Perspective

Civil society to government policy: a case study of bear management in Slovakia

Robin Rigg

Slovak Wildlife Society, Liptovský Hrádok, Slovakia

Contact: info@slovakwildlife.org

Introduction

In 2001, a young bear named Brigita trapped herself in a refuse bin in the Tatras National Park, sparking debate about what to do not only with her but with problem bears and bear management in Slovakia in general. This is the story of the progress, setbacks and missteps taken during the ensuing two decades of twists and turns in government policy and of the key role of civil society during the post-communist transition period.

When addressing wildlife damage and related conflicts, identifying the most appropriate level to target is an important aspect that can have a major influence on the outcome of interventions [1]. Grassroots efforts are attractive if the necessary resources are within reach of local communities and non-governmental organisations (NGOs). Moreover, NGOs are quick to react, nimble, open to learning lessons from the outside world and outcome-oriented. On the other hand, high-level policy decisions by national institutions have the potential to enact broader change though likely require far greater resources to implement and may take longer to manifest in tangible effects on the ground. Salutary lessons can be learned from examples related to bear management in Slovakia.

Background

The brown bear (*Ursus arctos*) was almost eradicated from Slovakia by the 1930s. A 30-year moratorium on hunting enabled an ongoing process of natural recovery [2]. One of the reasons for persecution of the species in the past was its impact on agriculture and other human interests. As bears increased in number and recolonised much of their former range, these issues re-emerged and became increasingly prominent [3].

Bear hunting resumed in the 1960s with the intention of controlling population growth and limiting damage [2]. Although it was unclear if either of these goals was being achieved, bear management in Slovakia continued to be based largely on trophy hunting for 60 years (Fig. 1). Hunting advocates claimed that impacts were a result of 'over-abundant' bears and so, they reasoned, population control should form the basis of management. Although compensation for damage to livestock and beehives, introduced in the 1960s, was nominally conditional on an inspection commission absolving the owner or guardian of blame, in practice it was often paid even when prevention measures were inadequate.

This situation discouraged a sense of personal responsibility among people living, working and recreating in

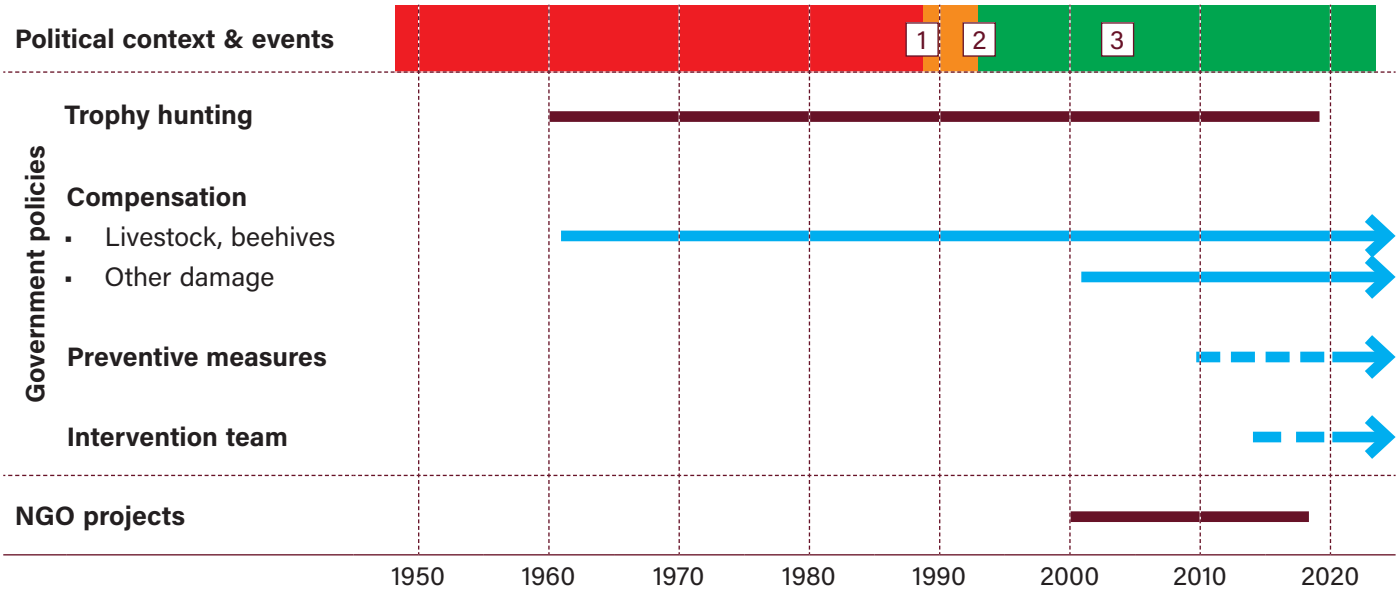

Fig. 1. Timeline of changes in bear management policies in Slovakia in relation to the political context and the NGO projects described in this article. Shading: red = Czechoslovak Socialist Republic; orange = Czech and Slovak Federative Republic; green = independent Slovak Republic. Numbers: 1 = 'Velvet Revolution' (end of Communist party rule); 2 = 'Velvet Divorce' (dissolution of Czechoslovakia); 3 = EU accession.

areas with bears. At the beginning of the 21st century, the level of awareness among the Slovak public and tourists of appropriate behaviour in bear country was low [4]. Negative aspects, such as economic losses and occasional attacks on people, dominated news coverage of bears, promoting a sense of fear (see below).

To increase knowledge of bears and promote non-lethal approaches to mitigating impacts, the Slovak Wildlife Society (SWS)[1] implemented a series of inter-related projects beginning in 2000. By providing information as well as practical and financial help on how to prevent problems, we hoped to reduce the need, whether real or perceived, for lethal control. With this overall goal in mind, our specific aims were to:

- Increase tolerance and understanding of bears in Slovakia;
- Raise public awareness and knowledge of bears and bear safety;
- Test, implement and promote the use of non-lethal preventive measures;
- Provide the best available information based on scientific research;
- Encourage children and youth to take an active interest in nature;
- Contribute to the scientific understanding of bears;
- Improve the quality of data available to managers;
- Support bear conservation and habitat protection.

