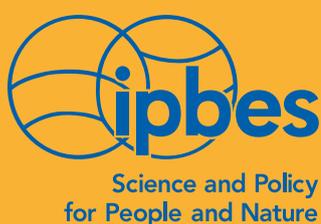


Knowing our Lands and Resources

Indigenous and Local Knowledge of Biodiversity
and Ecosystem Services in Europe and Central Asia



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6. Rangers bridge the gap: Integration of traditional ecological knowledge related to wood pastures into nature conservation

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Introduction

A new opportunity and, at the same time, a new challenge has unfolded for nature conservation in the past few years: to enhance the efficiency of conservation management through the use of traditional ecological knowledge (TEK) in strategic and practical decision-making (Berkes *et al.* 2000; Hernández-Morcillo *et al.* 2014; Sutherland *et al.* 2014). This approach is ensured by four fundamental and functionally interlinked elements of TEK: general knowledge (information on both the living and non-living components of the natural environment), practice (practical knowledge and experience), belief and cultural value (including social context) and traditional ways of learning (individual and social knowledge transmission between generations) (Berkes 2008; Berkes *et al.* 2000; Turner *et al.* 2000; Whiteman and Cooper 2000; Molnár 2014). The reason TEK is able to improve the efficiency of conservation management is that it assists conservation with a dynamic approach embedded in local situations (Whiteman & Cooper 2000; Molnár *et al.* 2008; Schmitz *et al.* 2012). Conservation management projects with the aim to use TEK were conducted in recent decades at a number of locations worldwide (Hunn *et al.* 2003; Ens *et al.* 2015), but success is still far from complete (Nadasdy 1999; Ween & Riseth 2007; Padilla & Kofinas 2014; Pooley *et al.* 2014).

Although there are a growing number of ‘best practices’, implementations often are prevented by several factors (Heikkinen *et al.* 2012). These include, inter alia: that the traditional and the Western scientific knowledge systems are different (Berkes 2008); TEK frequently holds information on species other than those conservationists intend to protect (Bíró *et al.* 2014); in many communities, TEK has eroded to a great extent, and today it exists only as a memory rather than practice (Benz *et al.* 2000; Bürgi *et al.* 2013); local populations were often chased away or forced to migrate from their home territory as a result of ‘fortress’ conservation practices, and TEK disappeared with the local people (Adams & Hutton 2007; Riseth 2007); in many cases, only the easy-to-integrate TEK elements, such as general knowledge or practice were incorporated in conservation management (Reo 2011); due to changing socio-economic and

ecological environment the adaptiveness of TEK could also change (Fernández-Llamazares *et al.* 2015). Another important factor is that governments are not taking seriously the use of TEK in conservation policy, management and education despite of the recognition of the importance of traditional farming (EC 2014). Many authors also argue (Nadasdy 1999; Berkes *et al.* 2000) that ethical and effective application of TEK requires a holistic approach, with emphasis on simultaneous usage and preservation of knowledge, practice, belief and learning.

From a conservation perspective, the use of TEK is particularly important in the case of those habitats of the cultural landscape that are created and maintained by local people (e.g. mountain hay meadows and wood pastures) (Anderson 2005; Babai & Molnár 2014). Cultivation of such habitats requires a substantial amount of manual labour, personal attention and care, including traditional management methods (Oteros-Rozas *et al.* 2013; Varga & Molnár 2014). These factors have contributed to their increasingly frequent abandonment throughout Europe (Schmitz *et al.* 2012). Today, nature conservation agencies are playing an active role in the management of these habitats, and decisions made by conservationists have a growing level of influence in addition to TEK-holders such as farmers and herders.

Our research focused on TEK related to wood pastures, a habitat associated with high natural and economic values in Europe and shaped over hundreds or thousands of years by humans (Bergmeier *et al.* 2010). During the past 100 years, changing socio-economic relations resulted in the dramatic deterioration of the extent and use of wood pastures across Europe (Johann *et al.* 2012; Hartel & Plininger 2014a). For this reason, active nature conservation management is of growing importance.

