

# CDPnews

Carnivore Damage Prevention

Issue 27 Autumn-Winter 2023

**SPECIAL ISSUE  
FOCUSED ON BEARS**



Projects  
**Solutions for living  
with bears: practical  
examples from Europe  
and Asia**

Perspective  
**Civil society to  
government policy:  
managing bears in  
Slovakia**

Pop-up feature  
**Dinaric-Balkan-Pindos  
Large Carnivore  
Platform and Initiative**

# Editorial

## Chief Editor

Robin Rigg  
Slovak Wildlife Society, Slovakia  
info@slovakwildlife.org

## Editor and Project Coordinator

Daniel Mettler  
AGRIDEA, Switzerland  
daniel.mettler@agridea.ch

## Associate Editors

Silvia Ribeiro  
Grupo Lobo, Portugal  
globo@fc.ul.pt

Micha Herdtfelder  
FVA-Wildlife Institute, Germany  
micha.herdtfelder@forst.bwl.de

Valeria Salvatori  
Institute of Applied Ecology, Italy  
valeria.salvatori@gmail.com

## Senior Advisor

John Linnell  
NINA, Norway  
john.linnell@nina.no

## Design

Merel Gooijer & Katja Krawetzke  
AGRIDEA, Switzerland

## Layout and typesetting

Katja Krawetzke  
AGRIDEA, Switzerland

## Photo credits

Front cover: Picchio  
Back cover: Robin Rigg

## E-mail

info@cdpnews.net

Bears and people have coexisted for thousands of years, as reflected in beautiful cave art left by our ancestors<sup>1</sup> as well as various myths and rituals. In Greek mythology, the gods transformed a young huntress into a bear and placed her in the night sky together with her son as the constellations Ursa Major (Great Bear) and Ursa Minor (Little Bear). For the Ainu people, indigenous to northern Japan, the bear is the head of the gods and has a human form in the country of gods but appears as an animal in the world of people<sup>2</sup>. The fates of bears and humans remain celestially entwined today, with climate change now impacting not only polar bear survival<sup>3</sup> but also bear hibernation and human–bear conflicts<sup>4</sup>.

Eight years ago, issue 12 of Carnivore Damage Prevention News (*CDPnews*) featured several projects dealing with European brown bears. The articles in the current issue broaden our focus to include three of Eurasia's six extant species and illustrate the benefits of international collaboration. We see how Karelian bear hunting dogs, taken from Europe to North America and reinvented as 'bear shepherding dogs', are used to help manage Asiatic black bears in Japan (p. 20). Another concept successfully exported is the 'bear smart community', implemented in Romania (p. 27). These and other examples demonstrate that, while local context is always important, there is much that can be learned from elsewhere if we are open to new ideas.

The potential for constructive dialogue to achieve positive change is described in a feature on the Dinaric–Balkan–Pindos Large Carnivore Platform (p. 11). A case study from Slovakia examines the role of civil society in steering government policy towards sustainable solutions (p. 45). Community-based initiatives in India have integrated traditional knowledge and perspectives to identify culturally sensitive approaches to minimising conflicts and promoting more harmonious long-term coexistence with sloth bears (p. 37). In Spain, damage prevention tools are implemented within a wider strategy of habitat improvement and work with local communities, raising awareness and income through bear-centred tourism (p. 4 and 61). Recent events in Italy, on the other hand, show that coexistence in modern times can be fragile and in need of careful nurturing (p. 16).

Work is progressing on our new website, where it will soon be possible to read current and past issues of *CDPnews* online and access individual articles in a searchable library. In the meantime, we welcome your feedback, suggestions and proposals for new articles.

<sup>1</sup> <https://artsandculture.google.com/story/the-bears-of-chauvet-cave-grotte-chauvet/owWR-JA5ZuHCZJA?hl=en>

<sup>2</sup> <https://www.journals.uchicago.edu/doi/10.1086/soutjanth.5.4.3628594>

<sup>3</sup> <https://www.science.org/doi/10.1126/science.adh2280>

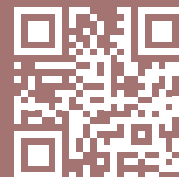
<sup>4</sup> <https://besjournals.onlinelibrary.wiley.com/doi/full/10.1111/1365-2664.13021>

# Index

---

- Project*
- 4 LIFE Oso Courel: Facilitating coexistence with bears in Galicia, Spain**
- Pop-up feature*
- 11 Dinaric-Balkan-Pindos Large Carnivore Platform and Initiative**
- Short communication*
- 16 Bear-human coexistence at risk in Trentino, Italy**
- Project*
- 20 Setting boundaries: borderlines and bear dogs in a Japanese town**
- Project*
- 27 Creating bear smart communities: the example of Băile Tuşnad, Romania**
- 34 News Roundup**
- Research*
- 37 Can education and outreach help foster human-sloth bear coexistence?**
- Perspective*
- 45 Civil society to government policy: a case study of bear management in Slovakia**
- Focus*
- 61 Improving protection of beehives from bears in the Cantabrian Mountains, Spain**
- 67 Abstracts of scientific articles**
- 73 Videos**
- 75 Books**
- 78 Events**

Available at:  
[www.cdpnews.net](http://www.cdpnews.net)



ISSN 2813-2165 (pdf/printed edition)  
ISSN 2813-2173 (online edition)



We welcome the translation, reprint and further distribution of articles published in *CDPnews* under citation of the source.

The responsibility of all data presented and opinions expressed is with the respective authors.

Project

# LIFE Oso Courel: Facilitating coexistence with bears in Galicia, Spain

## Guillermo Palomero

Brown Bear Foundation (Fundación Oso Pardo), Santander, Spain  
Contact: fop@fundacionosopardo.org



## Brown bears in the Cantabrians

After years of conservation efforts, the brown bear (*Ursus arctos*) has been recovering in the Cantabrian Mountains of Spain (Fig. 1), but the population remains small [1]. As the number of bears increases, young males tend to disperse to areas where bears have not been seen for many years, promoting population expansion and raising complex challenges regarding coexistence of bears and human activities [2]. One such area is Serra do Courel, part of the Natura 2000 network, where bears began to reappear at the beginning of the 21<sup>st</sup> century.



Fig. 1. Brown bear in northern Spain  
(Photo: Fundación Oso Pardo).

The Courel Mountains in Galicia have high quality habitat for bears (Fig. 2), with a mosaic of different landscapes of native bushes and trees, especially oak and chestnut forests, that provide refuge and abundant food, but there are also many unprotected apiaries (Fig. 3). In fact, the first signs of bears recolonising the area were beehives damaged by bears seeking honey and bee larvae. This gave rise to conflicts as local people no longer had experience or knowledge of what the presence of the species entails.



Fig. 2. High quality bear habitat in Serra do Courel, Galicia.  
(Photo: Fundación Oso Pardo).



Fig. 3. Bear-damaged beehives (Photo: Fundación Oso Pardo).

## Facilitating coexistence

The LIFE Oso Courel project, which ran in 2017 – 2021, aimed to enable the spread of bears to new areas southwest of their established range in the Cantabrian Mountains (Fig. 4). Actions were implemented to favour dispersing bears, support the long-term viability of the Cantabrian bear population and mitigate rising conflicts with beekeepers and other human activities in the Courel Mountains. The project was coordinated by the Brown Bear Foundation (Fundación Oso Pardo) with the collaboration of the Galicia Regional Government (Xunta de Galicia) and the Galician Association of Land Stewardship (Asociación Galega de Custodia do Territorio).

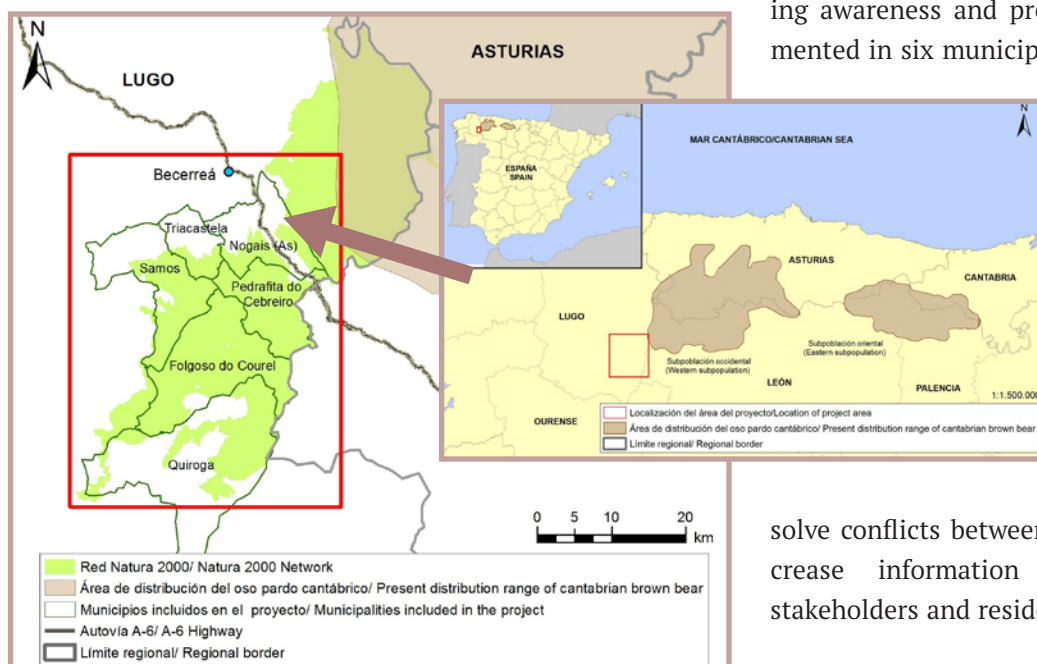


Fig. 4. Location of the project area in relation to bear distribution in the Cantabrian Mountains (Source: Fundación Oso Pardo).

Serra do Courel is a cultural landscape facing rural abandonment, depopulation and loss of traditional activities. The presence of bears in the past is evident in the many structures, currently in ruins, that were built to protect beehives from bears (Fig. 5) and which are also testimony to the economic significance that honey and wax production used to have. Beekeeping is still an important activity, with many amateur and professional beekeepers producing high quality honey. As bears began



Fig. 5. A traditional stone structure (alvares) to protect apiaries from bears (Photo: Fundación Oso Pardo).

to return to such an area, where the practice of protecting apiaries had been lost, the potential for conflict was clear.

Project actions focused on improving habitat, raising awareness and preventing conflicts were implemented in six municipalities of the province of Lugo, Galicia (Fig. 4). Specifically, the project aimed to improve trophic availability and connectivity between high quality habitats; to guarantee connectivity with the main bear reproductive nucleus in the western Cantabrian subpopulation; to prevent and resolve conflicts between bears and people; and to increase information and awareness of local stakeholders and residents.

## Project activities and results

### Improving habitat for bears

A total of 107,805 native fruit trees and shrubs were planted in more than 140 patches (averaging around one hectare each) to improve the carrying capacity and connectivity of habitat for bears (Fig. 6). These were planted in collectively owned forests and on private lands, with 20 land stewardship agreements signed, and on 17 hectares of land acquired by the project for long-term management. These actions have had a demonstrative effect and allowed the involvement of residents and owners, especially in communally owned forests. Positive interest was generated in this model of autochthonous small forest plantations, both for their improvement of the land-



Fig. 6. Planting fruit trees in Serra do Courel to increase the carrying capacity for bears through trophic enrichment and habitat connectivity (Photos: Fundación Oso Pardo).

scape and natural value and for their potential economic interest, and above all for allowing a forest structure compatible with livestock use and favourable for the prevention and reduction of forest fires.

### Preventing damage to beehives

During the project a total of 225 records of bear presence were collected, of which 104 related to attacks on apiaries. Genetic analysis identified four individual bears in the project area. Damage prevention was addressed in collaboration with the Galician Beekeeping Association and local beekeepers and based on experience gained by the Brown Bear Foundation in previous projects in nearby areas. A total of 154 electric fences were distributed for the protection of more than 150 apiaries containing a total of over 3,000 hives (Fig. 7). Additionally, 168 beekeepers were informed of what the presence of bears entails and of the best measures to protect apiaries.

Fences consisted of five parallel wires of nylon or, preferably, metal (steel or aluminium, 1.5 – 2 mm in diameter) 25 – 30 cm apart. The bottom wire was 20 cm above the ground: as low as possible without touching the ground while allowing vegetation beneath it to be cut. Wires were attached to poles of wood, steel, plastic or fibre glass, with the latter preferred due to its high resistance and insulating properties. When metal poles are used, insulators are necessary and wires have to be more than 1 cm away from the poles to avoid losing electricity. Poles were placed at intervals of 4 – 5 metres (sometimes less depending on the terrain) with their bases buried 30 – 40 cm in the ground. Fences were powered by a 12-V battery, charged by a solar panel, providing 0.5 – 2 joules.

Monitoring visits were made to 96 apiaries to assess fences, provide advice and correct any installation problems (Fig. 8). A lesson learned was that it is not enough only to provide equipment: it is also essential to provide technical advice on how to properly build and maintain fences to guarantee their effectiveness. This being so, a brochure<sup>1</sup> and a video tutorial<sup>2</sup> were produced describing installation procedures. Participating beekeepers' level of satisfaction with the fences was very high, with an average score of 4.4 out of 5.

<sup>1</sup> [https://fundacionosopardo.org/wp-content/uploads/2020/05/libreto\\_COLMENARES\\_2020.pdf](https://fundacionosopardo.org/wp-content/uploads/2020/05/libreto_COLMENARES_2020.pdf)

<sup>2</sup> English version: <https://www.youtube.com/watch?v=-2j-Hqoi0N0&t=165s>  
Spanish version: [https://www.youtube.com/watch?v=SiOzGDeFE\\_0](https://www.youtube.com/watch?v=SiOzGDeFE_0)



Fig. 7. Electric fences distributed to beekeepers to protect apiaries from bears (Photos: Fundación Oso Pardo).



Fig. 8. A monitoring visit to provide advice and correct problems concerning the use and maintenance of electric fencing (Photo: Fundación Oso Pardo).

## Working with hunters

With the collaboration of the Galician Hunting Federation, an information campaign was developed to raise awareness among hunters of the presence of bears where they carry out their activities and of the need to properly identify animals when hunting, with a focus on how to behave in the presence of a bear. Furthermore, the project established more than 30 agreements with ten hunting areas for the clearing of more than 230 hunting sites (totalling 63 hectares) to increase visibility and facilitate the identification of animals.

## Establishing an intervention team

A specialist intervention team, made up of rangers from Xunta de Galicia, was set up and trained to solve possible conflict situations with bears. The team was provided with equipment and material for the capture, transport, veterinary treatment and monitoring of bears (Fig. 9). In addition, an enclosure for the treatment and care of injured or problematic bears was also built. Training staff of the Xunta de Galicia responsible for managing the species, especially nature rangers, was very important, since their work is fundamental to facilitating coexistence by dealing with any problematic situations that may arise in the future.