As a small NGO with modest means[2], we sought to increase our efficacy by working with partners, lobbying authorities to act and using a variety of media to reach hearts and minds. In this article, I summarise what we achieved while being candid about where we failed. In many instances, our efforts built on past work and traditions in Slovakia or, where these were lacking, drew inspiration from elsewhere. I describe how small-scale initiatives fed into broader endeavours, with multiple generations standing on the shoulders of giants[3] in a kind of human pyramid[4] of progress towards fostering greater bear–human coexistence.

Understanding people

To improve our understanding of the situation and guide subsequent work, in 2003/04 we conducted a survey

[1] The Slovak Wildlife Society (http://slovakwildlife.org/) is a not-for-profit, non-governmental organisation founded in 1998 and registered in Slovakia as an association of citizens in 2005.
[2] The activities described in this article were implemented by a core team of up to five staff and consultants (mostly part-time), plus volunteers, with annual budgets typically less than €8,000 per project.
[3] https://link.springer.com/chapter/10.1007/978-1-4471-0051-5_5
[4] https://phys.org/news/2015-04-human-pyramid.html

of public knowledge, attitudes and practices (KAP). We administered a written questionnaire to various target groups (residents, school pupils, shepherds, farmers, hunters, foresters and tourists) in two contrasting regions: a 'core' area of relatively high bear densities and a 'control' area where large carnivores were rare or absent. As well as finding out what people knew and thought about bears, wolves, lynx and their management, we wanted to identify what most influenced levels of acceptance [4]. Taking a social science approach to large carnivore issues was novel at the time in Slovakia but has since been adopted by other researchers[5].

As we expected, our KAP survey found low levels of knowledge about bears and how to behave in bear country but, encouragingly, showed that over 90 % of respondents (n = 1,178) wanted to find out more. More surprising, though also encouraging, was the finding that most people held neutral to positive attitudes toward bears, despite the focus of journalists and stakeholders on damage and conflicts. Furthermore, a positive correlation was found between levels of knowledge and acceptance, except among people most impacted by large carnivores. Considering occupational groups, shepherds had the most negative attitudes and foresters the most positive. Fear was an important factor: very fearful people had the most negative attitudes. The bear was considered the most dangerous species of carnivore and was most feared, and yet was more accepted than the wolf. Residents aged 16 – 35, males and people living in towns were more positive toward large carnivores than their counterparts.

Regarding management-related questions, most respondents (61 %) agreed that farmers should be compensated for losses although only 30 % knew that such compensation was available. Almost all respondents (97 % in the core area) were aware that bears sometimes foraged for food in bins but almost twice as many people attributed this to a lack of natural food, or 'too many' bears, than to refuse being an easily accessible food source. Most respondents (78 %) agreed that hunting of large carnivores should be strictly regulated, although 41 % of those in the core area thought there were too many bears.

Education and awareness

We used the findings of the KAP survey to design a countrywide awareness-raising campaign which we implemented together with various partners from 2004 [5]. To target school children and teachers we produced and distributed a range of materials including a teachers' manual; a wall calendar illustrating the first year of a cub's life; information leaflets and postcards, stickers etc. We organised an annual bear-themed art and literature competition that peaked in its sixth year when we received over 1,900 entries from 133 schools in 72 % of Slovakia's administrative districts. The theme *"What do bears dream about?"* appealed to children's imagination, according to which bears most often dreamt of honey, forest fruit or having cubs, but sometimes also about taking a rubbish bin into their den for the winter! We also ran excursions and 'Bear Camps' for local teenagers, with trips to areas with bears, lectures on bear–human coexistence and clearing up refuse to prevent it attracting bears.

To reach the wider public, we set up an educational website[6] in Slovak and English with information on bear ecology, appropriate behaviour in bear country, damage prevention measures, project activities, research results and links for further information. By 2008, four years after it was established, the website was receiving over 50,000 hits per month, exceeding 400 separate visits on some days, around half of them from Slovakia and the rest from more than 80 other countries per month. The website proved a very effective means of disseminating information, materials and advice and we often saw it quoted in newspaper articles and elsewhere. Although now only occasionally updated, it is still active after two decades. Recently the Ministry of the Environment (MoE) and State Nature Conservancy (SNC) used EU funds to set up their own website[7] that has very similar content with a more sophisticated design.

During our most intense period of work, in 2003 – 2013, we gave dozens of presentations on bears and bear safety in schools, at teachers' gatherings and various venues for the general public and interest groups. The results of our KAP survey had shown a lack of awareness of prevention measures so we emphasised this aspect with presenta-

[5] For example: https://www.truni.sk/news/medvede-prieskum-vysledky
[6] www.medvede.sk
[7] https://omedvedoch.sk

tions and practical demonstrations at events for farmers, foresters, hunters, veterinarians, police officers and community leaders. We produced an official Slovak version of the Safety in Bear Country Society's excellent film *Staying safe in bear country*[8] that we distributed via our website and showed during many of our talks and seminars.

We produced a travelling exhibition with mounted photographs and text, the first version of which was seen by around 20,000 people at 50 venues in 2005 – 2009, following which we prepared an improved version[9] using roll-up banners that toured 30 venues in 2010 – 2012. Venues included schools, universities and education centres, town and village halls, museums and galleries, various cultural events and tourist facilities in areas with bears. In addition to presenting information about bears such as what they eat, why they hibernate and what threats they face, the exhibitions explained how problems between bears and people can be reduced, by protecting beehives and crops and learning how to avoid the riskiest situations as well as what to do in an encounter. Exhibition openings were often done in conjunction with a talk and film screening.

In an attempt to improve the balance and accuracy of media reporting on bears, we worked actively with journalists from local and national TV stations, radio, newspapers, popular and specialist magazines. Regular liaison with individual journalists as well as press releases to agencies, publishers and broadcasters led to considerable positive media attention, promoting knowledge about bears and non-lethal prevention measures. While the media did not stop sensationalising conflicts and scaremongering, it has at least become more standard practice to mention potential solutions as well as problems.

As our efforts gathered momentum and became better known, opportunities arose to reach bigger audiences. The largest public events in which we participated were the Bear Days festivals in the High Tatras, held annually from 2008. Our part in the programme included fun and educational activities for children and adults, with an emphasis on raising awareness about appropriate waste management and bear safety. Similar to working with journalists, it was not always easy to find a good fit between education and entertainment, particularly as the festivals grew in size and became more commercial, but our message reached at least some of the tens of thousands of attendees each year. To target an even wider audience on a longer-term basis, we tried to establish a Bear Centre, or Large Carnivore Centre, as a major tourist attraction and focal point for media interest as well as hosting school groups but, unfortunately, we did not succeed in raising the required funds.