We would expect that conservation management is based on TEK in the habitats of the cultural landscape such as the wood pastures. Although quite often this is the case (Hirschnitz Garbers *et al.* 2011), in many places the recognition of TEK is only written down and not practiced. Conservation management practices (e.g. mulching hay meadows, shredding shrubbery), is often fundamentally different from traditional practices (Holl & Smith 2002). In addition to the reasons listed earlier, the values and working methods of conservationists are important factors: top-down and science-based decision-making systems dominate. Conservation managers are exposed almost exclusively to Western science in the course of their studies (Primack 2010), and the ability of TEK-holders to protect their rights and advance their own interests is relatively low (Heikkinen *et al.* 2012).

Research on traditional ecological knowledge has predominantly documented the TEK of TEK-holders (Babai & Molnár 2013; Oteros-Rozas *et al.* 2013; Hernández-Morcillo *et al.* 2014). We argue the importance to examine the relationship of TEK not only to those communities that preserve and provide local knowledge, but also to those with the potential to receive and use it. In relation to nature conservation management, the key recipient groups are rangers and national park conservation officers (Lewis 1989; Robinson & Wallington 2012).

We conducted interviews with stakeholders who interact with wood pastures, including herders and conservation managers (officers and field rangers). Traditional ecological knowledge about wood pastures and their management was collected and analysed. The knowledge held by conservation managers was compared to the traditional knowledge of herders working on wood pastures. In the present paper, we focused on the following questions:

- ▶ Can conservation managers be differentiated from each other and from herders based on their TEK related to wood pastures?
- ▶ If so, which elements of TEK are most different and to what extent?
- ▶ What lifestyle factors determine successful use of TEK by conservation managers?



6.1. Methods

6.1.1. Study area

Our studies were conducted in Hungary (East-Central Europe, Pannonian biogeographic region) in Baranya, Veszprém, Szabolcs-Szatmár-Bereg, Borsod-Abaúj-Zemplén, Békés, Győr-Moson-Sopron, Vas and Zala counties. In these regions wood pastures are characterized by oak, hornbeam and beech trees (Bölöni *et al.* 2008).

Wood pastures are the basis for traditional silvopastoral husbandry and constitute an integral part of the cultural landscape across Europe (Bergmeier *et al.* 2010; Hartel *et al.* 2013; Hartel & Plininger 2014a) (**Photo 6.1**). They were created from dense forests centuries or millennia ago (Rackham 1998). They consist of a mosaic of grasslands and trees or groves that are utilized mainly for grazing. Acorn- and fruit-bearing trees are quite common on wood pastures. In order to maintain the required mosaic-like pattern in certain parts of the wood pasture, colonizing trees must be removed, while in other areas, the regeneration and survival of young trees needs to be secured (Bugalho *et al.* 2002; Oellerer 2014; Varga & Molnár 2014). Historical and current socio-economic environments have strong influence on the extent and quality of wood pastures (Hartel & Plininger 2014b). The primary conservation values of wood pasture are best represented by ancient solitary trees, high levels of biodiversity, and continuation of traditional land-use (Manning *et al.* 2006; Bergmeier & Roellig 2014).

Utilization and extent of wood pastures in Hungary were significantly reduced in the past 50 years as a consequence of the suppression of traditional land-use practices. No more than 5500 ha wood pastures have survived (Bölöni *et al.* 2008), and only half of this area is being used. About 30% of these 5500 hectares are under protection, and 30% is designated as a NATURA 2000 area. These two areas (the protected areas and NATURA areas) partially overlap. The official nature conservation agency conducts wood pasture management directly in the main part of the protected areas and through administration of leases to resource users, including herders. NATURA 2000 is a European Union wide coordinated network of nature protected areas. The emphasis on the area that is part of the NATURA 2000 network will be on ensuring that future management is sustainable, both ecologically and economically, and to support traditional farming practices and give due recognition to the farmers involved (EC 2014).



Photo 6.1 Hungarian Grey Cattle, an ancient traditional breed, is grazing in an oak dominated wood pasture near Cserépfalu village. This area is managed by the Bükk National Park.

6.1.2. Stakeholder groups

Three stakeholders groups were investigated:

- ▶ conservation officers of national park directorates,
- ▶ field rangers of the national parks, and
- ▶ traditional herders (Table 6.1).