Fig. 9. The bear intervention team created to address potential conflict situations (Photo: Fundación Oso Pardo).

## Promoting tourism

Cultural resources can help promote bear presence as an asset to tourism in the region. An inventory of traditional dry-stone structures (*alvarizas*) built to protect apiaries from bears was carried out, resulting in the identification of 267 such structures in the project area<sup>3</sup> (Fig. 10). Six of these structures were restored for beekeeping or tourism, three through collaboration agreements with the owners and three acquired by the project.



Fig. 10. Inventorying a traditional apiary protection structure (*alvares*) for restoration and possible use in tourism (Photo: Fundación Oso Pardo).

Furthermore, three touristic *Routes of the bear and honey in Courel*<sup>4</sup> were developed in collaboration with the Neighbours Association of Seceda do Courel, Folgoso do Courel Town Hall and the Montañas do Courel Geopark (Fig. 11). The development of thematic routes and promotion of the area's values have been highly appreciated, clearly showing that the arrival of a species like the bear can have positive impacts. A *Handbook of good practices*<sup>5</sup> to develop sustainable ecotourism in bear country, focused on the Serra do Courel, was also produced.

## Raising awareness

To inform the local community and gain their support, more than 30 meetings were held with over 380 participants, an exchange visit with local actors was made to Somiedo Natural Park in Asturias to share experience with people who live in bear country and several conferences and talks were held to disseminate information about bears and coexistence with human activities (Fig. 12). As mentioned above, actions also focused on livestock breeders and hunters. Work with stakeholders,

<sup>3</sup> <https://fundacionosopardo.org/wp-content/uploads/2021/06/Alvares-seleccionados.html>

<sup>4</sup> <https://fundacionosopardo.org/wp-content/uploads/2021/06/Triptico.pdf>

<sup>5</sup> <https://fundacionosopardo.org/wp-content/uploads/2019/06/Buenas-practicas-turismo-Courel.pdf>





Fig. 11. A tourist route focused on bears, habitats and cultural values established to show that bear presence can have a positive impact on the local economy (Photo: Fundación Oso Pardo).

especially hunters, made it possible to counteract misinformation that circulated in the region. The arrival of a species like the bear can generate suspicion and false narratives, so the project took an important step in this regard.

An educational campaign was developed that included two workshops for teachers, production and provision of educational material for 15 schools and the organisation of 12 classroom activities in which a total of 254 children from the project area participated. Furthermore, information panels were exhibited in various places and information brochures disseminated.

An intense media campaign was implemented that led to over 150 news items and articles as a result of collaboration with regional and local media, providing information about bear presence, project actions to prevent conflicts and raising awareness of bears and the importance



Fig. 12. An event to raise awareness and share experience of coexisting with bears (Photo: Fundación Oso Pardo).

<sup>6</sup> <https://www.youtube.com/watch?v=Ur5deQrf5dU>

<sup>7</sup> <https://www.youtube.com/watch?v=3t4EdzkXX8E&t=154>



and opportunities presented by the presence of this emblematic species in the region. In addition to the video tutorial on electric fences already mentioned, a short video explaining the main results of the project was also produced in Spanish<sup>6</sup> and Galician<sup>7</sup>.

## Public opinion about bears and project activities

In 2021, at the end of the project, 205 beekeepers, hunters, livestock breeders and local residents were surveyed to find out their opinions about bears and the LIFE Oso Courel project. Opinions were most positive among the tourism sector (averaging 4.4 on a 1–5 Likert scale) and lowest among hunters (2.9). Beekeepers and livestock breeders were mostly positive about bears (3.6 and 3.4, respectively), with 60% of beekeepers considering their activity to be compatible with bears and 93% being in favour of the use of damage prevention measures.

Project actions were also rated positively, particularly the environmental education activities (4.4 out of 5), delivery of electric fences and restoration of *alvarizas* (4.3), organisation of informative meetings (4.2), planting native species (4.0) and cleaning hunting sites (3.9).

Beekeeping is very important in the area and beekeepers, who do not have a negative perception of bear presence, have assumed the need to incorporate the protection of apiaries as a normal part of their activity. This is one of the most important changes generated by the proj-

ect, in an area where knowledge of prevention measures did not exist. Furthermore, positive expectations have resulted, with local entities, associations and some sectors of the community seeing bear presence as an important element of the natural value of the area and an opportunity to promote rural development.

## Steps beyond the project

The LIFE Oso Courel project sought the support and collaboration of organisations and groups involved in the region in order to work together with local residents. There were still unprotected apiaries at the end of the project, as it is a dynamic sector, but the long-term task of protection goes on. To this end, collaboration agreements have been established with various entities, such as the Serra do Courel Rural Development Association, the Galician Beekeepers Association, the Uxío Novoneyra Foundation and the Courel Scientific Station of the University of Santiago de Compostela. This has enabled development of additional activities not initially planned, such as the organisation of a 3-day summer course<sup>8</sup> with the University of Santiago de Compostela (Fig. 13), publication of a handbook for sustainable tourism in Serra do Courel and a conference on natural areas as drivers for rural development.

Recently, a video providing *Advice for visiting the mountains of the brown bear*<sup>9</sup> was produced within the LIFE Bears with future project<sup>10</sup>, which is running from 2020 to 2025, to inform and raise awareness among stakeholders of the potential for conflicts with bears less prone to hibernate and to provide advice and guidance for the development of winter activities in bear areas. Together with information leaflets on how to behave in bear country and during encounters with bears<sup>11</sup>, this should help to limit problematic bear-human interactions in a changing climate.

## Acknowledgements

The Oso Courel project was co-financed by the EU LIFE programme, the Biodiversity Foundation of the Spanish Ministry for Ecological Transition and the Demographic Challenge and the Naturgy company. We thank Silvia Ribeiro and Robin Rigg of *CDPnews* for their help in compiling this article.

## References

- [1] Huber D (2018). *Ursus arctos* (Europe assessment). The IUCN Red List of Threatened Species. <https://www.iucnredlist.org/species/41688/144339998>.  
 [2] Palomero G et al., eds. (2021) Osos cantábricos. Demografía, coexistencia y retos de conservación. Fundación Oso Pardo. Lynx Edicions.



Fig. 13. Summer course focused on bear ecology, conservation and coexistence organised in collaboration with the University of Santiago de Compostela (Photo: Fundación Oso Pardo).

<sup>8</sup> <https://fundacionosopardo.org/proyecto-life-oso-courel-realizado-un-seminario-universitario-de-verano-sobre-el-oso-en-courel-y-la-conservacion-de-grandes-carnivoros-2>

<sup>9</sup> [https://fundacionosopardo.org/wp-content/uploads/2022/07/Dibujos-animados-consejos-oso\\_LIFE-OsosFuturo\\_english\\_br.mp4](https://fundacionosopardo.org/wp-content/uploads/2022/07/Dibujos-animados-consejos-oso_LIFE-OsosFuturo_english_br.mp4)

<sup>10</sup> <https://fundacionosopardo.org/en/life-projects/project-life-bears-with-future/>

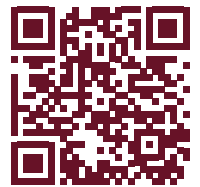
<sup>11</sup> [https://fundacionosopardo.org/wp-content/uploads/2021/08/triptico\\_COUREL\\_esp-2.pdf](https://fundacionosopardo.org/wp-content/uploads/2021/08/triptico_COUREL_esp-2.pdf)

Pop-up feature

# Dinaric–Balkan–Pindos Large Carnivore Platform and Initiative

**Katrina Marsden, Andrea Solic, Đuro Huber, Julia Schmidt**

Dinaric–Balkan–Pindos Large Carnivore Platform secretariat: adelphi research, Berlin, Germany  
and Carnivora Magna, Croatia  
Contact: [dinaric.carnivores@adelphi.de](mailto:dinaric.carnivores@adelphi.de)



## Background and challenges

The Dinaric–Balkan–Pindos region in SE Europe (Fig. 1) is a biodiversity hotspot, where protected species and habitats thrive (Fig. 2). Populations of brown bear (*Ursus arctos*), wolf (*Canis lupus*) and Eurasian lynx (*Lynx lynx*), including the endangered Balkan lynx (*L. l. balcanicus*), span national and regional borders. Transnational coordination is therefore essential to enable their long-term conservation and management.

Large carnivores persisted in the region throughout

times when they were eradicated in Western Europe. People’s experience of living with large carnivores extends over many generations, tolerance is often high and there is much that can be learned from the region. Nonetheless, conflicts exist and there is a need for more discussion of proactive management with those most involved (e.g. farmers, hunters, conservationists and tourism operators). Moreover, while some large carnivore populations are doing well in the region, others are highly threatened and additional efforts are needed to maintain them. A recent background report [1] gives an overview of the situation



Fig. 1. Countries of the Dinaric–Balkan–Pindos region.



Fig. 2. Trnovačko Lake, Montenegro (Photo: Nemanja Bjelogrić).

in each country regarding the current status of large carnivores, their management and monitoring, threats and conflicts.

Large-scale, cross-border collaboration remains challenging in the Dinaric-Balkan-Pindos region which includes a range of different cultures, languages, scripts and religions and that over time has seen more than its fair share of conflict. Some countries in the region are EU Members States but several are not and there is no overarching legal framework within which to organise cross-border nature management, no Dinaric-Balkan-Pindos treaty or convention following the example of the Alpine or Carpathian Conventions. Approaches to large

carnivore management vary considerably even within countries, in particular in Bosnia and Herzegovina.

Another challenge is the lack of national capacity for biodiversity management which tends to receive less attention than more immediate political and social challenges. Capacity building and knowledge exchange are therefore important as well as fund-raising to support management authorities and experts in their efforts where resources are lacking. There is growing recognition among experts and administrators that transnational cooperation within the region can help to address a lack of capacity in individual countries.

### Box 1. The EU Large Carnivore Platform as a model

Large carnivore conservation is a topic that involves a diversity of stakeholders including hunters, foresters, livestock producers, reindeer herders, landowners, rural communities, conservation organisations and the wider public. All these groups are influenced by and perceive large carnivores in different ways, and in some cases these differences can be the foundation of conflicts.

The EU Platform on Coexistence between People and Large Carnivores<sup>1</sup> is a grouping of organisations representing different interest groups which have agreed a joint mission to minimise and, whenever possible, find solutions to conflicts between human interests and the presence of large carnivores. This model was used by the Dinaric-Balkan-Pindos Platform in

considering how to manage cross-border collaboration and bring stakeholders into discussions.

Since conflicts related to large carnivores vary considerably across the EU depending on local conditions, EU Platform members suggested funding regional platforms on people and large carnivores in areas with ongoing conflicts. The European Parliament agreed to finance six regional/local platforms, which were contracted by the European Commission. Their aim is to work together with stakeholders to discuss potential solutions for conflicts around large carnivores at the national, regional or local level [2]. These platforms are supported by a team of facilitators, social scientists and communicators.

## Large carnivores for regional collaboration

Counterintuitively, large carnivore management, while often a conflictual topic, is one where authorities can share experience and show willingness to work together. There has been a long-term desire, dating back to before the 1990s, to establish an exchange platform in the region. The current initiative was launched in 2018 at a regional workshop of the EU Platform on Coexistence between

People and Large Carnivores (Box 1), where participants signed the Budva Statement<sup>2</sup>, indicating their desire to work together more closely. The Dinaric-Balkan-Pindos Large Carnivore Platform was subsequently established as a transnational exchange process to discuss conservation and management practices, establish joint actions and work towards a transnational treaty on large carnivores for the region.

The Platform brings together authorities and stakeholders in Albania, Bosnia and Herzegovina, Bulgaria,

<sup>1</sup> [https://environment.ec.europa.eu/topics/nature-and-biodiversity/habitats-directive/large-carnivores/eu-large-carnivore-platform\\_en](https://environment.ec.europa.eu/topics/nature-and-biodiversity/habitats-directive/large-carnivores/eu-large-carnivore-platform_en)

<sup>2</sup> [https://ec.europa.eu/environment/nature/conservation/species/carnivores/pdf/181106Budva\\_LCP\\_Workshop%20statement-EN.pdf](https://ec.europa.eu/environment/nature/conservation/species/carnivores/pdf/181106Budva_LCP_Workshop%20statement-EN.pdf)

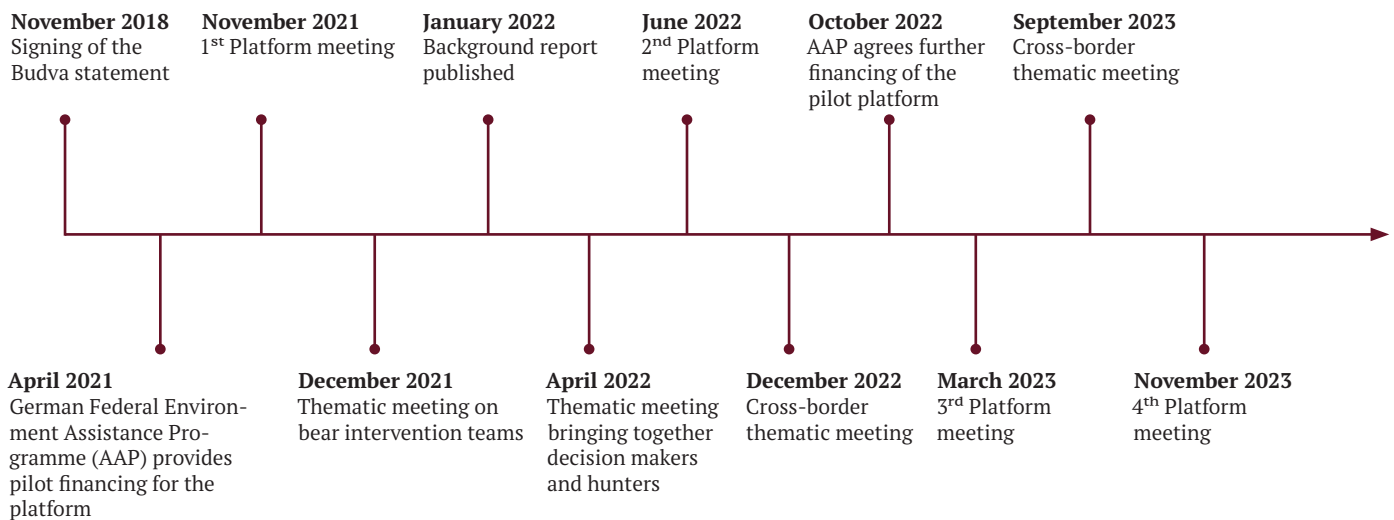


Fig. 3. Timeline of the Dinaric-Balkan-Pindos Platform.