Respondents of the KAP survey who said they had seen a bear had significantly more positive attitudes toward the species than those who had not (there was no equivalent difference for the wolf or lynx). To show that local people can benefit from carnivore presence, we offered various guided trips focused on bears, wolves and lynx [6]. Such activities were rare in Slovakia when we started in 2000. Although wildlife watching is still only a small part of the country's tourism sector, interest is growing amongst the public, media, NGOs and government[10] and several operators now offer bear watching trips[11] (Fig. 2).

Research and monitoring

Slovakia was ahead of its time when introducing legal protection of bears (1932) and a damage compensation scheme (1962) but fell behind in terms of scientific study. A comprehensive review of the state of knowledge [2] found that most studies in the 20th century were limited to aspects of hunting and game management.

To help improve the quality and quantity of data available to managers and educators, we conducted basic ecological research on, for example, bear diet [7] and parasitology [8,9] as well as bear–human impacts such as patterns of damage [3,10], the effectiveness of prevention measures [10 – 12] and vehicle collisions [13]. We monitored bear activity and conflicts in several regions of Slovakia and visited sites of bear–human encounters. We carried out the first non-invasive genetic sampling of bears in Slovakia for international studies [e.g. 14,15]. We supported protected area administrations by participating in field surveys, provided them with expert advice [e.g. 16] and helped set up a telemetry study [17]. We also con-

[8] https://www.medvede.sk/index1.php?action=film
[9] https://www.medvede.sk/index1.php?action=vystava
[10] See: https://prirodnyturizmus.sk/en/
[11] For example: http://slovakwildlife.org/en/offers/guides

Fig. 2. Guided bear watching tour in the Tatra Mountains, Slovakia (Photo: Robin Rigg).

tributed data to continental-scale analyses of bear damage [18], compensation and prevention programmes [19] and attacks on humans [20].

We presented our work at scientific meetings, notably conferences on Mammal Research and Conservation in Slovakia [3,5,7] as well as international events such as the IBA International Conferences on Bear Research and Management [10,11,21 – 23], the International Human–Bear Conflict Workshop [24] and European Congress of Conservation Biology [25]. Until about 2014, I was often the only participant at such events working on large carnivores in Slovakia, but in recent years there has been a flowering of research and monitoring [26 – 29]. Unfortunately, some work implemented or contracted by state institutions has been marred by allegations of corruption[12] as well as controversies about possible negative effects of telemetry collars on bears[13] and doubts about the reliability of a recent genetics-based estimation of population size[14].

Damage prevention measures

When we began our work, many people seemed to accept the oft-repeated argument that problems were due to 'over-abundant' bears, so they felt little personal responsibility or need to use preventive measures. This applied to shepherds protecting sheep as well as to hotel staff storing food or disposing of waste. Those who tried to implement mitigations often lacked sufficient know-how to do so effectively. Improving damage prevention measures has thus been a key focus of the SWS.

Livestock protection

There is a long tradition in the Slovak Carpathian Mountains of using livestock guarding dogs (LGDs). They probably came with flocks of sheep and goats from Romania and the Balkans during the Wallachian colonisation in the 14th to 17th centuries. However, agricultural manuals in Czechoslovakia's post-war socialist period in-

[12] https://domov.sme.sk/c/5819164/medvede-sledujeme-za-milion.html
[13] https://www1.pluska.sk/regiony/stredne-slovensko/pri-murani-tula-medvedica-tesnym-obojkom-rocnym-mladatkom
[14] https://tvnoviny.sk/domace/clanok/849275-polovnici-spochybnili-pocet-medvedov-zverejnili-vlastne-cisla

structed that LGDs should be kept chained up near flocks at night and not accompany them to pastures for grazing [27]. This approach may have been sufficient when predators were scarce, but it was not enough to deter recovering populations of bears and wolves.

To address this situation, we built on pilot work in the 1990s to reinvigorate the LGD tradition in Slovakia [28]. We donated nearly 70 pups of the Slovenský čuvač, Caucasian shepherd dog and other breeds to farmers and shepherds, who raised them amongst sheep from about 6 – 8 weeks of age and later kept them with their flocks day and night. The median loss of sheep to bears and wolves at trial flocks with one or two project LGDs was 70 % lower than at control flocks, even when the dogs were still less than two years old [12].

We also conducted a survey of 147 farms in 2003 and found that almost 80 % of losses were reported to occur at 12 % of sheep flocks [12]. Much of the variation was explained by local conditions and husbandry practices, especially damage prevention measures. Although eligibility for compensation was supposedly conditional on the use of appropriate preventive measures, it was often paid even when such measures were poorly implemented and/or maintained. Our work inspired improvements at some additional farms but keeping LGDs on chains continued to be the norm. During the last decade state authorities have prioritised effective damage prevention [29] and stricter criteria[15] for receiving compensation came into force in 2023. Unfortunately, Slovakia is still not utilising available EU financial mechanisms to support costs of implementing preventive measures [30].

Bears and bees

Apiaries account for around a third of compensation paid for damage by bears in Slovakia [32]. We noticed that some beekeepers installed home-made but inadequate protection measures, leading them to conclude that "*electric fences don't help*". Experience elsewhere has shown that electric fences, if properly implemented and maintained, can be very effective at excluding carnivores *(Editor's note: see pages 4 and 61 in this issue of CDPnews)*.

Fig. 3. Helping a beekeeper to instal electric fencing (Photo: SWS archive).

[15] https://www.slov-lex.sk/pravne-predpisy/SK/ZZ/2021/170/

Between 2009 and 2016 we worked with beekeepers in central Slovakia to protect 10 apiaries with electric fences. We followed guidelines for electric fencing against bears (see *CDPnews* issue 5), meeting or exceeding recommended parameters in order to maximise the likelihood of success. During an initial visit, a site-specific design was agreed following which the beekeeper sourced and installed fence posts. We then returned to assist with the installation of wires, energiser and other electrical equipment (Fig. 3). On drier or stonier ground with less conductivity, an alternating hot–earth design was used while elsewhere all wires were live. Equipment was provided to beekeepers without charge for a trial period of 6 – 12 months, following which they could purchase it at half the normal purchase price to help cover some of our costs.

There was no further damage by bears at any of the protected apiaries. In the most extreme case, we managed to end a cycle of damage and compensation claims that had recurred at the same site for decades (Fig. 4). All 10 beekeepers chose to keep the fences and we have since seen many other beekeepers in the area inspired to use similar designs. In recent years there has been a proliferation in the use of electric fences to protect livestock and crops, though often with inadequate construction or maintenance and hence limited effectiveness.