Hereafter, 'conservation managers' refers to both conservation officers and field rangers.

Traditional herders were identified as people who are currently engaged in traditional pasture-based livestock husbandry, or had been engaged in these activities for a long period of their lives. They earn or had previously earned a living from pastoralism and consider the long-term sustainability of pasturing and grassland use in the course of their work (Varga & Molnár 2014; Molnár 2014).

Field rangers are employed by the nationwide network of the Nature Conservation Guard, overseen by the National Park Directorates (KvVM 2009), and have been educated as forest and nature conservation engineers, agronomists, biologists, and ecologists. On average, each ranger operates within an area of approximately 400 km². Rangers are responsible for the preservation of the legally-protected natural values in his/her territory. Rangers inform higher authorities, and also directly manage and make decisions in the implementation of conservation management. For example, rangers decide where herds are driven or which tree species should be left standing when the wood pasture is restored.

Conservation officers (ecological, botanical, zoological experts) work in public administration (headquarters of national parks) and have been educated as biologists, ecologists, forest and nature conservation engineers, and agronomists. They conduct work within their respective fields of expertise. Their duty is to verify compliance with the legal statutes and conduct botanical and zoological monitoring in protected and NATURA 2000 areas, as well as to prepare and approve management and maintenance plans for the national parks.

6.1.3. Data collection

As a preliminary study, 76 semi-structured interviews and 60 days of participatory observation were conducted between 2008 and 2013 with conservation managers and traditional herders engaged in wood pasture management (Newing *et al.* 2011; Varga & Molnár 2014). Based on this research, a structured questionnaire was compiled, consisting of 50 questions for systematic data collection. The questions in the interview focused on four elements of TEK:

- ▶ general knowledge of wood pastures ('Knowledge');
- ▶ practical experiences related to the management of wood pastures ('Practice');
- ▶ belief and cultural value to wood pastures ('Belief');
- ▶ ways of acquiring knowledge about wood pastures ('Learning').

The interviews were conducted in February and March of 2014. Sixteen independent variables were gathered from each informant about their education, experiences and other lifestyle attributes that were expected to affect their knowledge related to wood pastures (Table 6.1).

In-depth structured interviews were conducted with 12 herders, 19 rangers and 18 nature conservation officers. The number of informants was limited due to the low number of people engaged in wood pasture use and management. Conservation managers (field rangers and officers) worked for the Balaton Uplands, Danube-Drava, Danube-Ipoly, Kiskunság, Körös-Maros, Aggtelek, Bükk, Hortobágy, Órség and Fertő-Hanság National Parks. Herders worked within the territories of the Balaton Uplands, Danube-Drava, Danube-Ipoly, Kiskunság, and Aggtelek National Park Directorates.



Table 6.1. Variables of conservation officers (18), rangers (19) and herders (12).

Independent Variables	Officer	Ranger	Herder
Continuous			
Age (years, mean \pm SD)	41.11 \pm 6.29	44.05 \pm 7.13	50.75 \pm 16.32
Years in occupation (years, mean \pm SD)	14.17 \pm 6.03	13.47 \pm 6.56	40.33 \pm 21.22
Dummies and ordinals			
University graduation (%)	100	100	8
<30% of worktime spent in the field (%)	78	21	0
30–50% of worktime time in the field (%)	22	32	0
>50% of worktime in the field (%)	0	47	100
Childhood spent in the area (%)	55	68	67
Living in the area at time of interview (%)	5	63	100
Practicing livestock husbandry as a child (%)	0	21	100
Childhood memories of livestock husbandry (%)	16	63	100
Engagement with livestock husbandry (%)	0	21	100
Conducting active conservation management (%)	39	74	100
Knowledge of a second language (%)	83	68	25
Interest in traditional heritage activities (%)	67	47	50
Reading scientific literature about wood pastures (%)	44	53	25
Reading management literature about wood pastures (%)	78	89	58
University studies about wood pastures (%)	5	0	8