Croatia, Greece, Kosovo<sup>3</sup>, Montenegro, North Macedonia, Serbia and Slovenia. It is made up of a range of different exchange formats including main meetings, thematic meetings on important management practices and capacity building events. Members include management authorities (ministries, departments and agencies dealing with nature, agriculture, forestry, hunting); stakeholders (environmental NGOs, hunters, farmers); and scientists. The Platform is supported by a secretariat which organises the meetings and provides necessary technical support and background research. The secretariat relies on the input of an advisory board made up of scientists, technicians and administrators from all participating countries and beyond.

Full Platform meetings are supported by a number of smaller, more technical meetings (Fig. 3). Their aim is to provide a long-term basis for collaboration between the countries involved by 1) establishing a co-ordinational transnational agreement and 2) collaborating on practical measures related to large carnivore management such as setting up intervention teams and exchanging experiences on population monitoring.

## Working towards a regional treaty

As described above, the lack of an administrative framework restricts long-term collaboration in the region.

However, all the countries involved are either EU Member States, accession countries or potential candidates. As countries must demonstrate compliance with EU law in order to join, the prospect of EU membership provides a common framework in the area. Additionally, all countries must comply with international wildlife conventions to which they are signatories, such as CITES and the Bern Convention. A Dinaric-Balkan-Pindos Large Carnivore Agreement could formalise a framework for collaboration, supporting countries in implementing existing international legal requirements. For this reason, Platform participants agreed on the 2023 Skopje Statement<sup>4</sup> which sets out their desire to establish a legally binding regional treaty on large carnivore management.

## The importance of cross-border collaboration

Large carnivores require large ranges and habitat connectivity is important for their conservation, as recognised in European guidelines for population-level management [3]. The examples for each species below demonstrate why cross-border management and exchange of information and experience are so important.

<sup>3</sup> For this initiative, Kosovo is referred to in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo declaration of independence.

<sup>4</sup> <https://dinaric-carnivores.org/wp-content/uploads/2023/03/Skopje-statement-FINAL.pdf>

### Brown bear

The Dinaric-Pindos bear population is one of the largest in Europe and is shared by all countries in the region (Figs. 4 and 5). According to the latest IUCN Red List assessment, it consists of approximately 4,000 individuals [4]. Conflicts related to bear presence are similar across the region and result from damage to livestock and beehives as well as direct risk to humans (often due to bears being attracted to settlements by food or refuse). Establishing intervention teams to act as a first ‘port of call’ in case of bear-related incidents is seen as a first step to reduce conflict. Such teams can remove the immediate danger (tranquilising or, if necessary, killing problematic bears) and document the context of each incident to allow lessons to be learned. They also have an educative purpose, supporting communities in preventing bears habituating to humans. Thematic meetings in Bosnia and Herzegovina have addressed this issue and taken the first steps in establishing intervention teams.

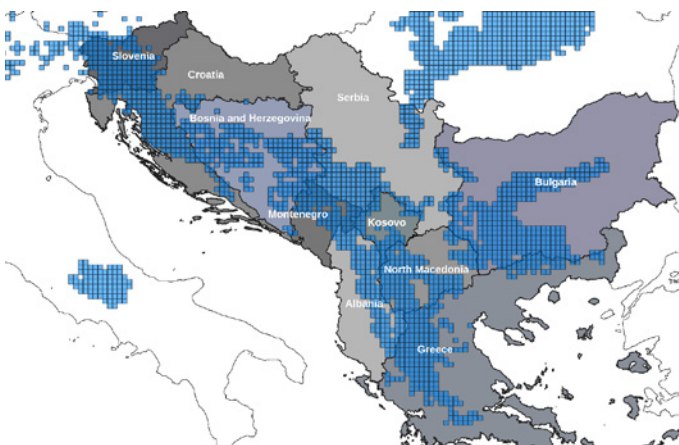


Fig.4. Brown bear distribution across the Dinarides in 2012 – 2016 (Source: Kaczensky et al. [5]).



Fig. 5. A brown bear in Greece (Photo: Callisto).

### Grey wolf

Wolves are present throughout most of the region (Figs. 6 and 7). At the time of the most recent IUCN Red List assessment, the Dinaric-Balkan subpopulation was estimated to number almost 4,000 individuals [6]. In many countries, however population counts (for bears as well as wolves) are based on hunters’ reports and expert estimates rather than a robust monitoring system. This is one of the knowledge gaps that Platform participants would like to fill. In early 2023, at a thematic meeting between Bosnia and Herzegovina and Croatia, authorities and experts discussed how monitoring could be better coordinated across borders. During a subsequent meeting in Skopje, a monitoring working group was established to compare practices across the region. The group plans to meet virtually to establish monitoring protocols which can be used by all participating countries.

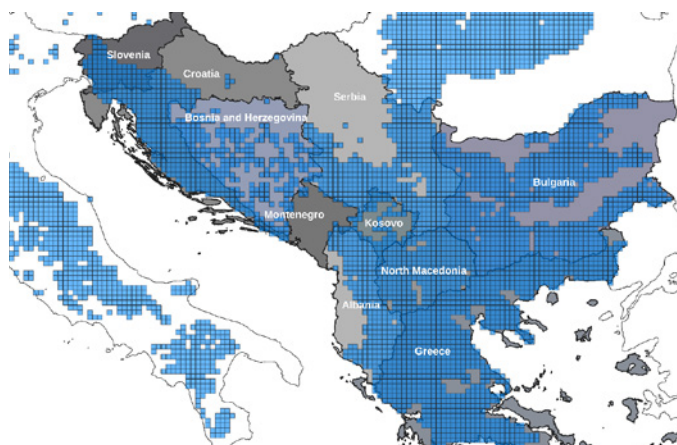


Fig. 6. Wolf distribution across the Dinarides in 2012 – 2016 (Source: Kaczensky et al. [5]).



Fig. 7. Wolf pack in Osogovo, Bulgaria (Photo: Diana Zlatanova).

## Eurasian lynx

There are around 140 lynx in the Dinaric population according to the latest IUCN Red List assessment [7] and fewer than 50 mature Balkan lynx in a subpopulation focused on North Macedonia, Albania and Kosovo (Figs. 8 and 9). The lynx was eradicated from most of the region in the early 20<sup>th</sup> century. A small remnant population, today a separate subspecies known as the Balkan lynx, survived but is critically endangered and intensive efforts are underway to save it. The long-running Balkan Lynx Recovery Programme<sup>5</sup> has been instrumental in bringing experts together to secure “the long-term existence of a viable Balkan lynx population in its historic distribution range in harmony with and supported by local communities”. With such a small, remnant population, cross-border collaboration is crucial.

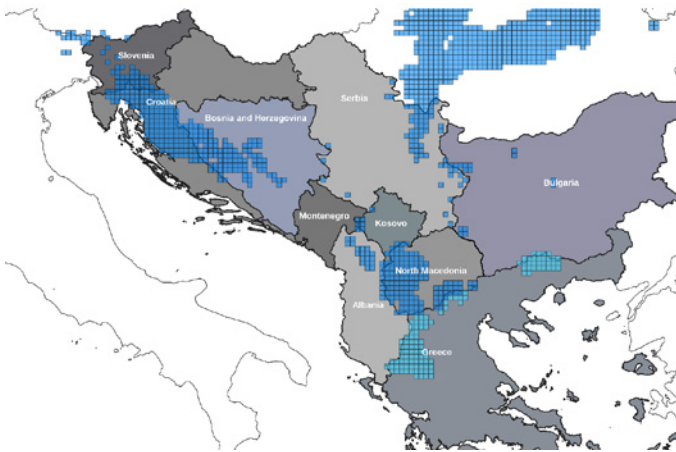


Fig. 8. Distribution of lynx across the Dinarides in 2012–2016). Dark blue = permanent presence, light blue = sporadic presence (Source: Kaczensky et al. [5]).



Fig. 9. Balkan lynx (Photo: PPNEA).

<sup>5</sup> <https://balkanlynx.com/>

<sup>6</sup> <https://dinaric-carnivores.org/en/>

## Future prospects

The broader Dinaric–Balkan–Pindos Large Carnivore Initiative beyond the Platform itself aims to establish collaboration between organisations active in the region in order to better coordinate projects and pool resources. Organisations involved include the Platform secretariat (adelphi and Carnivora Magna), the Advisory Assistance Programme, current funders of the secretariat (the German Federal Environment Agency and German Federal Nature Agency); Platform members and the expert advisory board; organisations such as WWF Adria, organisations coordinating their work with the Platform such as EuroNatur, the IUCN as well as the Alpine and Carpathian Conventions. The Platform secretariat is working to build up this network to support open exchange and help find the necessary long-term financing for Platform meetings and practical measures. For more information or to propose collaboration see the Initiative website<sup>6</sup> or contact the secretariat: [dinaric.carnivores@adelphi.de](mailto:dinaric.carnivores@adelphi.de).

## References

- [1] Marsden K et al. (2022) Large carnivores in the Dinarides: Management, monitoring, threats and conflicts – background report. Bundesamt für Naturschutz, Bonn. <https://adelphi.de/en/publications/large-carnivores-in-the-dinarides-management-monitoring-threats-and-conflicts>.
- [2] Marsden K et al. (2023) Dialogue platforms on large carnivores. Carnivore Damage Prevention News 26: 39–42.
- [3] Linnell J et al. (2008) Guidelines for population level management plans for large carnivores. LCIE report for the European Commission. [https://ec.europa.eu/environment/nature/conservation/species/carnivores/pdf/guidelines\\_for\\_population\\_level\\_management.pdf](https://ec.europa.eu/environment/nature/conservation/species/carnivores/pdf/guidelines_for_population_level_management.pdf).
- [4] Huber D (2018). *Ursus arctos* (Europe assessment). The IUCN Red List of Threatened Species. <https://www.iucnredlist.org/species/41688/144339998>.
- [5] Kaczensky P et al. (2021) Distribution of large carnivores in Europe 2012–2016: Distribution maps for brown bear, Eurasian lynx, grey wolf, and wolverine [Dataset]. Dryad. <https://doi.org/10.5061/dryad.pc866t1p3>.
- [6] Boitani L (2018) *Canis lupus* (Europe assessment). The IUCN Red List of Threatened Species. <https://www.iucnredlist.org/species/3746/144226239>.
- [7] von Arx M (2020) *Lynx lynx* (Europe assessment) The IUCN Red List of Threatened Species. <https://www.iucnredlist.org/species/12519/177350310>

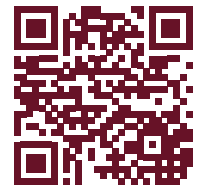


Short communication

# Bear–human coexistence at risk in Trentino, Italy

**Claudio Groff**

Wildlife Service, Autonomous Province of Trento, Italy  
Contact: [claudio.groff@provincia.tn.it](mailto:claudio.groff@provincia.tn.it)



## Reestablishing a bear population

Mainly due to direct persecution, by 1950 bears in the Alps had been reduced to a few animals in the Italian province of Trentino (Figs. 1 and 2). In 1969, no more than eight bears persisted. By the late 1990s, the population had dwindled to just three or four individuals and was on the verge of extinction [1]. To save this population, ten bears from Slovenia were released in Trentino in 1999–2002 [2].

As part of the population reinforcement programme, before the translocation of the animals, a feasibility study

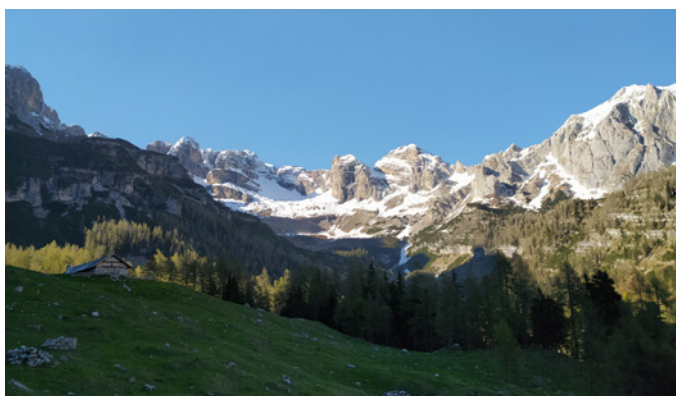


Fig. 1. Bear habitat in Trentino (Photo: C. Groff).

[1] and a survey of public attitudes were conducted and a management plan was created with the input of local government and stakeholders [3]. The basic goal was to increase the number of bears in Trentino to at least 40–60 (considered to be the minimum viable population) and, ultimately, to connect this small population with the larger population in the Dinaric region [4].

Each year since 2002 the population size has been estimated with capture–recapture models using genetic samples from hair traps and scats. Reproduction has been ascertained from sighting data and telemetry-collared bears have provided information about mortality events. In the early years of demographic monitoring, the genetic profile of virtually every individual bear was known, but that has become more difficult as the population has grown. A decade after release of the ten Slovenian bears, the population numbered 43–48 animals. Nowadays there are around 100 bears in an area of about 2,000 km<sup>2</sup> in the western part of the province (Fig. 3). The population is still growing numerically and expanding geographically regarding both females (slowly) and dispersing males [5].





Fig. 2. A bear in Trentino, Italy (Photo: M. Papi).

## Damage mitigation

The feasibility study suggested that bear impacts on local communities (damage and risk to public safety) would arise as the population grew. A bear management plan was drafted and approved for the whole Italian Alps in 2008. The PACOBACE Action Plan [3] was produced following a cooperative effort among institutions from various Italian regional and provincial administrations, the National Institute for Wildlife Management and Research (ISPRA) and the Ministry of Environment. In particular, the plan considered bear predation on cattle, don-

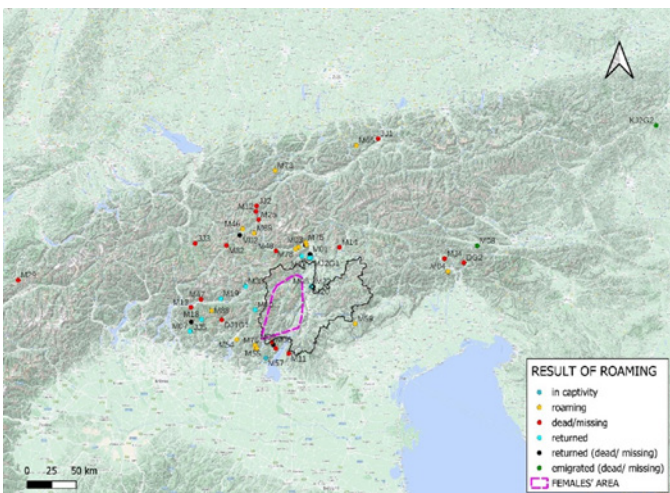


Fig. 3. Core area (pink polygon) of the bear population in Trentino (dark line) in 2022. Dots show individual dispersing males and their fate.