Securing refuse

The first cases of human habituated, food-conditioned bears in Slovakia were reported in the 1960s, when bear numbers but also tourist infrastructure in bear areas were increasing [31]. Nuisance bears injured several people in the 1970s and 1980s [32,33]. Refuse bins in some locations were enclosed in bear-resistant structures but most were left unsecured. Dangerous situations arose due to poor food storage and/or waste management, deliberate luring of bears as tourist attractions and inappropriate behaviour during encounters.

The issue came to prominence in 2001 – 2002 when Brigita injured several people, leading to considerable public discussion and an international conference on problem bear management [34]. Opinions divided along familiar lines: hunting advocates called for culling to

Fig. 4. Protecting this apiary with electric fencing ended a decades-long cycle of damage and compensation (Photo: Robin Rigg).

Fig. 5. A bear foraging in a refuse container in the High Tatras (Photo: SWS archive).

maintain the bear population at an "optimal" level while environmentalists claimed that protecting sufficient natural habitat would solve the problem. Not much changed in terms of policy beyond implementing EU legislation[16]. Authorities and managers were slow to intervene in cases of food-conditioning, sometimes failing to do so until after people had been injured and there was little alternative but to remove the offending bear. Even then, it was typical for food sources to be left unsecured and thus likely to attract more bears (Fig. 5).

According to the IUCN/SSC Bear Specialist Group's expert team on human–bear conflict (HBC), removing or securing 'attractants' (anthropogenic food) is widely regarded as the best way to prevent many conflicts [35]. Substantial decreases in HBC have been achieved in North America through a combination of strict garbage management, regulations on human food storage, prohibition of bear feeding and public education about appropriate behaviour in bear country [e.g. 36]. We therefore implemented a project promoting bear-resistant refuse storage systems [24]. Finding no interest among larger manufacturers, in 2007 – 2008 we worked with a local company[17] to develop bear-resistant bins, inspired by N. American designs. A prototype withstood several attempts to open it by a young food-conditioned bear in the Tatras. We conducted a more controlled test with adult bears at Košice Zoo (Fig. 6) and some deficiencies in design became apparent. After correcting these, we repeated the zoo test: this time the bears could not get in[18]. We installed three of the improved bins as demonstration examples at tourist facilities and a roadside rest stop that were frequented by bears.

Other approaches can be cheaper, easier and quicker than replacing existing bins. For example, in 2007 – 2008 we supervised and co-funded work to construct cages[19] around multiple 1,100-litre capacity bins at sites where nuisance bears had been removed but refuse was left unsecured (Fig. 7). The new structures successfully prevented additional bears accessing refuse and becoming food-conditioned. We also funded installation of electric fencing at a mountain chalet in the High Tatras where a female with cubs had repeatedly obtained anthropogenic food from the terrace, storeroom and kitchen. We were inspired in this by the successful use of electric fencing to secure refuse containers and recreational buildings on the Polish side of the Tatra Mountains [37], where persistent bears were scared off with rubber bullets and problem individuals were monitored with radio collars or tags. Using this approach, even bears that started to show problem behaviour were no longer removed from the population.

We informed the MoE, protected area staff and local authorities of our work and lobbied for support of non-lethal preventive measures on a larger scale. Instead of this, following a change of government in 2006, the SNC joined those blaming 'over-abundant' bears for the problems. They prepared an EU-funded project on large carnivore research and monitoring to run from 2009 until 2014 with a budget of over €2 million, but the focus was on counting bears, not improving coexistence.

Following another change of government in 2010, the new Environment Minister announced a major change in

[16] The Habitats Directive was incorporated into national legislation ahead of Slovakia joining the EU in 2004.
[17] http://ferrumline.sk/
[18] http://www.medvede.sk/index1.php?action=kontajnery
[19] http://www.medvede.sk/index1.php?action=oplotenie

Fig. 6. Testing the efficacy of a bear-resistant refuse container (Photo: Robin Rigg).

Fig. 7. Metal cage constructed to prevent bears gaining access to standard refuse containers (Photo: Robin Rigg).

policy: emphasising prevention rather than post hoc removal of problem bears. The range of measures to be implemented included support for the installation of bear-proof bins, an information campaign to inform the public and new procedures for dealing with problem bears. As neither the MoE nor the SNC had any bear-proof bins, they borrowed ours to demonstrate at their press conference.

The impact of the policy change was apparent in 2012 when Banská Bystrica Town Hall asked us to supply bear-resistant bins for a recreation area within the Low Tatras National Park buffer zone. Park staff prescribed that, "It is essential to implement refuse containers so that their contents are not accessible to wild animals, particularly the brown bear, which occasionally wanders through the site and would be encouraged to visit more often by easily accessible refuse; likewise it is necessary to arrange for regular refuse removal so that it does not accumulate." We worked with the Town Hall to design and install suitable bins but a lack of regular maintenance limited their lifespan.

We conducted another KAP survey about bears and waste management in the High Tatras in 2014, which revealed strong public support for non-lethal solutions [23]. Both residents and stakeholders rated bear-resistant containers as an appropriate and effective means to reduce the incidence of food-conditioned bears, showing that efforts to raise awareness had succeeded. Nevertheless, distrust and disharmony among stakeholders and insufficient 'ownership' of the problem resulted in failure to take sufficient action.

The situation began to improve after the introduction in 2016 of a legal requirement[20] for appropriate storage of garbage in areas with bears, although implementation remains inconsistent. In the High Tatras, local authorities spent more than €1 million on specially constructed cages but the design was not consulted with bear experts and proved to be flawed[21]. During the last four years, a more systematic approach by authorities, aided by the recruitment of staff with experience gained through SWS projects, and sanctioning by the Slovak Environmental Inspectorate in cases of non-compliance, has seen instances of problem bears in the High Tatras fall substantially[22]. Elsewhere, however, the legislation is not consistently enforced and refuse remains easily accessible to bears.

