the socialist era, connection to the land has remained strong, and intergenerational transmission of knowledge has not stopped. Hence, most members of the community still possess substantial traditional ecological knowledge (Molnár and Babai, 2009, 2013, 2014). Csángó people spend about 210 days annually outdoor in the woodlands and on the meadows and pastures. Since they still depend chiefly on the biomass production of their landscape, their traditional ecological knowledge is astonishingly deep (Babai 2013; Babai & Molnár 2013).

The population of Zala also is Hungarian. This was considered an area with traditional agriculture until the mid-20th century, but social and economic changes took place earlier and more rapidly than in Gyimes. In Zala the traditional small-holder agriculture was turned into a more intensive socialist cooperative system in the 1950–1960s. Traditional practices are disappearing and are mostly maintained by old people and agri-environmental incentives. Only 2.6% of the inhabitants live on agriculture (KSH 2012). Thus people in Zala has to rely less on the biomass produced in the fields, and spend much less time outdoor.