Fig. 4. A bear captured for management purposes (Photo: C. Groff).

keys, sheep, goats and poultry, damage to crops and beehives and possible danger to public safety.

Claims for compensation for damage caused by bears have risen steadily since 2002 [6]. In 2021, over 300 cases were filed amounting to over €170,000. Preventive measures, namely electric fencing and livestock guarding dogs, are heavily subsidised by the government and now cost over €160,000 annually. The damage prevention programme includes field visits and functionality checks at farms. Moreover, the Wildlife Department meets regularly with local stakeholders to discuss better ways of mitigating bear damage.

Notwithstanding these efforts to mitigate damage, some individual bears have shown a particular ability to overcome preventive measures or are highly tolerant of human presence, exhibiting bold behaviour around people or entering human settlements. Such individuals are

identified as ‘problem bears’ according to the precise indications of the Action Plan. All of them are fitted with radio-collars so they can be monitored more closely (Fig. 4). According to what was foreseen in the Action Plan, some have been subject to aversive conditioning by a dedicated emergency team using rubber bullets or trained bear dogs (Fig. 5) in an effort to alter their behaviour with respect to people.



Fig. 5. The bear dog team in Trentino (Photo: C Groff).

## Public safety

Local people regularly report close encounters with bears. This is not unexpected as Trentino has the highest human density (80 inhabitants per km<sup>2</sup>) of all bear-occupied areas in Europe. Reports of human–bear encounters are collated and analysed systematically. An emergency team composed of officials from the province investigates to better understand the circumstances in which they occurred and how bears behaved (Fig. 6). These data are useful in guiding human behaviour and in documenting which individual bears may pose a threat to people.

Results of data analysis suggest that, in most close encounters, bears simply moved away. On some occasions



Fig. 6. Members of the bear emergency team investigate an incident (Photo: Wildlife Service archive).

they bluff-charged, meaning that the bear rushed towards the person but turned away without making physical contact. Typically, these were cases in which neither the person nor the bear were aware of each other’s presence until they were in close proximity, when the bear responded defensively. However, in eight cases since 2014 a bear physically attacked a person causing injuries and, in one of them, a fatality. Six of these cases involved a female bear with cubs of the year. Two of the females attacked people twice, in different years and with different litters. A total of four different females with cubs were involved in the six cases.

One notable case is that of female bear JJ4, born in 2006. She was reportedly involved in several bluff charges. Then, in June 2020, a father and adult son encountered her with two cubs as they crested a hill while hiking. She charged them, injuring both. Following this attack, and in accordance with the provisions of the Action Plan, the President of the Province issued an emergency order to lethally remove JJ4 from the population to protect public safety. Although it may be said that a mother bear behaving aggressively in defence of her cubs is not abnormal, the IUCN SSC Bear Specialist Group wrote a letter supporting this decision. However, animal rights organisations took the case to court and managed to have the order overturned. As a result, bear JJ4 was captured, fitted with a GPS telemetry collar and released. People in Trentino can follow the movements<sup>1</sup> of telemetry-collared bears with an online app<sup>2</sup> as a way to be more bear-aware and to reduce potentially dangerous encounters, especially with females and cubs. The Wildlife Department raised the issue of the danger posed by JJ4 and the risk of new attacks three more times in 2021 – 2022. Despite this, and the fact that in the meantime another female with cubs of the year, KJ2, had attacked and injured people in different years while defending different litters, the National Wildlife Institute stated that the bear was not dangerous enough to be removed from the wild.

## Responses to a fatal attack

In early April 2023, a 26-year-old man was jogging on a mountain path above his village when, unsuspectingly, he came close to female bear JJ4, then 17 years old and

<sup>1</sup> There is a reduction in resolution of the position data to protect the bears from disturbance or harm.

<sup>2</sup> <https://grandicarnivori.provincia.tn.it/Comunicazione/MAPPA-ORSI-RADIOCOLLARATI>

with three yearling offspring. She attacked and killed him – the first human fatality caused by a bear in Italy in more than a century. JJ4 was implicated in the attack by DNA found at the scene. Authorities again decided to capture and euthanise her as mandated in the Action Plan. The bear was captured a few days after the attack but, following intervention by the same animal rights organisations, a court again overturned the order to kill her. As of October 2023, JJ4 was being kept in an enclosure and it appears that the court decision will result in her remaining in permanent captivity.

The Wildlife Department has argued that captivity is not a practical long-term solution for bears that may pose a danger to public safety, as in the future there are likely to be increasing numbers of such individuals, and limited space to house them, as the population continues to grow. According to a recent study by the National Wildlife Institute, 1 – 5 such bears may show up each year [7]. Keeping wild bears in captivity also causes a lot of controversy and public protest, worsening attitudes toward bears due to continuous conflict between polarised positions. Last, but not least, capturing a bear usually takes much more time than shooting it (when collared), exposing people to further risk in the meantime.

Even when courts agree on the need to remove a dangerous bear (and the 2023 fatality made a lot of people understand that bears can be dangerous), they mostly argue that killing it is disproportionate and that captivity is more appropriate. So far, experts and authorities have been unable to convince the courts that these two choices are absolutely equal in terms of wildlife management: in both scenarios, the animal is permanently removed from the population.

## Coexistence at risk

Actions such as public awareness campaigns, removal of attractants and aversive conditioning with rubber bullets and bear dogs are prioritised and implemented by the Wildlife Department on a regular basis [6], while the removal of dangerous bears is a last resort which is de facto difficult to implement when needed.

In the aftermath of the recent fatality, some people are calling for a significant reduction in the size of the bear population; others emphasise the need for people to take

more safety precautions. For the first time in Italy (and most of Europe), there are serious considerations of setting a maximum threshold for bear populations as one means of controlling conflicts. Bear spray (containing capsaicin), which is commonly used in North America to deter bears during close encounters, is not legal in Italy, although the national government recently changed this restriction to allow use of bear spray by Department personnel dealing with bears.

Attacks on people, combined with a lack of active management (shooting) of dangerous bears by the local government because of courts overturning removal orders, sharply erode public confidence in the bear management programme, undermine trust in bear managers and increase the temptation for individuals to take matters into their own hands. Five bears were found dead in Trentino since the fatality up to October; at that time, official autopsies were still in progress but poaching was suspected in at least some cases. Nevertheless, animal rights protesters do not seem to see a connection between this situation and the court decisions. Thus, Trentino, which has served as an exemplary model of the recovery of a nearly-extirpated bear population, is now at a crucial juncture, testing the limits of coexistence of people and bears.

## References

- [1] Duprè E et al. (2000) Studio di fattibilità per la reintroduzione dell’Orso bruno (*Ursus arctos* L.) sulle Alpi centrali. Biol. Cons. Fauna 105.
- [2] AA VV (2002) La reintroduzione dell’orso bruno nel Parco Naturale Adamello Brenta”. Gruppo di Ricerca e Conservazione dell’Orso bruno del Parco Naturale Adamello Brenta. Documenti del Parco 15. Strembo.
- [3] AA VV (2010) Piano d’Azione interregionale per la Conservazione dell’Orso Bruno nelle Alpi centro-orientali – PACOBACE. Quaderni Conservazione Natura 32, Ministero Ambiente – ISPRA. <http://www.minambiente.it/pagina/piano-d-azione-interregionale-la-conservazione-dellorso-bruno-sulle-alpi-centro-orientali>.
- [4] AAVV (2006) Action A.2 - Analysis of possibilities of establishing a brown bear metapopulation. Final Report. LIFE 2003 NAT/CP/IT/000003. Parco Naturale Adamello Brenta. Strembo.
- [5] Groff C et al., eds. (2023) Rapporto grandi carnivori 2022 del Servizio Faunistico della Provincia Autonoma di Trento.
- [6] Zeni M (2020) Brown bears and damage prevention: the Trentino experience in the Italian Alps. Carnivore Damage Prevention News 20: 1 – 8
- [7] ISPRA – MUSE (2021). Orsi problematici in provincia di Trento. Conflitti con le attività umane, rischi per la sicurezza pubblica e criticità gestionali. Analisi della situazione attuale e previsioni per il futuro. Rapporto tecnico.

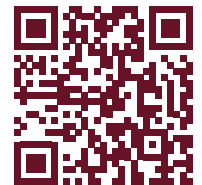
Project

# Setting boundaries: borderlines and bear dogs in a Japanese town

**Amelia Hiorns, Hiroo Tamatani**

Picchio Wildlife Research Centre, Karuizawa, Nagano, Japan

Contact: [musteattaiyaki@picchio.co.jp](mailto:musteattaiyaki@picchio.co.jp)



## Bear-human interactions

The Asiatic black bear (*Ursus thibetanus*) (Fig. 1) has a fairly wide distribution and can be found throughout southeast Asia, China and Japan [1]. In some parts of their range, such as Taiwan, Asiatic black bears are struggling with low or decreasing population densities in the face of habitat destruction and poaching [2]. Bear body parts such as gall bladders are coveted in both Chinese and Taiwanese markets for their supposed benefits in traditional medicine as well as their bushmeat value. As a result, the species is currently listed as vulnerable by the IUCN [3].



Fig. 1. An Asiatic black bear (Photo: Picchio).

Japan's population of Asiatic black bears is also considered vulnerable [4], although the IUCN has assessed it as stable [3]. The last national population estimate put the number of bears in 2011 at 15,685 animals [5]. However, the species is now largely confined to the main island of Honshu (Fig. 2), having been extinct on Kyushu since 2012 [6] and currently numbering only 16–24 bears on Shikoku [7]. It is likely that these subpopulations declined to such a point because of habitat loss and persecution [8] (Fig. 3). These same causes have led to the distribution on Honshu becoming fragmented, with some portions recognised as endangered local populations now facing genetic isolation [9].

Persecution of bears is often in response to conflict issues and the potential harm that bears may cause to people and agriculture [10]. Plantations, corn fields, orchards, fish farms and apiaries are all prone to attracting bears, which can result in considerable damage [11] (Fig. 4). In order to protect their livelihoods, farmers and landowners often want bears permanently removed from their area. In Shikoku, foresters killed bears in an effort to protect plantations from bark stripping, further reducing the already dwindling bear population [8].

With the lack of a national wildlife agency in Japan, it mostly falls to local municipalities and hunting associa-

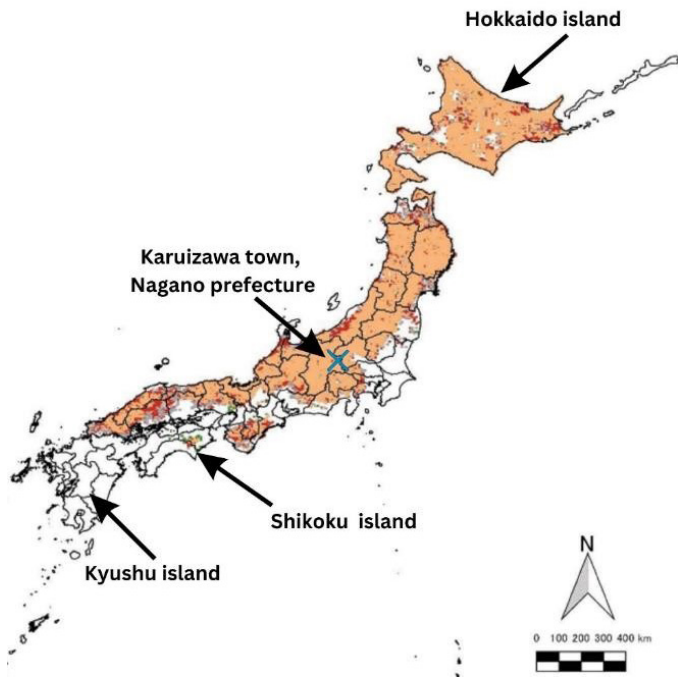


Fig. 2. Distribution range of Asiatic black bears (and brown bears on Hokkaido) in Japan based on capture data, questionnaires and sightings. Data collected in 2018 are marked in red. Location of Karuizawa town is shown with a blue cross (Source: Ministry of the Environment [18]).

tions to respond to conflicts with lethal control [10,12]. The removal of a few bears each year would not be too problematic, but it has been observed that hunters often take more bears than government limits dictate, resulting in the killing of an average of over 3,000 Asiatic black bears per year in Japan in 2012 – 2022 [13]. Persecution and harvesting at such levels are very likely to impact even the large Honshu population.

It is thought that conflicts have increased in recent



Fig. 3. A typical example of a human settlement surrounded by bear habitat in forested mountains in Japan. The tree in the foreground shows signs of bear feeding (Photo: Picchio).

decades in part due to changes in land use. Areas once utilised by local people for timber production or agriculture (e.g. rice fields) have been abandoned and instead, through succession, become bear habitat which has spread towards and overlaps with human-inhabited areas [11] (Fig. 5). This phenomenon increases the risk to people of encountering bears: an average of 85 people were attacked by black bears per year in 2012 – 2022, with up to 156 people attacked in a single year [14]. Some of these attacks occurred when people entered forests close to their homes in order to collect wild plants and unexpectedly came into contact with bears feeding in the area [15]. The encroachment of bears into human-inhabited areas is mostly perceived as something that should not happen and many local people (not just landowners and hunters) have negative opinions of bears, either as a result of per-



Fig. 4. Damage by Asiatic black bears in the Karuizawa locality to A) an apiary; and B) a corn field, showing the outcome of a failed attempt to capture the bear responsible (Photo: Picchio).



Fig. 5. A female Asiatic black bear using an old charcoal kiln in an abandoned forest plantation as a den to over-winter and raise her cubs (Photo: Picchio).

sonal experience or because of a lack of knowledge driving misconceptions of the threat that bears pose [10].

Besides coming into direct contact with humans in shared landscapes and natural habitats, some bears are attracted to anthropogenic food sources such as refuse, waste oil and compost. This can result in them exploring further into human-inhabited areas, losing their innate wariness of people and even becoming food-conditioned. This in turn can result in unfortunate consequences for the bears themselves as food-conditioned individuals are almost always killed by management authorities. Seeking such food may also lead bears to traverse busy roads or railway lines, resulting in injury or death due to collisions with vehicles. Cubs sometimes fall into man-made water courses and drown if they are unable to escape (Picchio unpublished data).

## Coexistence and waste management

The town of Karuizawa in Nagano prefecture has struggled with many of the issues described above. A popular resort town in the middle of Japan (Fig. 2), its resident population of around 20,000 people swells into the millions every summer as tourists from Tokyo and elsewhere flock into the mountains to take advantage of cool weather and fresh air. Many residents and visitors have built holiday homes within the surrounding forest and, at the same time, bear habitat has spread outwards. As a result, Karuizawa experiences a substantial overlap between humans and wildlife, perhaps more so than other countryside towns in Japan, which is a situation that calls for a dedicated management system.