Despite offers of state support, some local authorities continued to claim that they did not have sufficient funds for bear-proof bins. We worked with an international consortium of partners including Canadian specialists[23], Slovak manufacturers[24], a local refuse management company[25] and staff of the Tatras National Park to develop a cheaper alternative [21,22]. This consists of a strengthened 1,100-litre waste container fitted with a bear-resistant locking mechanism. The modified container successfully passed the Interagency Grizzly Bear Committee's live-bear testing protocol at the Grizzly & Wolf Discovery Center, USA[26] in 2015 and was certified as meeting minimum bear-resistant design and structural standards (IGBC Certification No. 5052). We also tested the design in Slovakia (Fig. 8), further improved it and then retested with free-living bears in the Tatras, captive bears in Košice Zoo and a simulated annual cycle of waste collection to ensure ease of use by refuse collection services and the public. The final version of the container passed all three tests and is currently in use at several localities.

Emergencies and intervention teams

The lack of a dedicated team to respond to emergency situations used to result in inaction, late intervention and reliance on local hunters to deter or remove problem bears. Cases arose in which the response of state authorities to serious incidents was inadequate, sometimes with disastrous outcomes. For example, a female bear was fed by visitors and workers at several recreation facilities in the Low Tatras National Park for three successive years but little action was taken until after she injured six people in three separate incidents [38]. In 2010, the manager of an animal shelter tried to restrain an adult bear with a dog capture noose and a vehicle tow rope prior to admin-

[20] https://www.slov-lex.sk/pravne-predpisy/SK/ZZ/2015/79/
[21] https://spis.korzar.sme.sk/c/20603575/majko-stanicky-na-odpad-neplnia-svoj-ucel-byvaju-otvorene.html?ref=av-center
[22] https://sita.sk/nasvidiek/pod-tatrami-pribudne-vyse-sto-vylepsenych-kontajnerovych-stojisk-ci-nadob-na-odpad-zabezpecenych-proti-medvedom/
[23] https://haulall.com
[24] https://www.meva.sk/Medved-a-kontajnery-c45_0_1.htm
[25] http://www.vpstatry.sk
[26] https://www.grizzlydiscoveryctr.org/product-testing

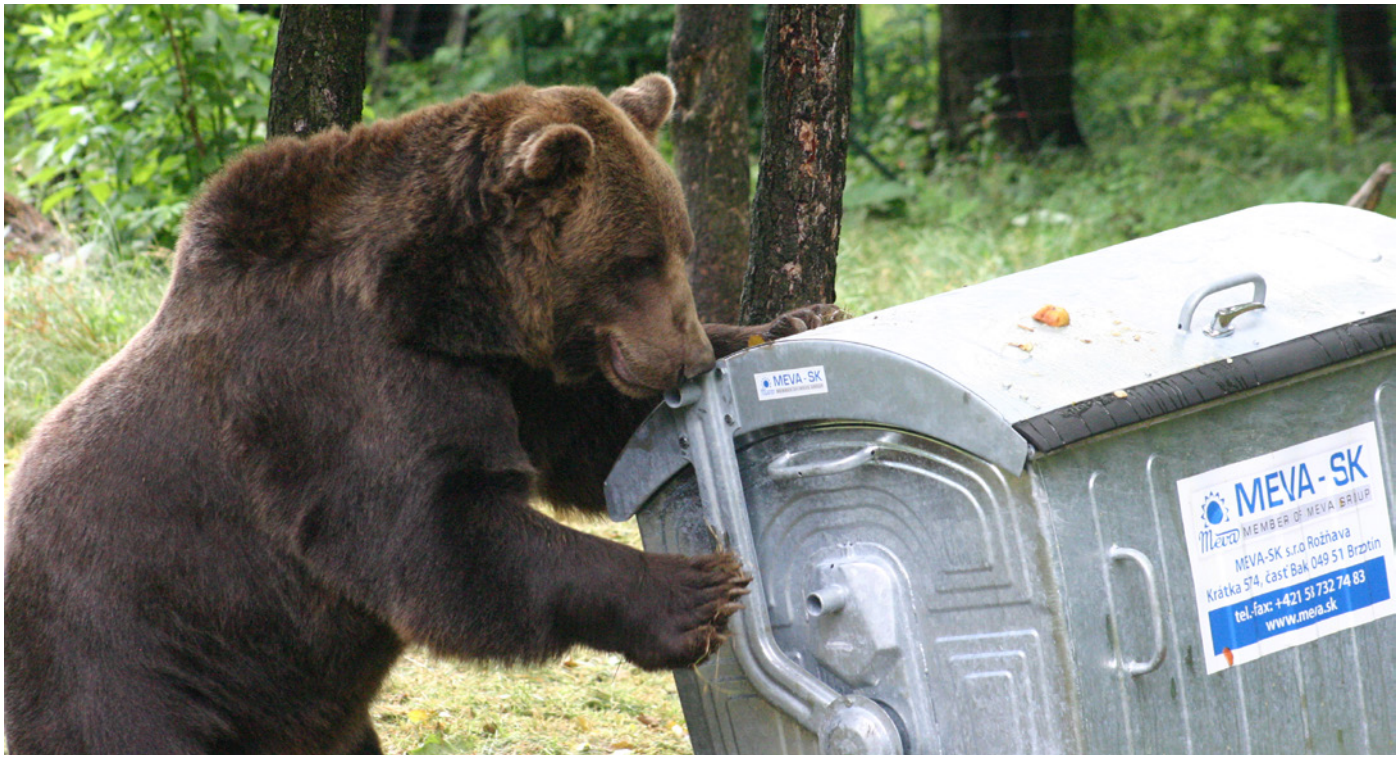

Fig. 8. A modified and reinforced refuse container undergoing testing (Photo: Robin Rigg).

istering tranquiliser using a hand-held syringe. The bear, later found to be a pregnant female, bit him and was shot by police[27].

We considered the establishment of a professional response team to be an important step to improve bear management in Slovakia. We lobbied the MoE and took part in meetings at the Ministry and in the High Tatras to discuss the proposal with representatives of interest groups including community leaders, veterinarians and hunters. In 2011 we organised a 2-day training event for potential team members with an international bear expert. It included presentation of the Croatian Bear Emergency Team's work, practical demonstrations of deterrent techniques and standardised procedures for bear immobilisation (Fig. 9) as well as drafting of a possible protocol for a Slovak Bear Emergency Team.