6.1.4. Data processing

A scoring system was developed in order to quantify the amount of traditional ecological knowledge possessed by informants. The main principles of the scoring were whether the answers were dominated by traditional ecological knowledge and emphasized the interest of livestock and herder in the management or focused on the conservation of biodiversity and were based on scientific knowledge. Scores ranged from 0 to 3. Three points were assigned when the reply was relevant to livestock husbandry and was rich with TEK, two points when the reply was only partly relevant and less rich in details, one when the reply was not so relevant and not rich with details, and no points were assigned if no answer was given or the reply was not relevant to livestock or TEK. In certain cases, only 2 or 3 responses were observed (e.g. in Yes or No type questions). Each of the questions were evaluated and the scores related to the four TEK elements were summed for a total value. For the purposes of evaluation, TEK documented during previous research (Molnár 2014; Varga & Molnár 2014) and ethnographic studies (e.g. Takács 1986; Andrásfalvy 2007) served as a basis for comparison. Descriptive statistics were used to analyse the variables for the three stakeholder groups, scores of the four TEK elements and the total TEK score.

6.2. Traditional ecological knowledge of herders, rangers and conservation officers related to wood pastures

Answers to the 50 questions of the questionnaire showed differences between herders, conservation officers and rangers (**Figure 6.1**). Herders stated that grass quality, livestock carrying capacity and the role in livelihood of the wood pastures are the primary values of wood pastures (emphasized by 92% of the herders). The role of the trees was seen exclusively as provision of shade, fruits and acorns (100%). Oak and wild pear were seen as the most valuable tree species (76%). The purpose of management was to maintain the pasture (100%). All herders (100%) were able to talk about management methods extensively, ranging from clearing thickets up to various ways of pasturing. Clearing of bushes was argued to ensure the possibility for grazing (58%), but more recently because it has also become a criterion for receiving subsidies (42%). Saplings were left over in each site case or even planted proactively (100%). When selecting which individuals should be spared, the function of the tree and the growth form of the individual were taken into account (76%). These trees were mainly protected by thorny bushes and were consistently supervised by the herders (92%). Dead old trees were removed from the grazing area (84%). Herders usually consulted with elderly herders on the use of the pasture (92%) and also said they consulted with the livestock in order to meet their needs (92%). The majority of the herders had started herding young and learned herding practices from an elder (84%). Herders were familiar with plants within the wood pastures, and referred to them by traditional vernacular names (100%). Herders also demonstrated a variety of traditional world-view elements and superstitions related to livestock husbandry (84%) (**Figure 6.1**).

In addition to their conservationist perspective, rangers described the preservation of traditional land-use practices as an outstanding value related to wood pastures (40%). They predominantly highlighted the economic values of the trees on the wood pastures (e.g. shade, acorns, wild fruits) (45%), but they also mentioned their conservation value (35%). Oak and/or wild fruits trees were considered to be the most useful tree species (95%). Both conservation and economic values were mentioned as the goals of wood pasture management (70%). The leaseholder, the livestock, and weather were all thought to be important, but not as important as the conservation values in the development of conservation management plans (42%). Weather and livestock were mentioned (50%) as important factors in determining the date in spring when animals are driven out to pasture and the date in autumn when they are driven back to winter quarters, in addition to adherence to tradition and compliance with conservation laws. Grazing under the supervision of a herder was seen as a better option than pasturing by electric fencing (40%) and they tried to promote the former. Clearing of bushes was identified as important for conservation (50%) as purely for grazing (20%), or because of rules pertaining to subsidies (30%). Both the function of the species and the growth form of young trees were said to be important during the selection process (40%). Attempts were made to preserve dead old trees (85%), and rangers only approved felling them when they threaten tourists. Management options were discussed primarily with colleagues, authorities or not at all (65%). They most often met herders in the fields during herding (55%). Some of the rangers were on friendly terms with local herders (25%). Many rangers collected traditional ecological knowledge intentionally (40%). They usually did not know traditional herder's days, some mentioned the best known traditional festivals: Saint George's Day (for driving livestock out to pasture) and Saint Michael's Day (for driving livestock back) (30%). Many knew traditional vernacular plant names (65%), albeit only superficially. Superstitions regarding the protection of livestock were usually not known by them (90%).