In 1998, members of the Wild Bird Research Centre, since renamed the Picchio Wildlife Research Centre and currently operating as both a nature tour operator and conservation organisation, wanted to understand the behaviour of a male bear that had been captured beside a rubbish disposal site in the town and was likely responsible for considerable damage in the area. They followed his movements via a radio-telemetry collar and came to the conclusion that he was highly food-conditioned. After several failed attempts to scare him away, he was eventually euthanised.

This case helped draw attention to the accessibility of food sources ('attractants') within the town as an underlying cause of conflicts, driving motivation to change Karuizawa's refuse disposal system (Fig. 6). Enlisting the support of the municipal authority, Picchio designed a bear-proof container that could help prevent similar



Fig. 6. A radio-collared bear opening a standard refuse bin with its nose. The bear subsequently accessed the contents and left the area carrying a bag of rubbish in its mouth (Photo: Picchio).

problems recurring in the future (Fig. 7). Use of this container reduced the number of incidents with bears at rubbish disposal sites from nearly 80 in 2003 to zero in 2009 (Fig. 8).

This solution was not enough on its own, however, to keep bears away entirely and some bears still occasionally wandered into town. Young males (1–3 years of age) would often pass through residential areas while dispersing from their natal home ranges [16,17]. Thus, in order to improve the lives not just of people but also of bears, Picchio commenced a multi-faceted conservation management programme consisting mostly of non-lethal measures aimed at promoting human–bear coexistence, the likes of which did not then exist either in Nagano or more widely in Japan.



Fig. 7. Bear-proof containers designed, tested and implemented by Picchio in cooperation with Karuzawa municipal authority (Photo: Picchio).

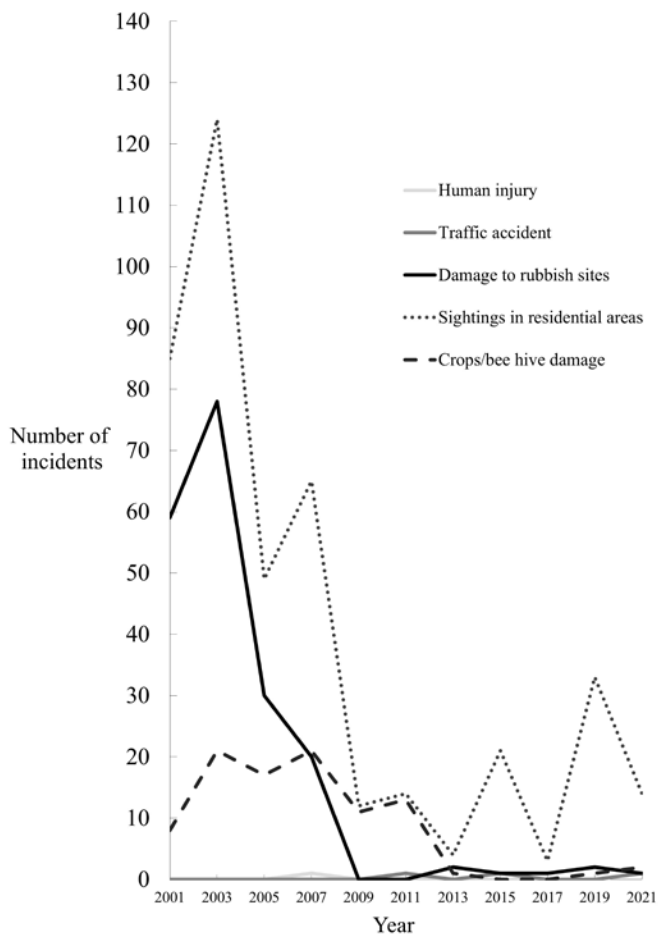


Fig. 8. Trends in various types of bear-related incidents documented in Karuzawa during the period 2001–2021. “Damage to rubbish sites” includes any kind of interference by bears: removal of rubbish bags, attempts to access containers, broken lids, etc. (Source: Picchio).

In addition to installing bear-proof refuse containers, one of the main elements of the work has been a system for capturing, collaring and releasing bears in conjunction with the use of aversive conditioning. The latter involves exposing bears to negative stimuli such as fireworks or projectiles during releases and subsequent chases. The rationale behind this is that if bears learn to associate such stimuli with proximity to humans, they will be more likely to avoid human-occupied areas in the future or, at the very least, to move away from them quickly when confronted. Assisting in the success of these techniques was the introduction of Karelian bear dogs.

### Boundaries and bear shepherding

The Karelian bear dog<sup>1</sup> is a hunting breed that originates in Finland and can bring to bay large game such as moose (*Alces alces*), wild boar (*Sus scrofa*) and brown bears (*Ursus arctos*). Karelians were imported to the USA by bear biologist Carrie Hunt and trained as ‘bear shepherding dogs’ or ‘wildlife K-9s’ at the Wind River Bear Institute (WRBI)<sup>2</sup> which she founded in 1996. Bear shepherding dogs are encouraged to actively track and approach bears, under the supervision of their handlers, in order to push or chase them away through barking and pursuit. Picchio obtained a Karelian bear dog named Bullet from the WRBI in 2004 and began using him as a bear shepherding dog in Karuzawa.

Aversive conditioning and chasing of bears was not completely effective at first and there was still a need for lethal control when bears encroached to such an extent that they represented a threat to residents. This was in part due to Bullet’s youth and his handlers’ inexperience. While damages decreased, bears still lived close to residential areas and sightings remained fairly common in the surroundings of the town, so it was important to define where and when bears would not be tolerated. To this end, Picchio and Karuzawa municipal authorities designed a system with two borders. Border 1 outlines the main residential area of the town while Border 2 outlines the ‘second home area’ – a mostly forested area with holiday villas, cafes, some schools and allotments (Fig. 9). The system works in concert with a set of spatial and temporal conditions that can be applied to bear movements.

<sup>1</sup> <https://www.akc.org/dog-breeds/karelian-bear-dog/>  
<sup>2</sup> <https://beardogs.org>

## No.107 ♀ (1→3yrs)

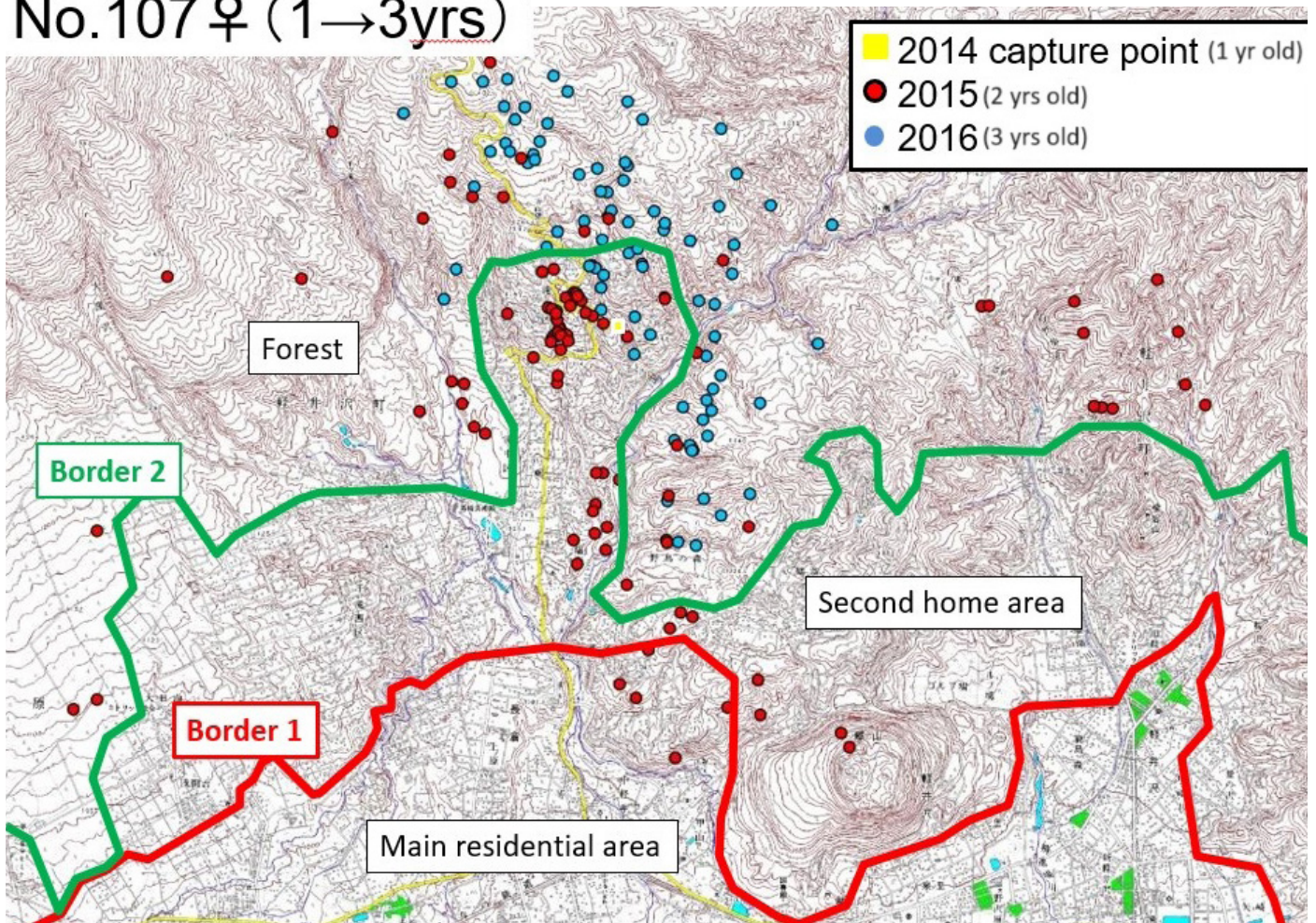


Fig. 9. Telemetry-located positions of a female bear in relation to the boundaries of Karuizawa town (red line) and second home area (green line). The difference in positions recorded in 2016 (blue dots) compared to 2015 (red dots) shows the effect of a year's worth of efforts to haze (chase) the bear away from residential areas (Source: Picchio).

By the time Tama and Nanuq, the second generation of bear dogs, arrived the handlers had more experience and this, combined with the border system, led to more success in shepherding bears (Fig. 10).

Where a bear is and at what time of day determines the type of response required and whether chasing with a bear dog is deemed necessary or not. Originally, Picchio's nightly patrols located the positions of bears fitted with radio-telemetry collars at least once every 24 hours. The introduction of GPS collars since 2022 has made this part of the process a lot more efficient and precise. Bears found within either border are chased back into the forest before daytime so as to minimise any unnecessary interactions with people. Individuals located within the residential area represent more of a problem than those in the second home area as more effort is required to shepherd them away. Bears found in the residential area during

the day may have to be captured and relocated, using the opportunity to administer aversive conditioning during release (Fig. 11).



Fig. 10. Karelian bear dogs Tama and Rela watch a bear they just chased up a tree (Photo: Picchio).





Fig. 11. A trapped and relocated bear is chased away on release (Photo: Picchio).

In both shepherding and capture–releases, bear dogs enforce the border system, effectively teaching bears where they can and cannot go, thereby creating a safe distance between people and bears and improving the efficacy of the system as a conflict mitigation strategy. The presence of the dogs and regular patrols also provides reassurance to local people that they are being protected; and all with minimal harm to bears.

## Raising awareness and promoting bear tourism

Handlers take their bear dogs into schools in order to explain their work and drive home the message of coexistence, which is vital for people to continue to support such methods and begin to feel more positively towards bears. Picchio’s long-term efforts to manage damage and conflicts have encouraged a more accepting attitude towards bears. Local magazines and newspapers write more positively about nature and bears than they did previously. However, ongoing public outreach is important to avert a resurgence in animosity towards bears. Picchio also promotes nature tours to explore habitats, spot bears and learn more about their conservation and management. It is hoped that these tours will amplify the other work and further encourage a positive relationship between townspeople and bears.

## Replication and future actions

The successes of the Karuizawa programme, including reductions in damage, better management of individual bears and the proven efficacy and assurance of the bear dogs, has been acknowledged around Japan. There are increasing efforts to replicate Picchio’s methods elsewhere, such as in the prefecture of Niigata and Kamikochi National Park. It is hoped that the next generation of bear dogs will go to Sapporo, capital of Hokkaido prefecture, and assist with the management of Hokkaido brown bears living close to the city.

There are also increasing efforts to quell another conflict issue occurring across Nagano prefecture and elsewhere: the unintended capture of Asiatic black bears in wire snares (Fig. 12). In 2018–2022, Picchio responded to between 88 and 116 such cases of bear mis-captures per year around Karuizawa and neighbouring towns. While it is common practice for hunters to catch and cull sika deer (*Cervus nippon*) using snares, trapping bears this way is illegal and they must be released. The process involves anaesthetising the bear, removing it from the snare and relocating it to an area free of traps. Helping to rescue bears from snares is another aspect of managing conflicts. Providing the means to release snared bears safely reduces the risk of them being shot out of fear or misunderstanding. However, while efforts are underway by several groups to improve the situation such as by redesigning snares, it is likely that this problem will persist until snares are no longer used and the deer population is controlled by other means.



Fig. 12. A young bear with his back leg caught in a wire snare intended for capturing deer (Photo: Picchio).

With several conflict issues afflicting Japan's relationship with bears, a range of different responses is necessary to improve the situation. Thus a multi-faceted approach, such as that employed by Picchio to manage bears as individuals through tracking, chasing and aversive conditioning as well as to educate the public, is vital for a successful resolution. Picchio staff are eager to learn and would like to see how this style of bear management compares with that of towns facing similar challenges in other countries, to share best practice and continue to improve upon the path of coexistence for both bears and people. With any conflict situation involving people and wildlife there are regrettable outcomes on both sides but only we, as humans, can make a conscious decision to


make it easier for humans and Asiatic black bears to live alongside each other before one side loses out completely.

## Acknowledgements

We thank the Karuizawa municipal authorities for funding and supporting our bear-related activities and allowing the use of information and figures in this article. We also thank those individuals and organisations who have helped fund our activities through donations and grants. Finally, we thank all past and present members of Picchio whose hard work and dedication have contributed to improving coexistence with nature in Karuizawa.