The SNC established an intervention team in 2014 but appropriate protocols for dealing with problem bears [cf. 39] were not adopted and further instances of mismanagement occurred. For example, throughout May 2017 a female named Ingrid and her two cubs frequented recreation and residential areas in the Tatras where they obtained anthropogenic food. After an attempt to translocate the family resulted in them returning to human habitation, the mother was tranquilised, during which she was allowed to fall from a tree several metres to the ground. Ingrid was translocated again but returned to the village the next day, apparently searching for her cubs (which had been taken into captivity), where she was shot, provoking widespread condemnation by animal rights activists, hunters and the public[28]. In at least two other cases, EU-funded bear traps were apparently abandoned in the forest where they decayed to the point of being unusable. Meanwhile, bear-related problems continued to increase in the Tatras, where authorities declared a 'state of emergency'[29].

Fortunately, there have since been improvements in the staff, training, equipment and procedures of the intervention team, most noticeably since another change of government in 2020 led to more backing from the then new Environment Minister. However, antagonistic messaging and the exclusion of interest groups from

[27] https://www.blesk.cz/clanek/zpravy-udalosti/145879/slovensti-geniove-zastrelili-tehotnou-medvedici.html
[28] https://spravy.pravda.sk/domace/clanok/433073-kauza-odstrelu-medvedice-ak-sa-vrati-zastrelte-ju
[29] https://www.noviny.sk/slovensko/160277-mimoriadna-situaacia-vo-vysokych-tatrach-medvede-ohrozuju-deti-pri-skolach

Fig. 9. Djuro Huber leading a training event for potential bear emergency team members (Photo: Robin Rigg).

decision-making and activities alienated stakeholders and local communities, leading to protests[30] and calls for a return to culling, for which the current government, elected in 2023, has shown support[31].

Bear attacks and pepper spray

Most bears avoid humans and flee from them when encountered and the absolute risk of being attacked by a bear is low. However, some interactions elicit aggressive responses by bears which may result in serious injury or, rarely, even death [40]. Although the number of people directly affected is small, such incidents leave a big psychological 'footprint' as they evoke people's fears, receive a disproportionate amount of media attention and frequently influence policy and decision-making. For bears, too, negative consequences extend beyond the individuals involved, as conflicts may affect public perceptions of bears per se and hence undermine support for conservation measures.

Whereas careful, scientific study can elucidate risk factors leading to recommendations for public safety [40], until recently reports of bear attacks in Slovakia were anecdotal [e.g. 32]. As a result, there was little understanding of the triggers of aggressive behaviour by bears, how to avoid potentially dangerous situations and what is the most appropriate way to react during an encounter to minimise the risk of serious injury. A first attempt to analyse cases quantitatively [41] relied on unverified accounts and lacked a clear, unbiased methodology. Game statistics published by the National Forest Centre report 'unfinished attacks', a classification not recognised by international experts [42] that includes cases in which bears showed no signs of aggression [43].

Beginning in 1998 I have maintained a dataset of alleged bear attacks on humans in Slovakia compiled from media reports, the internet and official sources. For his masters thesis [44], my colleague verified cases in the dataset through consultation with authorities and experts (national park staff, district offices, foresters, the police, medical services, etc.). He also interviewed victims and visited attack sites in order to gather detailed information on the circumstances in which injuries occurred and the activity and behaviour of both people and bears before and during attacks. A version of our protocol is now used by members of the bear intervention team when investigating alleged bear–human encounters.

Following a particularly severe mauling in 2006 that received widespread media coverage and left many people fearful of going to areas with bears, we decided to make bear spray available in Slovakia for the first time. Despite scepticism from some environmentalists and hunters, there proved to be considerable demand. An initial order of 30 cans of Counter Assault® Grizzly Tough Pepper Spray sold out within a month, helped by a press release that garnered extensive national TV, radio and newspaper coverage. Subsequent batches of bear spray were bought by foresters and hunters as well as the general public. For example, a forester-hunter interviewed in *Farmer* magazine described successfully repelling a bear with spray and stated that it was more humane and safer than using a firearm.

In 15 years, bear spray has gone from being virtually unknown to readily available in Slovakia. It is used and recommended by the bear intervention team and there are now domestic manufacturers[32]. Nevertheless, attacks on humans have increased in frequency and featured prominently in political campaigns ahead of 2023 parliamentary elections[33]. While bear spray can protect individuals, the proportion of people carrying it is too small to influence the overall number of injuries.

Working with people

Finding comprehensive solutions to coexistence with bears in human-dominated landscapes requires constructive cooperation of many organisations and people, especially those most affected. In Slovakia, this was hindered by disagreements about bear population size and culling. Legal challenges by environmentalists from 2006 onwards [45] contributed to the phasing out of trophy hunting by 2019, but provoked media campaigns by hunting advocates who selectively emphasised negative impacts of bears on human communities.

[30] https://www.aktuality.sk/clanok/KI5NIfE/ludia-na-podpolani-zvolali-protest-pre-problem-s-medvedmi-v-intravilanoch
[31] https://data.consilium.europa.eu/doc/document/ST-5478-2024-INIT/en/pdf
[32] https://www.gearcheckers.com/sk/outdoor/test-sprej-na-medvede-najlepsi
[33] https://tvnoviny.sk/domace/clanok/848841-rozhodnu-medvede-volby-co-dalej-so-selmami-je-uz-temou-kampane

To help bring different interest groups together, in 2011 – 2012 we organised a series of workshops facilitated by an independent human dimensions expert (Fig. 10). The workshops[34], held under the auspices of the MoE, had an ambitious goal: to devise a national bear management plan acceptable to all key groups including hunters, foresters, landowners, farmers, local authorities, state nature conservationists and environmental NGOs.

The facilitated workshop format allowed a very diverse group to engage in constructive discussion and, although the process ended without achieving its goal, it laid the groundwork for a multi-stakeholder working group convened by the SNC in 2015 and tasked with writing a national management plan. The resulting proposal was approved by the MoE [46] but lacked consensus on major issues and it has not been fully implemented. In particular, the requirement of the plan for all key stakeholders to be included in decision-making, population monitoring and other activities has not been adhered to, resulting in rejection of the latest genetics-based estimation of population size, questioning the effectiveness of the intervention team and an escalation in social conflicts.

Conclusions and lessons learned

Conflicting narratives of pro- versus anti-hunting have dominated media coverage and discussions about bears in Slovakia since the 1990s, often overshadowing initiatives to improve management practices. Nevertheless, after two decades of endeavour, the need for effective preventive measures is now widely acknowledged and substantial progress has been made in terms of implementation. It took 10 – 20 years for approaches tried and tested by civil society to be reflected in government policy. In some cases, progress was only achieved after a change of political leadership at national or local level (Fig. 1). For small NGOs endeavouring to catalyse broad-scale change, it seems that patience and perseverance are key. Working with a diversity of stakeholders in strategic partnerships is likely to be the best way forward.