Fifty-two percent of conservation officers focused exclusively on biodiversity as the value of wood pastures. Trees of the wood pasture were valued for conservation value with a general pasturing value (70%). Conservation officers described exclusively conservationist considerations when asked about the goals of wood pasture management (56%), such as maintenance of open habitats and repression of ecological succession. Legal provisions and nature conservation guidelines were advanced as fundamental management principles (76%). Sixty-seven percent of them had no or only general information about the management of wood pastures and focused only on



nature conservation laws and regulations. Conservation officers said that they would select trees for sparing based on their shape and location (50%). Most officers did not think protection of young trees from grazing was important in any way (64%). They would make efforts to preserve dead old trees in the area (88%) and would approve felling only when tourists were threatened. They conducted discussions with authorities, experts and the colleagues at the national park directorates in the course of developing management or maintenance plans (60%). Many officers reported that they do not meet herders, and those that did, primarily during inspection visits (40%) or biological field work (54%). Most of them knew nothing of traditional herder's days (94%), and they were unfamiliar with superstitions related to livestock husbandry (94%).

Based on the four TEK elements and TEK as a whole, conservation officers, rangers and herders differed from each other (**Figure 6.1**). Officers and herders had the lowest and highest overall scores, respectively, both in terms of the four TEK elements and in terms of the total sum. The TEK of the rangers fell between the two groups in all of the cases. Rangers had the highest variability for all four elements of traditional ecological knowledge.