## References

- [1] Kozakai C et al. (2020) Asiatic black bear (*Ursus thibetanus*). In: Penteriani V & Melletti M, eds. Bears of the world: Ecology, conservation and management. Cambridge University Press, Cambridge, pp. 110 – 121.
- [2] Hwang M & Wang Y (2006) The status and management of Asiatic black bears in Taiwan. In: Yamazaki K et al., eds. Understanding Asian bears to secure their future. Japan Bear Network Compiler, Ibaraki, Japan, pp. 107 – 110.
- [3] Garshelis D & Steinmetz R (2020) *Ursus thibetanus* (amended version of 2016 assessment). The IUCN Red List of Threatened Species 2020. <https://dx.doi.org/10.2305/IUCN.UK.2020-3.RLTS.T22824A166528664.en>.
- [4] Yamazaki K (2016) Basic information on bears. Training session on protection and management of specified birds and beasts. Nature Conservation Bureau, Ministry of the Environment, Japan. [https://www.env.go.jp/nature/choju/effort/effort5/effort5-3e/joukyu/kuma\\_2.pdf](https://www.env.go.jp/nature/choju/effort/effort5/effort5-3e/joukyu/kuma_2.pdf) [in Japanese].
- [5] MoE (2011) Fiscal 2010 basic survey on natural environment conservation - Report on specified mammal inhabitation survey and survey system construction. Biodiversity Center, Nature Conservation Bureau, Ministry of the Environment, Yamanashi. <https://www.biodic.go.jp/reports3/7th/honyurui2010.pdf> [in Japanese].
- [6] MoE (2012) Publication of the 4<sup>th</sup> Red List (Announcement). Wildlife Division, Nature Conservation Bureau, Ministry of the Environment, Japan. <https://www.env.go.jp/press/15619.html> [in Japanese].
- [7] Uno-Onodera R et al. (2019) Pedigree and reproductive history of black bears captured in Shikoku. Japanese Journal of Conservation Ecology 24: 61 – 69.
- [8] Tamatani H (2021) The status of forestry damage by black bears. Japan Forest Technology Association 949: 8 – 11 [in Japanese].
- [9] Ohnishi N et al. (2007) Low genetic diversities in isolated populations of the Asian black bear (*Ursus thibetanus*) in Japan, in comparison with large stable populations. Conservation Genetics 8: 1331 – 1337.
- [10] Sakurai R & Jacobson SK (2011) Public perceptions of bears and management interventions in Japan. Human–Wildlife Interactions 5: 123 – 134.
- [11] Kishimoto R (2009) Status of the 2006 drastic rise of Asiatic black bear (*Ursus thibetanus*) intrusions into residential areas in Nagano prefecture. In: Oi T et al., eds. FFPRI Scientific Meeting Report 4 Biology of bear intrusions. Forestry and Forest Products Research Institute, Ibaraki, Japan, pp. 35 – 39.
- [12] Huygens OC et al. (2001) Asiatic black bear conservation in Nagano Prefecture, central Japan: problems and solutions. Biosphere Conservation 3: 97 – 106.
- [13] MoE (2023) Number of permitted captures of bears (preliminary figures). Nature Conservation Bureau, Ministry of the Environment, Japan. <https://www.env.go.jp/nature/choju/effort/effort12/effort12.html>. [in Japanese].
- [14] MoE (2023) Number of casualties caused by bears (preliminary figures). Nature Conservation Bureau, Ministry of the Environment, Japan. <https://www.env.go.jp/nature/choju/effort/effort12/effort12.html>. [in Japanese].
- [15] MoE (2021) Trends in personal injuries. In: Bear encroachment response manual, revised edition. Nature Conservation Bureau, Ministry of the Environment, Japan pp. 99 – 105. <https://www.env.go.jp/nature/choju/docs/docs5-4a/> [in Japanese].
- [16] Costello CM (2010) Estimates of dispersal and home-range fidelity in American black bears. Journal of Mammalogy 91: 116 – 121.
- [17] Takayama K et al. (2023) Timing and distance of natal dispersal in Asian black bears. Journal of Mammalogy 104: 265 – 278.
- [18] MoE (2019) FY2018 medium and large mammal distribution survey report bears (brown bear, Asiatic black bear) and Japanese serow. Biodiversity Center, Nature Conservation Bureau, Ministry of the Environment, Yamanashi. [https://www.biodic.go.jp/youchui/reports/h30\\_chuogata\\_houkoku\\_teisei.pdf](https://www.biodic.go.jp/youchui/reports/h30_chuogata_houkoku_teisei.pdf) [in Japanese].



Project

# Creating bear smart communities: the example of Băile Tuşnad, Romania

Cristian Remus Papp<sup>a,b\*</sup>, László Gál<sup>b</sup>, Alexandra Sallay-Moşoi<sup>a</sup>,  
Imecs István<sup>c</sup>, Nándor Erös<sup>b</sup>

<sup>a</sup> WWF-Romania, Bucharest, Romania

<sup>b</sup> Babeş-Bolyai University, Cluj-Napoca, Romania

<sup>c</sup> Accent GeoEcological Organization, Băile Tuşnad, Romania

\* Contact: cpapp@wwf.ro



## Background context

As people increasingly share landscapes with large carnivores [1–3], their interactions result in damage to property and livestock, to human injuries and even deaths [4–6]. In certain regions of Romania, the brown bear (*Ursus arctos*) has become a social problem, as its presence in large numbers poses a real threat to the safety and integrity of local residents and their households [7]. Furthermore, discussions of the issue through social networks and the media typically lack proper contextualisation and explanation of the phenomenon, instead promulgating an atmosphere of severe insecurity and danger [8]. This has started to create a negative perception of the species and undermine recognition of its importance in ecosystems, a situation which is used by some interest groups to demand a reduction in legal protection of the species<sup>1</sup>. At the same time, environmental groups advocate maintaining strict protection, despite high lev-

els of conflict<sup>2</sup>. Views on the topic of bear conservation and management in Romania have thus become increasingly polarised in recent years, especially after a ban on hunting bears was introduced in 2016<sup>3</sup>.

Efforts are needed to reconcile the diverse perspectives of key stakeholders to ensure both human safety and acceptance of bear presence at the landscape level while minimising negative consequences for both species. An attempt was made in 2017 when a joint WWF–FACE meeting was organised under the umbrella of the EU Platform on Coexistence between people and large carnivores. Despite the participants reaching an agreement<sup>4</sup>, no significant improvement of the situation was observed<sup>5</sup>. Efforts to build trust were therefore pursued at the local level.

To this end, the creation of a ‘bear smart’ community started in 2022 in Băile Tuşnad, Harghita County, Romania, where the estimated density of 12.4 bears/100 km<sup>2</sup> (95 % confidence interval: 8.6–16.3) is among the highest

<sup>1</sup> <https://transylvanianow.com/romanian-counties-asking-for-eu-intervention-to-solve-the-bear-problem/>

<sup>2</sup> <https://www.romania-insider.com/environmental-ngos-protest-bear-hunting-quotas-romania-2023>

<sup>3</sup> <https://www.theguardian.com/environment/2016/oct/05/romania-bans-trophy-hunting-of-brown-bears-wolves-lynx-and-wild-cats>

<sup>4</sup> <https://adelphi.de/en/news/romania-hunters-and-environmental-ngos-sign-a-joint-statement>

<sup>5</sup> <https://www.politico.eu/article/romania-bear-attacks-on-humans/>

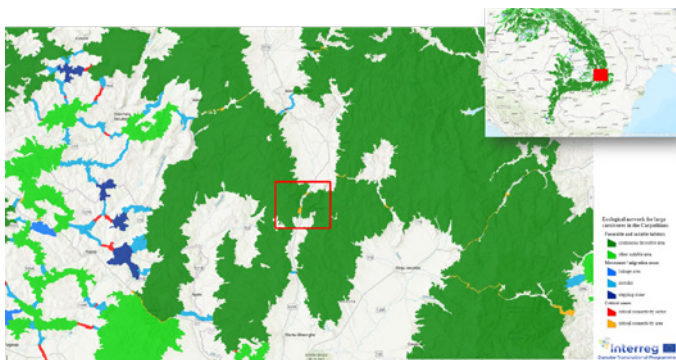


Fig. 1. Location of Băile Tușnad in Harghita County, Romania (Source: WWF-Romania).

in the country [9]. The large number of bears in this area is partly due to its geographical position: the town is situated on an important ecological corridor, actively used by bears and other species as a movement/dispersal route across the Eastern Carpathians (Fig. 1). The bear has become a symbol for this small community of about 1,700 inhabitants and bear watching generates important revenues for the tourism sector. On the other hand, some bears enter the town, habituate to human presence, damage property and generate fear (Fig. 2). The overall goal of the initiative is therefore to improve human–bear coexistence by co-creating and developing tailor-made, viable solutions in conflict management through an inclusive and participatory stakeholder process. The specific objectives are to:

- 1) improve and maintain safety for both humans and bears by implementing functional prevention measures and operationalising a bear intervention team;
- 2) understand the triggers and processes of bear habituation in the area by conducting a dedicated study;
- 3) improve the perceptions and attitudes of the local community towards the bear by implementing awareness-raising campaigns and providing regular targeted information;
- 4) work with key stakeholders to co-create viable solutions and measures to reduce the level of conflict in the area;
- 5) improve legislation and, more generally, the management of bears in Romania by providing clear policy recommendations based on experience in Băile Tușnad.



Fig. 2. Bears seeking easily-accessible food in the town (Photos: Laszlo Gál).

## Building partnerships

The initiative was brought to life through cooperation between WWF-Romania<sup>6</sup>, Băile Tușnad Town Hall and Accent GeoEcological Organisation<sup>7</sup>, a local NGO focused on developing ecotourism in the area. The interests of the community are represented through the mayor while the other organisations bring valuable knowledge and insights concerning coexistence with bears.

The most relevant stakeholders were identified and involved in the initiative right from the start (Fig. 3). They include the Ministry of Environment, the local council, Harghita County Environmental Protection Agency, the Agency for Natural Protected Areas of Harghita County, Harghita Environmental Inspectorate, the gendarmerie, hunting management units, the local landowners' association, Băile Tușnad Tourism Association, St. Anne Lake – Mohos Peat Bog administration, Babeș-Bolyai University in Cluj-Napoca, Accent and another NGO, the Transylvanian Wildlife Project.

<sup>6</sup> <https://wwf.ro/>

<sup>7</sup> <https://www.ogaccent.ro/?lang=en>

The idea of co-generating solutions was appealing to every stakeholder from the very beginning of the initiative. There was no prior active cooperation between the key stakeholders in the area, although there had been some initial attempts to collaborate. The initiative started to take shape after a bear-themed festival (TusnadEco-BearFest) and conference were held in the town in 2022 within the project WatchBear & AdvoCity – Bears and people for a common future<sup>8</sup>. During this event the partners identified a clear common interest, namely to demonstrate that human–bear coexistence is possible. WWF-Romania together with the Town Hall and Accent campaigned to raise funds that have enabled the initiative to go ahead.



Fig. 3. Stakeholder meeting to discuss the project (Photo: Accent GO).

## Actions towards becoming bear smart

The initiative in Băile Tușnad was inspired by the concept developed by the Get Bear Smart Society<sup>9</sup> in North America. The original idea was to “help bears be bears again” and we are now further integrating the needs of the human community and enhancing safety in a landscape where both species have a prominent presence.

## Operationalising an intervention team

The initiative has significantly enhanced the operational capabilities of the local Bear Emergency Team<sup>10</sup> (BET) through two key measures: upgrading equipment and introducing cutting-edge technology. The team’s equipment now includes walkie-talkies and body cams as well as GPS telemetry collars, GPS video collars and trail cameras to monitor bears in the area. The new technology allows continuous monitoring in near-real time via the Cluey app that operates with the associated Sensing-Clues<sup>11</sup> platform to systematically store and manage field data in a standardised format. Purpose-specific field sheets have been designed to comprehensively address technical needs. In addition, the system also alerts the BET when a GPS-collared bear approaches a pre-defined ‘area of interest’, such as a residential area (Fig. 4). This enables the BET to respond swiftly to emergency situations when bears threaten human safety or property. The information obtained from GPS collars and trail cameras will also allow a more comprehensive understanding of how individual bears respond to different management measures.

While recognising that not all bears pose a threat to people or cause material damage, the project’s technical team<sup>12</sup> considers various strategies to deter bears from entering populated areas, prioritising non-lethal methods such as aversive conditioning (with projectiles or noise) and installing bear-proof containers for storage of food or refuse. All such management options are analysed in more detail by the BET, drawing insights from prior experience. Interventions, which are tailored to the particular personalities of the bears involved, include continuous monitoring, chasing away, relocation or, as a last resort, euthanasia.

Interestingly, the same methods have been used in other settlements with varying degrees of success, so it seems that not only the choice of methods themselves but also the manner in which they are implemented are important. For example, if a bear is given the chance to seek refuge in a secure location without being pursued, it may

<sup>8</sup> <https://www.ogaccent.ro/watchbear/?lang=en>

<sup>9</sup> <https://www.bearsmart.com>

<sup>10</sup> Bear Emergency Teams were established by the state in July 2021 in areas with high bear densities. Costs are paid by town halls and refunded by the government. Town halls make agreements with a veterinarian and a local hunting association; the town mayor must be included and the gendarmerie is responsible for safety.

<sup>11</sup> <https://sensingclues.org/>

<sup>12</sup> The technical team comprises a coordinator, project manager, a field technician/ecologist and a GIS expert.

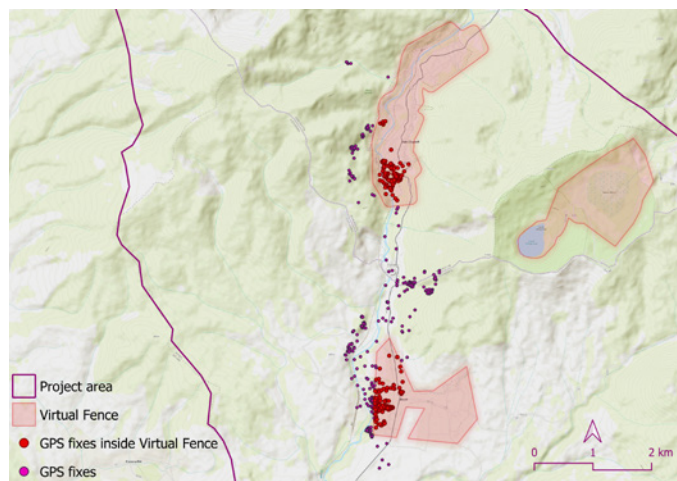
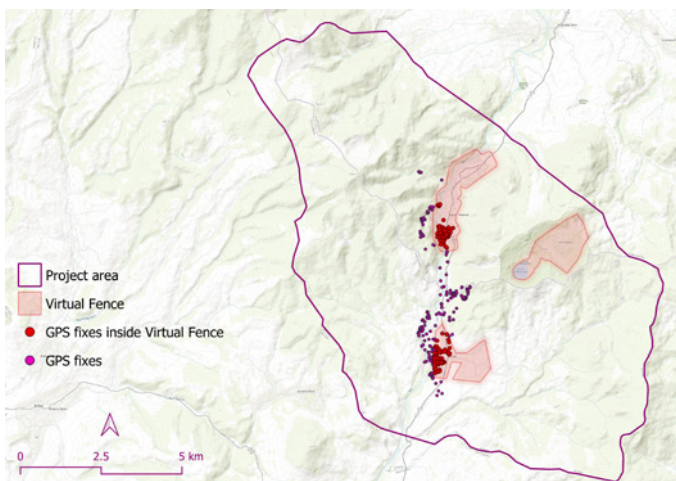


Fig. 4. Visualisation of data from a GPS collar used as part of an early warning system, showing incursions by a bear into Băile Tușnad and neighbouring town (Source: project technical team, WWF-Romania and Babeș-Bolyai University).

soon return to the settlement. The effectiveness of an intervention team depends on its capacity to patrol at night and observe bears under different circumstances. Interventions must be timely and effective; otherwise there is a risk of people’s fear increasing.