While the overall direction of travel has been towards prioritising damage prevention, debate continues to revolve around how many bears there are, what is considered a tolerable number and how they should be managed. Conflicts and distrust between groups defending disso-

Fig. 10. Alistair Bath facilitating a workshop on bear management in Slovakia (Photo: Robin Rigg).

[34] https://www.medvede.sk/index1.php?action=workshop

nant positions are exacerbated by issues of power relations, sociopolitical history and decision-making processes [47]. In such circumstances, technical solutions to reduce wildlife damage and nuisance behaviour, whilst important, are unlikely to provide satisfactory resolution of social conflict unless accompanied by constructive dialogue between antagonists leading to reconciliation, compromise and hence improved relationships and durable agreements [48].

Nature conservation authorities and environmental NGOs in Slovakia have somewhat neglected the human dimensions of bear management. Despite results achieved in terms of mitigating damage, there are indications that social conflicts have increased and public support for bear conservation is declining. This is perhaps understandable given the history of institutional failings such as resistance to change, repetition of past mistakes, inadequate problem analysis, limited search for solutions, poor decision-making processes and flawed implementation [cf. 49]. While there is clear interest and desire among the public to learn more about bears, many people are afraid of them and believe they cause a lot of damage. These concerns should be acknowledged and addressed with respect. It seems that there is much work to be done to mend broken bridges and rebuild trust.

Acknowledgements

SWS-led projects described in this article were funded by WWF-Denmark via the Danube–Carpathian Programme; Alertis – fund for bear and nature conservation (now Bears in Mind); WSPA (now World Animal Protection); the Wolves and Humans Foundation; and private donors. The Born Free Foundation provided core funding for work on livestock guarding dogs. Hotwire Electric Fencing[35] donated equipment to protect apiaries. We received no financial support from the Slovak government, although staff of the Slovak Environment Agency, national parks and other state bodies provided invaluable assistance. I am grateful to innumerable other people and organisations for their help and advice. I thank John Linnell and Silvia Ribeiro for helpful suggestions on an earlier draft of this article.

References

[1] Riley SJ & Gregory RS (2012) Decision making in wildlife management. In: Decker DJ et al., eds. Human dimensions of wildlife management. Johns Hopkins University Press, Baltimore, pp. 101 – 111.
[2] Rigg R & Adamec M (2007) Status, ecology and management of the brown bear (*Ursus arctos*) in Slovakia. Slovak Wildlife Society, Liptovský Hrádok.
[3] Rigg R & Gorman M (2006) Predation on sheep by large carnivores in Slovakia. Mammal Research and Conservation in Slovakia VII: 81 – 89.
[4] Wechselberger M et al. (2005) An investigation of public opinion about the three species of large carnivores in Slovakia: brown bear (*Ursus arctos*), wolf (*Canis lupus*) and lynx (*Lynx lynx*). Slovak Wildlife Society, Liptovský Hrádok.
[5] Beťková S & Rigg R (2006) The BEARS Project: Bear Education, Awareness and Research in Slovakia. Mammal Research and Conservation in Slovakia VII: 91 – 94.
[6] Chovanová A (2012) Brown bear conservation in Slovakia: tourism opportunity or threat? Bachelors thesis. Anglia Ruskin University, Cambridge.
[7] Rigg R & Gorman M (2006) Diet of brown bears (*Ursus arctos*): new results from the Tatras region and a comparison of research methods. Mammal Research and Conservation in Slovakia VII: 61 – 79.
[8] Goldová M et al. (2003) Medved hnedý (*Ursus arctos*) a parazitárne zoonózy. (Brown bear (*Ursus arctos*) and parasitic zoonoses.) Folia Venatoria 33: 123 – 127 [in Slovak].
[9] Finnegan S (2009) Seasonal dynamics in the prevalence of *Baylisascaris transfuga* ova in the faeces of the brown bear (*Ursus arctos*) in Slovakia. Diploma thesis. University of Veterinary Medicine in Košice.
[10] Rigg R. & Gorman M. (2002). The use of livestock guarding dogs to protect sheep from bears and wolves in Slovakia. In: Book of abstracts, 14th International Conference on Bear Research and Management, Nord-Trřndelag University College, Steinkjer: 107.
[11] Rigg R & Morley R (2010) Don't shoot! Developing alternative solutions to resolving bear-human conflict in Slovakia. In: Book of abstracts, 19th International Conference on Bear Research and Management, Nacres, Tbilisi: 122.
[12] Rigg R et al. (2011) Mitigating carnivore-livestock conflict in Europe: lessons from Slovakia. Oryx 45(2): 272 – 280.
[13] Janská S et al. (2012) Brown bear mortality on roads and railways in Slovakia: patterns, trends, factors. In: IENE international conference on Safeguarding Ecological Functions across Transport Infrastructure. Book of abstracts. Potsdam, Germany: 199.
[14] Paunovic M & Cirovic D (2006) Viability increase and recovery of brown bear *Ursus arctos* L. 1758 population in northeastern Serbia. Faculty of Biology, University of Belgrade.
[15] Saarma U et al. (2007) Mitogenetic structure of brown bears (*Ursus arctos* L.) in northeastern Europe and a new time frame for the formation of European brown bear lineages. Mol Ecol. 16(2): 401 – 413.
[16] Rigg R (2006) Medveď hnedý a zonácia CHÚ na príklade Tichej a Kôprovej doliny. (The brown bear and zonation of protected areas as exemplified by Tichá a Kôprová Valleys.) Chránené územia Slovenska 69: 18 – 20 [in Slovak].
[17] Lenko P et al. (2014) Časopriestorová aktivita medveďa hnedého (*Ursus arctos*) z telemetrických pozorovaní správy TANAP-u a TPN. (Spatiotemporal activity of the brown bear