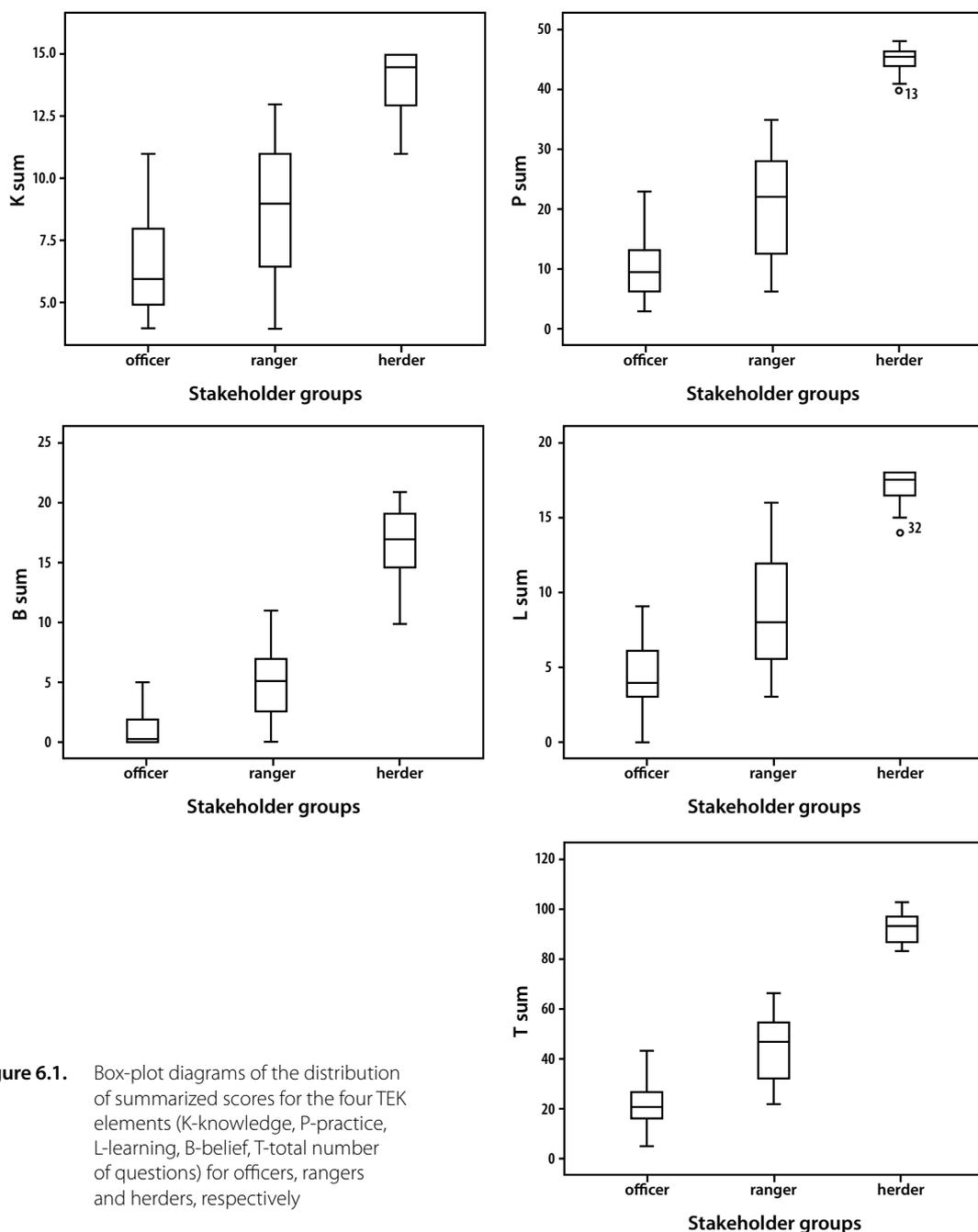


Figure 6.1. Box-plot diagrams of the distribution of summarized scores for the four TEK elements (K-knowledge, P-practice, L-learning, B-belief, T-total number of questions) for officers, rangers and herders, respectively

Photo 6.2 Tükrös (mirror box, in Hungarian – Magyargencs, Hungary, made in 1840). A traditional world view – expressed in pieces of folk art – constituted an integral part of traditional ecological knowledge. (Varga & Molnár 2014)



Hungarian Museum of Ethnography,
Inventory number: NM 1.149.69

6.3. The role of rangers in bridging the gap

The three stakeholder groups managing wood pastures (herders, conservation officers and rangers) differed in the amount of traditional ecological knowledge they possess. Herders had the highest amount of TEK; knowledge of the two conservation manager groups differed both from that of herders as well as from each other's. It was not surprising that the value system and the knowledge held by various stakeholder groups differed, similar results are reported by Andersson *et al.* (2007) for Sweden, Buijs and Elands (2013) for Netherlands, and de Koning *et al.* (2014) for Western Europe. Also, it was not unexpected that conservation managers held a predominantly biodiversity-centric view, while herders saw the world in a more holistic way with 'livestock' at the center (Roba & Oba 2009; Knapp 2009). However, the strong difference between the two conservationist groups (officers and rangers) was unexpected. Although rangers had smaller amount of TEK than herders, it was significantly higher than that of conservation officers, both in terms of the overall picture and in terms of each TEK element. It should be noted that herders did not achieve perfect scores for overall TEK or for the four elements. In Hungary, as in other parts of Europe, TEK is changing and diminishing at a high rate (Oteros-Rozas *et al.* 2013; Molnár 2014).

Our results highlighted a crucial, but not well-documented issue related to the use of traditional ecological knowledge into conservation. While the scores for 'Knowledge' were relatively high for both conservation officers and rangers, the score for 'Belief' was close to zero among officers, and rangers showed a similarly low score. This indicates that the 'Belief' element of TEK has been more difficult to integrate into nature conservation issues than lexical knowledge or practice (Berkes 2008; Nadasdy 1999; Reo 2011). The use of the practical element of TEK was more frequently observed among rangers. A similar situation is documented for rangers conducting fire management in an Australian national park (Lewis 1989). We found that rangers had higher scores for traditional learning than officers. This may indicate rangers' ability to combine different knowledge systems (Tengö *et al.* 2014). In Hungary (as in many other parts of the world) conservation management and ecology courses do not provide support for TEK. These courses focus mainly on the protection of biodiversity by applying Western-science-based methods and practices (Saunders *et al.* 2002; Pásztor & Oborny 2007; Primack 2010). Our results suggest that rangers may be able to bridge the gap between Western-science-based conservationists and herders pursuing traditional pasturing.