### Increasing understanding of problem bears

A study on bear habituation, financed by WWF-Romania with support from WWF-Belgium, was initiated at the beginning of 2023. A habituated young female bear that had been roaming in the area for over a year was fitted with a GPS video collar (Fig. 5). The device delivers valuable data regarding the position, movement and daily activity of the bear while the video provides important insights into the life and behaviour of the animal. It is



Fig. 5. A tranquilised bear being fitted with a GPS video collar so its movements can be tracked and activity observed (Photo: WWF-Romania).

planned to fit four more such collars to bears from spring 2024. Trail cameras are deployed at wildlife feeding sites, in cooperation with local hunting management units, to gather additional information in order to better understand the habituation process of bears.

The data collected within this study will be analysed using AI algorithms to create early warning signals with the potential to reduce human–bear conflicts and predict when and where future conflicts may occur. The probability of bear presence in various areas of the landscape can be forecast by analysing past locations and behaviours. This is crucial in terms of optimising the investment of resources as well as to implement the most appropriate solutions to keep the community and bears safe. The data will also contribute to research on bear behaviour, population dynamics and habitat use, informing strategic management decisions and enhancing understanding of bear ecology.

### Implementing preventive measures

Not only bears but also potential food sources (‘attractants’) are being managed in the immediate vicinity of the town area through the removal of wild fruit trees, clearing bear hiding places, adapting waste management and using electric fencing (Fig. 6). Two years ago, on the basis of expert advice provided to the Town Hall, the community took a seemingly radical decision to cut down fruit trees that were not protected by electric fencing and replace them with other tree species whose fruit does not attract bears. This has helped to reduce the occurrence of bears in gardens and on public land (Fig. 7). Various pro-



Fig. 6. A mobile fast-food outlet secured with electric fencing at night to deter bears (Photo: Robin Rigg).

totype bear-proof containers will be tested to identify the most suitable design for the town, which later should be more widely used to discourage bears from entering the community in search of food. This activity will go hand-in-hand with informing residents and tourists about the need to store waste securely<sup>15</sup>.

## Communication

Awareness-raising among the local community and tourists is crucial. A dedicated mobile phone app called TusnadEcoBearWatch<sup>14</sup> has been developed with the aim of having a permanent communication channel between local residents or tourists and the Town Hall or the BET that serves as a kind of ‘watchdog’ so that damage and conflicts can be addressed more efficiently. Regular consultation meetings are organised with key stakeholders to discuss the progress of the initiative as well as to agree next steps and solutions to be tested and implemented (Fig. 3). Four such meetings were held during the last 12 months. Additionally, in October 2023 a second Tusnad-EcoBear festival was held along with another conference, which this time had a more international set-up [Editor’s note: see the News Roundup section in this issue for details]. The TusnadEcoBear conference<sup>15</sup> has the potential to become a reference event for Eastern Europe and beyond in



Fig. 7. A bear visiting fruit trees in Băile Tușnad (Photo: Laszlo Gál).

<sup>15</sup> An open-air rubbish dump near the town, where bears used to forage nightly, was closed down in 2009.

<sup>14</sup> <https://tusnadecobear.ro/app/?lang=en>

<sup>15</sup> <https://tusnadecobear.ro/conf/>



Fig. 8. Single electrified wire mounted on an existing wooden fence to deter bears from entering a garden (Photo: Robin Rigg).

terms of bear management and human–bear coexistence. The intention is to organise a third conference in 2024.

## Outcomes and next steps

The long-term goal of the initiative is to achieve viable human–bear coexistence, including through the development of clear policies and guidelines related to bear management, damage prevention and conflict resolution. From this perspective, the combined effort of key stakeholders in the Băile Tușnad area has already filled a gap related to the exchange of know-how and social cohesion. This was made possible in several ways but particularly through shared responsibilities within the BET, whose members are also part of the key stakeholder groups involved in the initiative such as the gendarmerie, game management units and the mayor. Further training and experience-sharing workshops are planned for the next year to ensure appropriate handling of bear-related incidents.

To keep bears away from their property, some local residents and businesses had already begun installing electric fencing, at their own expense and initiative, from around 2010. A programme was launched in 2019, with the joint support of the mayor’s office and county council, to provide and instal electric fences for all local residents. There are now around 400 systems in the town (which has a total of 600 households and businesses including hotels). However, most of them use single electrified wires (Fig. 8) whereas the efficacy of electric fences is greater when 3–5 wires are used (Fig. 9). The current initiative therefore aims to make further improvements, at least at the most critical sites.

The community is receptive to our communication and education activities: around 500 people attended the festival in 2022 and about 1,300 in 2023. The TusnadEco-BearCave visitor centre<sup>16</sup>, which opened in July 2023 and offers a comprehensive educational programme on the topic of human–bear coexistence, receives on average five visitors per hour. Results of monitoring and questionnaire

<sup>16</sup> The visitor centre offers one-hour programmes for groups of up to 15 people or guided tours and information for other visitors. In both cases, communication is provided in three languages. The centre is funded by the same project as the festival and conference. See: <https://tusnadecobear.ro/cave/>



surveys<sup>17</sup> indicate that the attitudes of the community towards bears have already improved to some extent. Local people perceive that bears enter the town less often than before and, when they do, spend less time there. The increased performance and efficiency of the intervention team has significantly reduced levels of conflict. Whereas 41 cases of damage by bears were documented in 2021, there were none in 2022 or 2023. RoAlert emergency calls due to bears show a similar trend: 149 in 2021, 30 in 2022 and six in 2023. Băile Tușnad is clearly well on its way to becoming a truly bear smart community.

## Acknowledgements

The WatchBear & AdvoCity project was financially supported by the Active Citizens Fund Romania, a programme funded through the EEA Grants and Norway Grants 2014–2021. We acknowledge the role of the NatureFirst project<sup>18</sup>, funded by the EU's Horizon 2020 programme, in addressing conflicts from a scientific perspective. We are grateful to Băile Tușnad Town Hall, Sfânta Ana and Miercurea Ciuc hunting associations and the gendarmerie for collaboration; the Transylvanian Wildlife Project for providing expertise in bear capture and capture/relocation equipment; and the Zarand Association for cooperation and provision of a GPS video collar through the LECA project. We thank Tibor Hartel of Babeș-Bolyai

## References

- [1] Chapron G et al. (2014). Recovery of large carnivores in Europe's modern human-dominated landscapes. *Science* 346: 1517–1519.
- [2] López-Bao JV et al. (2017). Finding space for large carnivores. *Nature, Ecology & Evolution* 1: 0140.
- [3] Hartel T et al. (2019) Mainstreaming human and large carnivore coexistence through institutional collaboration. *Conservation Biology* 33(6): 1256–1265. <https://doi.org/10.1111/cobi.13334>.
- [4] Linnell JDC et al. (1999) Large carnivores that kill livestock: Do “problem individuals” really exist? *Wildlife Society Bulletin* 27(3): 698–705.
- [5] Bombieri G et al. (2019) Brown bear attacks on humans: A worldwide perspective. *Scientific Reports* 9(1): 8573. <https://doi.org/10.1038/s41598-019-44341-w>.



Fig. 9. Multi-wire electric fence at St. Anna Lake tourist area, Băile Tușnad (Photo: Robin Rigg).

University for his support and scientific guidance. Our thanks also go to all donors who have contributed to implementing the bear smart community concept.

- [6] Bombieri G et al. (2021) Towards understanding bold behaviour of large carnivores: The case of brown bears in human-modified landscapes. *Animal Conservation* 24(5): 783–797. <https://doi.org/10.1111/acv.12680>.
- [7] Salvatori V et al. (2021). Are large carnivores the real issue? Solutions for improving conflict management through stakeholder participation. *Sustainability* 13: 4482.
- [8] Neagu AC et al. (2022) The drums of war are beating louder: Media coverage of brown bears in Romania. *Nature Conservation* 50: 65–84. <https://doi.org/10.3897/natureconservation.50.86019>.
- [9] Popescu V et al. (2017). Integrating sign surveys and telemetry data for estimating brown bear (*Ursus arctos*) density in the Romanian Carpathians. *Ecology and Evolution* 7(18): 7134–7144.

<sup>17</sup> [https://www.researchgate.net/publication/353688374\\_Provocari\\_ale\\_coexistentei\\_om-urs\\_in\\_localitatea\\_Baile\\_Tusnad\\_experienta\\_unei\\_practici\\_de\\_teren\\_in\\_domeniul\\_ecologiei](https://www.researchgate.net/publication/353688374_Provocari_ale_coexistentei_om-urs_in_localitatea_Baile_Tusnad_experienta_unei_practici_de_teren_in_domeniul_ecologiei)

<sup>18</sup> <https://www.naturefirst.info/>

# News Roundup

## Livestock farming and large carnivores in Europe

Responding to the European Parliament Resolution of 24<sup>th</sup> November 2022 on the protection of livestock farming and large carnivores in Europe (for details see *CDPnews* issue 25 p. 9), the European Commission initiated an in-depth analysis of data from expert groups, key stakeholders and reports by national authorities under existing EU and international legislation (see *CDPnews* issue 26 p. 17). In September 2023, the Commission issued an invitation<sup>1</sup> to local communities, scientists and all interested parties to submit, within an 18-day window, data on wolf populations and their impacts. A huge quantity of material was received and the data were integrated into a report intended to help guide the Commission in deciding on a proposal to modify the status of protection of the wolf within the EU. Member States and stakeholder organisations were consulted in this process via the Nature Directives sub-expert group<sup>2</sup>. The resulting report, an in-depth analysis on the situation of the wolf in the European Union, was published on 20<sup>th</sup> December 2023 and is available online<sup>3</sup>. On the same day, the Commission announced its proposal<sup>4</sup> to adapt the status of the wolf under the Bern Convention from 'strictly protected' to 'protected'.

A related event was held in July, organised jointly by the NAT<sup>5</sup> and ENVE<sup>6</sup> commissions of the European Committee of the Regions and the Intergroup on Biodiversity, Hunting, Countryside<sup>7</sup> of the European Parliament. Participants discussed proposals and exchanged best practices for improving the coexistence of livestock farming and large carnivores in Europe. The debate with various mem-

bers of the Committee reflected different visions of how to deal with the legal framework of the EU Habitats Directive. However, there was an overall consensus that constructive dialogue between diverse interest groups is key. A video recording of the meeting can be viewed on the Committee Portal<sup>8</sup>.



(Photo: Robin Rigg).

<sup>1</sup> [https://ec.europa.eu/commission/presscorner/detail/en/ip\\_23\\_4330](https://ec.europa.eu/commission/presscorner/detail/en/ip_23_4330)

<sup>2</sup> <https://ec.europa.eu/transparency/expert-groups-register/screen/expert-groups/consult?lang=en&groupID=100623>

<sup>3</sup> <https://op.europa.eu/en/publication-detail/-/publication/5d017e4e-9efc-11ee-b164-01aa75ed71a1/language-en/format-PDF/source-299076073>

<sup>4</sup> [https://ec.europa.eu/commission/presscorner/detail/en/ip\\_23\\_6752](https://ec.europa.eu/commission/presscorner/detail/en/ip_23_6752)

<sup>5</sup> <https://cor.europa.eu/en/our-work/commissions/Pages/nat.aspx>

<sup>6</sup> <https://cor.europa.eu/en/our-work/commissions/Pages/enve.aspx>

<sup>7</sup> <https://www.biodiversityhuntingcountryside.eu/>

<sup>8</sup> <https://cor.europa.eu/en/events/Pages/co-existence-livestock-farming-large-carnivores.aspx>



(Photo: WWF Romania).

## Improving bear–human coexistence

The 2<sup>nd</sup> TusnadEcoBear conference<sup>9</sup>, held on 27–29<sup>th</sup> October 2023 in Băile Tuşnad, Harghita County, focused on the issue of human–bear coexistence in Romania and beyond. The event brought together experts with a variety of views, competences and experience from around Europe in order to identify the current level of knowledge as well as good and bad practices regarding bear management and to translate the professional content into a form that communities can understand and put into practice. There were 29 presentations by speakers from Romania, Slovakia, Slovenia, Ukraine, Czech Republic, Bulgaria and the United Kingdom. The book of abstracts can be downloaded online<sup>10</sup>.

The conference ran in parallel with the 2<sup>nd</sup> TusnadEco-Bear festival<sup>11</sup> which reached out to the wider community, introducing locals and tourists of all ages to the details of human–bear coexistence through entertaining and educational activities including quizzes, competitions, a puppet theatre, bear-themed photo exhibitions, a cinema room and evening concerts. Issues such as climate change, recycling and ecotourism were presented based on the human–bear relationship and highlighting local values.

The festival and conference were attended by a total of around 1,300 people. The organisers were Accent Geo-Ecological Organisation, Vox Iuventutis Association and Băile Tuşnad mayor's office in cooperation with WWF-Romania. Financial support came from the Active Citizens Fund Romania, a programme funded by the EEA and Norway Grants 2014–2021.

## Wolves across borders

Nearly 300 researchers, managers, stakeholders and others with an interest in wolf ecology, management and conflict resolution gathered near Stockholm, Sweden, for an international conference<sup>12</sup> on 8–11<sup>th</sup> May 2023. Participants from 32 countries exchanged knowledge about wolves and discussed some of the challenges posed by wolf population management across borders and how they are being addressed.

The programme featured several talks about wolf–human interactions and conflict mitigation. Panel discussions debated the extent to which wolves control their own numbers and the pros and cons of wolf hunting as a management tool. Workshops were held on stakeholder participation, social mediation, just governance, poach-

<sup>9</sup> <https://tusnadecobear.ro/conf/>

<sup>10</sup> <https://bit.ly/TEBCBook>

<sup>11</sup> <https://tusnadecobear.ro/fest/>

<sup>12</sup> <https://www.wolvesacrossborders.com/>

ing and preventing predation on livestock. The latter examined opportunities and limitations of traditional damage prevention methods, as well as alternatives such as aversive conditioning, with an ambition to co-design a strategic research plan.