[35] https://hotline-fencing.co.uk

(*Ursus arctos*) from telemetry observations by the TANAP and TPN administrations.) In: Lenko P et al. Problematika a súčasný stav medveďa hnedého v Tatrách. (The issue and current status of the brown bear in the Tatras.) Tatras National Park administration, Tatranská Štrba [in Slovak].
[18] Bautista C et al. (2016) Patterns and correlates of claims for brown bear damage on a continental scale. Journal of Applied Ecology Early View DOI 10.1111/1365-2664.12708.
[19] Bautista C et al. (2019) Large carnivore damage in Europe: Analysis of compensation and prevention programs. Biological Conservation 235: 308 – 316.
[20] Bombieri G et al. (2019) Brown bear attacks on humans: a worldwide perspective. Scientific Reports 9: 8573.
[21] Losinski G & Rigg R (2013) Cooperative container modification: a global conspiracy to be smarter than the average bear. In: Book of abstracts, 22nd International Conference on Bear Research and Management, Provo, Utah: 45.
[22] Haring M et al. (2016) Designing, testing and installing bear-resistant containers in Europe. Poster, 24th International Conference on Bear Research and Management, Anchorage, Alaska.
[23] Rigg R et al. (2016) Public opinion about food-conditioned bears in the Tatras National Park, Slovakia. In: Book of abstracts, 24th International Conference on Bear Research and Management, Anchorage, Alaska: 112.
[24] Rigg R (2012) Experiences with human–bear conflicts in the Carpathian Mountains of Slovakia. In: Summary, 4th International Human–Bear Conflict Workshop, Missoula, Montana: 48, 80 – 81.
[25] Rigg R & Adamec M (2009). Conservation and management of the brown bear (*Ursus arctos*) in the Western Carpathians. In: Book of abstracts, 2nd European Congress of Conservation Biology, Czech University of Life Sciences, Prague: 206.
[26] Lešová A & Antal V, eds. (2015) Ochrana a manažment veľkých šeliem na Slovensku. (Protection and management of large carnivores in Slovakia.) State Nature Conservancy of the Slovak Republic, Banská Bystrica [in Slovak].
[27] Rigg R (2004) The extent of predation on livestock by large carnivores in Slovakia and mitigating carnivore-human conflict using livestock guarding dogs. Masters thesis, Department of Zoology, University of Aberdeen.
[28] Rigg R (2002) The use of livestock guarding dogs to protect sheep and goats from large carnivores in Slovakia. Annual project report, Protection of Livestock and Conservation of Large Carnivores in Slovakia project.
[29] Antal V et al. (2015) Škody spôsobené veľkými šelmami, preventívne opatrenia na ich čiastočnú, resp. úplnú elimináciu a náhrady škôd. (Damages caused by large carnivores, preventive measures for their partial or total elimination and compensation of damage.) In: Lešová A & Antal V, eds. Ochrana a manažment veľkých šeliem na Slovensku, (Protection and management of large carnivores in Slovakia.) State Nature Conservancy of the Slovak Republic, Banská Bystrica, pp. 153 – 190.
[30] Marsden K & Hovardas T (2020) EU Rural Development Policy and the management of conflictual species: The case of large carnivores. Biological Conservation 243: 108464.
[31] Kovac J (2003) The issue of nuisance bears in the Tatras National Park. In: Rigg R & Baleková K, eds. The integrated solution to the problem of nuisance bears (*Ursus arctos*). Sloboda zvierat, Bratislava, pp. 77 – 88.
[32] Bevilaqua F (1995) Zoči-voči s medveďom. (Face-to-face with the bear.) PaRPress, Bratislava [in Slovak].
[33] Hell P & Slamečka J (1999) Medveď v slovenských Karpatoch a vo svete. (The bear in the Slovak Carpathians and in the world.) PaRPress, Bratislava [in Slovak].
[34] Rigg R & Baleková K, eds. (2003) The integrated solution to the problem of nuisance bears (*Ursus arctos*). Sloboda zvierat, Bratislava.
[35] HBCET (2012) Approaches to HBC management. IUCN-IBA Bear Specialist Group Human-Bear Conflict Expert Team.
[36] Sowka P (2013) Techniques and refuse management options for residential areas, campgrounds, and group-use areas. Living with predators resource guide series. Living with Wildlife Foundation, Arlee, Montana.
[37] Rigg R (2004). Slovakia and Poland: different countries, different attitudes. International Bear News 13(4): 21 – 23.
[38] Martínková N & Zahradníková A (2003) The brown bear in Slovakia. In: Kryštufek B et al., eds. Living with bears: a large carnivore in a shrinking world. Ecological Forum LDS, Ljubljana, pp. 258 – 271.
[39] Majić Skrbinšek A & Krofel M (2014) Defining, preventing and reacting to problem bear behaviour in Europe. Istituto di Ecologia Applicata, Rome.
[40] Herrero S (1985) Bear attacks: their causes and avoidance. The Lyons Press, New York.
[41] Šebo M (2004) Úrazy spôsobené medveďom. (Injuries caused by bears.) Poľovníctvo a rybárstvo 56(11): 10 – 11 [in Slovak].
[42] Hopkins JB III et al. (2010) A proposed lexicon of terms and concepts for human–bear management in North America. Ursus 21(2): 154 – 168.
[43] Rigg R (2015) Nebezpečné strety človeka s medveďom. (Dangerous human–bear encounters.) In: Lešová A & Antal V, eds. Ochrana a manažment veľkých šeliem na Slovensku, (Protection and management of large carnivores in Slovakia.) State Nature Conservancy of the Slovak Republic, Banská Bystrica, pp. 191 – 195.
[44] Haring M (2018) Bear attacks on people in Slovakia in 2000 – 2016. Masters thesis, University of South-Eastern Norway and Žilina University, Slovakia.
[45] Lešová A et al. (2015) Manažment veľkých šeliem v Európe a na Slovensku. (Management of large carnivores in Europe and Slovakia.) In: Lešová A & Antal V, eds. Ochrana a manažment veľkých šeliem na Slovensku. (Protection and management of large carnivores in Slovakia.) State Nature Conservancy of the Slovak Republic, Banská Bystrica, pp. 117 – 147.
[46] Antal V et al. (2016) Program starostlivosti o medveďa hnedého (*Ursus arctos*) na Slovensku. (Programme of care of the brown bear (*Ursus arctos*) in Slovakia.) State Nature Conservancy of the Slovak Republic, Banská Bystrica [in Slovak].
[47] Redpath SM et al. (2013) Understanding and managing conservation conflicts. Trends in Ecology and Evolution 28(2): 100 – 109.
[48] Young JC et al. (2016) The role of trust in the resolution of conservation conflicts. Biological Conservation 195:196 – 202.
[49] Taylor D & Clark TW (2005) Management context: people, animals, and institutions. In: Clark TW et al., eds. Coexisting with large carnivores: lessons from Greater Yellowstone. Island Press, Washington, pp. 28 – 67.