There are a number of examples of cooperation between local people and official nature conservation administrations (Borrini-Feyerabend *et al.* 2004; Bohensky & Maru 2011; Berkes 2008; Robinson & Wallington 2012). However, the underlying factors determining TEK utilization by conservationists are not well understood (Bohensky & Maru 2011). We found that the key factors for successful use of TEK related to wood pastures by conservation officers and rangers were similar to the traditional ways of knowledge acquisition and maintenance among indigenous and local communities (e.g. time spent in nature, role of parents and experiential knowledge transmission (Berkes *et al.* 2000; Oteros-Rozas *et al.* 2013; Iniesta-Arandia *et al.* 2015). In our research case, rangers spent an average 74% of their working hours in the field, while officers only spent 39%. In our study, the main factors for success were living in the area, spending considerable time in the field, childhood memories of and recent engagement in livestock husbandry. All of these may support local ecological 'embeddedness', of which the importance for resilience of natural

resource management was emphasized by Whitmann and Cooper (2000), as well as Knapp and Fernandez-Gimenez (2009).

The 'Practice' element of TEK was determined based on our own experiences. We argue that engagement in every-day practical management of wood pastures enhances the efficiency of TEK utilization through the hands-on experiences gained during management. The development of rangers' TEK corresponds to the crisis learning methods described by Berkes and Turner (2006). Seventy-four percent of the rangers interviewed applied traditional land-use practices as a form of adaptive conservation management (e.g. grazing, clearing of bushes) in the areas they managed (Photo 6.2).

We found that one of the main determining factors of 'Learning' and maintaining TEK was the local social and cultural context (Agrawal 1995; Eraut 2004; Berkes 2009). This was shown by the effect of childhood memories and connection to locality. More time and more interaction with local herders could enhance social connections and increase possibilities for knowledge transmission (Rodela 2011; Iniesta-Arandia *et al.* 2015). Conservation officers have a lot less opportunity to meet herders, and when they do, these meetings are related to official matters. Traditionally, an elderly guide, teacher, or community plays an important role in transferring TEK to the younger generations (Folke 2004). Due to the erosion of TEK in the changing socio-economic and ecological environment, opportunities for such encounters are expected to diminish further in the future (Schmitz *et al.* 2012; Oteros-Rozas *et al.* 2013; Fernández-Llamazares *et al.* 2015). Traditional worldviews are even more vulnerable as they cannot 'reach' people who do not meet TEK-holders on a regular basis (Berkes 2009). We found that 40% of rangers intentionally study traditional knowledge on the use of wood pastures. Hence they have a personal, mentor-like relationship with one or more highly-knowledgeable local TEK-holders. A mentor-apprentice relationship is not simply a way to gain TEK and embrace a local worldview (Barnhardt 2005; Reo 2011), it also improves communication and knowledge transfer between conservationists and local communities (Bohensky & Maru 2011; de Snoo *et al.* 2013; Fazey *et al.* 2013). Furthermore, these kinds of relationships may promote the strengthening of bottom-up initiatives and increase the conservation responsibilities of local people (Mills *et al.* 2014).



Photo 6.2 Most of the Hungarian national parks do wood pasture management. They are organized by the local rangers as a form of adaptive conservation management (e.g. grazing, clearing of bushes) in the areas they managed. They use traditional ecological knowledge and sometimes they work with the local herders together on the management plan.

Conclusion

Socializing with herders, spending time in the field, practicing livestock husbandry, and spending one's childhood in a traditional community are important in the development of TEK. All of these factors increase the possibility of social learning and knowledge transfer.

We argue that the fundamentally different ways of learning within traditional and scientific knowledge systems provide presents an alternative for Western-scientific pedagogy. Use of traditional learning methods would be of paramount importance for training conservation managers (Kimmerer 2002; Lemus *et al.* 2014). Based on our results we argue that rangers may play a key role both in keeping TEK alive and in adapting it to prevailing conditions as 'brokers' between local people and government officers (Lewis 1989; Tengö *et al.* 2014). This may be particularly necessary in those areas where traditional land-use is applied or required as a form of nature conservation management (Gugić 2009; EC 2014).

The gap between traditional local communities and government conservation approaches could be bridged and conservation management and decision making could become more efficient if rangers have possibility to learn, adapt and use TEK during their work. Besides TEK holder rangers could have a consultant role between local people and conservation officers and enrich the adaptive capacity of the traditional ecological knowledge.

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