The event was organised by SKANDULV – the Scandinavian Wolf Research Project<sup>13</sup>. Funders included the Norwegian, Swedish and Finnish Environmental Protection Agencies, the EU's Interreg Sweden–Norway programme and WWF-Sweden. There is an intent to run another Wolves across Borders conference in 2025. In the meantime, the Wildlife Biology journal is producing a special issue<sup>14</sup> with the same name.

## Swiss wolf cull

Switzerland currently has 32 wolf packs with a total of approximately 300 individuals including packs, pairs and single animals<sup>15</sup>. On 1<sup>st</sup> December 2023 the national hunting law was amended to allow the pro-active removal of whole packs with the aim of reducing wolf numbers, thereby preventing damage to livestock. Prior to the

change, it was only legal to shoot individual animals such as persistent livestock depredators or bold wolves close to villages and to eliminate up to half the juvenile members of a pack.

Although a scientific assessment published in 2016 concluded that a minimum of 17 – 20 packs are needed in Switzerland to contribute to a viable Alpine wolf population<sup>16</sup>, this autumn the new Minister of Environment made a political decision that 12 packs would be sufficient. The Federal Office of Environment authorised the removal of 12 packs in December–January. Within the first 10 days of this period 18 wolves were shot but hunting was then stopped by the cantons of Valais and Graubünden. Environmental organisations filed a complaint calling for a review of the legal basis of the hunt. For the time being the new national hunting law is provisional; the final version will be reformulated based on the results of analysis by the federal administration court and evaluation of wolf hunting and impacts on domestic animals and wild ungulates. Wolf hunting is nevertheless expected to continue until 31<sup>st</sup> January, targeting seven packs instead of 12.



The Wolves across Borders conference held in Sweden in May 2023 (Photo: Silvia Ribeiro).

<sup>13</sup> <https://www.slu.se/en/departments/ecology/research/teman/wildlife-and-predators-/skandulv/>

<sup>14</sup> <http://www.wildlifebiology.org/blog/call-papers-wolves-across-borders>

<sup>15</sup> <https://www.kora.ch/de/arten/wolf/bestand>

<sup>16</sup> Breitenmoser U et al. (2016) The recovery of wolf *Canis lupus* and lynx *Lynx lynx* in the Alps: Biological and ecological parameters and wildlife management systems. KORA Bericht 70, Muri bei Bern, Switzerland.

Research

# Can education and outreach help foster human–sloth bear coexistence?

Khushboo<sup>a</sup>, Pratikkumar Desai<sup>a,b</sup>, K Sasikumar<sup>c</sup>, Nishith Dharaiya<sup>b,d\*</sup>

<sup>a</sup> Hemchandracharya North Gujarat University, Patan, India

<sup>b</sup> Wildlife and Conservation Biology Research Foundation, Patan, India

<sup>c</sup> Gujarat Forest Department, India

<sup>d</sup> Bhakta Kavi Narsinh Mehta University, Junagadh, India

\* Contact: nadharaiya@gmail.com



## Introduction: human–wildlife interactions

Human–wildlife conflict (HWC) is a global issue of increasing concern to local communities, governments and stakeholders [1,2]. It has been defined in different ways (see Box 1) but, broadly speaking, HWC arises where wildlife habitats and human populations overlap, such as at forest edges and in shared landscapes, resulting in competition for resources and the potential for adverse impacts on both wildlife and humans [2–5]. As human settlements and activities expand into natural habitats, wildlife is displaced, killed or forced to adapt in order to survive [6]. When animals seek food and shelter in human-inhabited areas, this can result in crop damage, predation on livestock and pets as well as direct impacts on both humans and wildlife, including injury and death [7–9].

Community support for conservation and its potential benefits is easily undermined by persistently negative interactions with wildlife [2]. Furthermore, disputes often arise between interest groups with diverse opinions about

how to address the situation and different priorities in terms of safeguarding livelihoods and protecting wildlife populations [10]. Finding solutions that are effective, accepted and viable in the long-term therefore calls for not only wildlife management [11] but also working with people through participatory processes (*Editor's note: see the article in this issue on stakeholder collaboration in the Dinaric–Balkan–Pindos region*). Striking a balance between human and wildlife needs is crucial for achieving harmony in conflict-prone zones and resolving HWC typically requires a multi-pronged approach that may include, for example, habitat restoration, waste management, damage prevention, compensation and community-based conservation [4].

Diverse terrestrial and aquatic species, from invertebrates to megafaunal mammals, fish (e.g. sharks) and reptiles such as crocodiles, are involved in HWC worldwide (2,12). Among the groups of animals most often mentioned in respect to HWC are large carnivores, including bears [13]. In this article we examine the case of the sloth bear (*Melursus ursinus*) and its interactions with rural communities in India. Specifically, we focus on efforts

made by the Wildlife and Conservation Biology Research Foundation (WCBRF)<sup>1</sup> in collaboration with Gujarat Forest Department and other organisations to improve human–bear coexistence in the western state of Gujarat through social science, education and outreach.

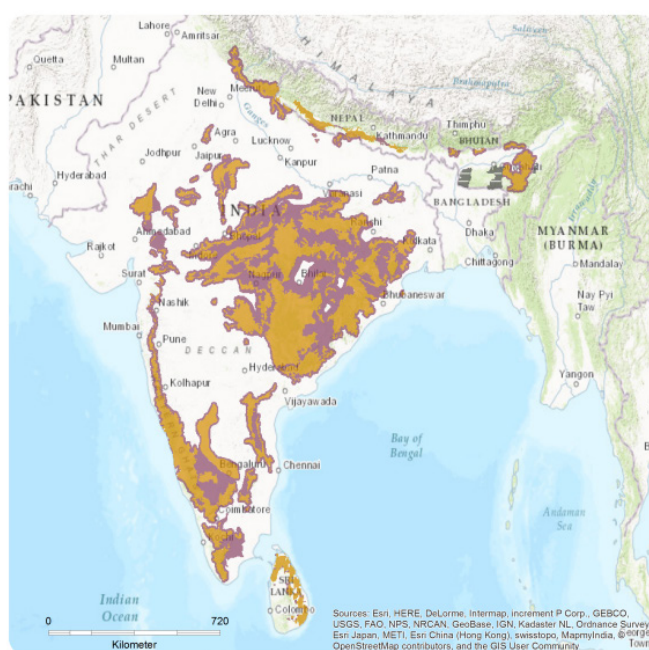
**Box 1. Defining and understanding human–wildlife conflict**

In a recent briefing document on the topic, the IUCN SSC Human–Wildlife Conflict & Coexistence Specialist Group defined human–wildlife conflict as, “struggles that emerge when the presence or behaviour of wildlife poses an actual or perceived, direct and recurring threat to human interests or needs, leading to disagreements between groups of people and negative impacts on people and/or wildlife”<sup>2</sup>.

However, the term is often applied only to human–wildlife impacts: negative interactions between people and wildlife in which wildlife poses a direct threat to the safety, livelihoods and wellbeing of people (e.g. damage arising from crop raiding or livestock depredation) and retaliatory actions by people against the species blamed. This narrower focus disregards antagonism between diverse groups (e.g. hunters and/or farmers versus environmental activists) about what should be done to resolve the situation. Such disputes are sometimes referred to as human–human conflicts or conservation conflicts: “situations that occur when two or more parties with strongly held opinions clash over conservation objectives and when one party is perceived to assert its interests at the expense of another” [10].



Fig. 1. A subadult sloth bear showing markings and colouration typical of the species (Photo: WCBRF).



Range

- Extant (resident)
- Possibly Extant & Origin Uncertain (resident)
- Possibly Extant (resident)
- Presence Uncertain

Compiled by:  
Wildlife & Conservation Biology Lab, HNG University

Scale: 0 to 720 Kilometer

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), Swisstopo, MapmyIndia, ©2016 OpenStreetMap contributors, and the GIS User Community

World map showing the location of the study area in the Indian subcontinent.

**Sloth bear status and conflicts**

Sloth bears have a distinctively long black coat, with a white or cream/yellow crescent on the chest and pale muzzle (Fig. 1). They feed mostly on termites and other insects as well as fruit [14]. The species is restricted to the Indian subcontinent (Fig. 2) where it inhabits various habitats including grasslands, tropical forests and savannahs up to elevations of around 1,500 metres [15,16]. It

© The IUCN Red List of Threatened Species: *Melursus ursinus* – published in 2016. <http://dx.doi.org/10.2305/IUCN.UK.2016-3.RLTS.T13143A45033815.en>

Fig. 2: Sloth bear (*Melursus ursinus*) distribution in the Indian subcontinent showing the location of the study area (Source: IUCN Red List).

is listed as vulnerable by the IUCN, its distribution being highly fragmented and its numbers declining [15]. Although there are no reliable large-scale population estimates, there are thought to be 7,500 – 8,000 sloth bears in

<sup>1</sup> <https://wcbresearch.in/>

<sup>2</sup> <https://www.iucn.org/resources/issues-brief/human-wildlife-conflict>

India, approximately 800–1,000 in Sri Lanka and a few hundred in Nepal. There have been no records of occurrence in Bhutan since 2009 and the species has been extirpated from Bangladesh [15,17].

In India, the sloth bear is the most common ursid but its distribution is patchy, especially in the northwest. The western edge of its range is in the state of Gujarat, where it is the only bear present and its numbers have been increasing, with an estimated 358 individuals in 2022 (Gujarat Forest Department unpublished data). Due to its propensity to attack people, causing serious and sometimes fatal injuries, the sloth bear is regarded as one of the most dangerous and unappreciated species in the country [18]. As in other states, sloth bear attacks in Gujarat are on the rise [19,20]. Conflicts typically arise when sloth bears enter human settlements or agricultural fields in search of food and water [9]. Bear foraging behaviour can lead to damage to crops and property, causing economic losses for the local communities. In response, people resort to retaliatory actions to protect their livelihoods or out of fear for their safety, with implications for conservation of the species.

## Study area

Central Gujarat, at the western edge of the sloth bear range, is one of the most important corridors for the species [21]. Out of eight administrative districts, sloth bears have been recorded in three: Panchmahal, Dahod and Chhota Udepur (Fig. 3).

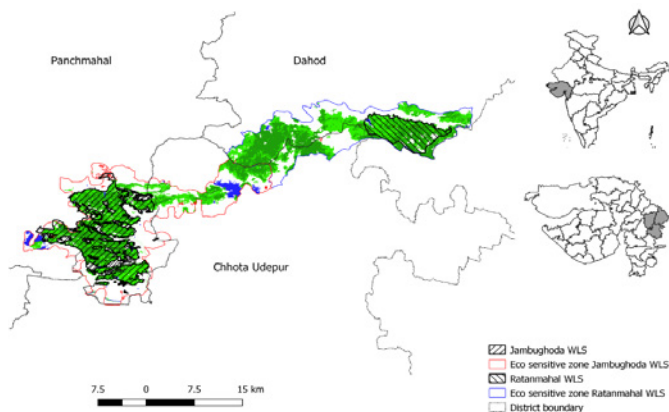


Fig. 3. Location of the study area in the corridor between Jambughoda and Ratanmahal wildlife sanctuaries.

<sup>5</sup> Eco-Sensitive Zones are buffers around protected areas intended to reduce developmental pressures by transitioning from higher to lower levels of protection.

The present study was conducted in Chhota Udepur which covers an area of 3,436 km<sup>2</sup> and includes 757 km<sup>2</sup> of forest that is potential sloth bear habitat (Fig. 4) [21]. This area has been designated as an Eco-Sensitive Zone (ESZ)<sup>5</sup> and is considered to be a crucial wildlife corridor linking Jambughoda and Ratanmahal wildlife sanctuaries. The landscape, forest type and availability of fruiting species such as East Indian ebony (*Diospyros melanoxylon*), Mahua (*Madhuca indica*) and Indian jujube (*Ziziphus mauritiana*) provide food and shelter to sloth bears [22,23].



Fig. 4. Sloth bear habitat around Ambakhut village, Chhota Udepur, Gujarat (Photo: Pratikkumar Desai).

Chhota Udepur is also home to several indigenous tribes, including the Rathwa, Bhil, Koli, Baria and Nayaka, who engage in activities such as agriculture, pastoralism and handicrafts. Their livelihoods depend on the forest to provide them with essential resources like food, fodder, fuel wood and medicinal plants which are integral to their traditional way of life [24]. The corridor between Jambughoda and Ratanmahal encompasses around 40 villages.

## Social science research

To better understand how local people perceive sloth bears and to gather data on the level and nature of conflicts, we conducted a total of 663 interviews with villagers (from 10 to 80 years of age, 75% males). Additionally, out of 214 identified victims of sloth bear attacks, 120 (56%) from 31 villages were interviewed using a semi-structured questionnaire. Here, we summarise key findings, some of which have been published previously in different formats [17,25,26].

A large majority of interviewees (87%) stated that sloth bears were present in their surroundings, mostly being seen or detected in the forest or on farmland. Misinformation was found to be prevalent: many villagers believed sloth bears to be lazy, slow-moving meat-eaters with poor vision. Slightly over half (55%) those interviewed agreed that sloth bears are a threat to humans, with 22% unsure about this. Less than a third (29%) thought they should be protected, 22% were against protection and half were unsure.

Most (76%) interviewed victims of sloth bear attacks were male. The attacks took place in the forest (59%), on farms (31%) or in villages (10%). Attacks were typically reported to occur in the morning or evening, reflecting sloth bear activity patterns, with victims attacked when they entered the forest to collect fruit or defecate. Among those interviewed, 40–69-year-olds prevailed and farming was the most common occupation. However, migrant workers (few of whom could be interviewed) in the age range 20–39 were also vulnerable to attack. Encounters were frequent in summer, when locals visit forests to collect Mahua fruit and sloth bears seek water and food near villages.

## Outreach and education

The presence of many villages directly within an important wildlife corridor means it is very important to raise awareness of the inhabitants about sloth bear presence and to educate them on how to coexist. Moreover, our survey showed a clear need to replace misinformation with accurate, science-based information. Based on these findings, the WCBRF initiated a community outreach and safety education programme in Chhota Udepur for the benefit of both people and bears (Fig. 5).

The WCBRF, in collaboration with Gujarat Forest Department and the Wildlife and Conservation Biology Research Lab at Hemchandracharya North Gujarat University, developed the concept of *Atamavat Sarvabhuteshu*. This is a Sanskrit phrase meaning that one should feel the happiness and distress of others as one's own. In the context of promoting human–bear coexistence, the intention is to link feelings among tribal people living in and around sloth bear habitat with education through authentic information about bears [27]. The main idea of the programme was to engage with local people in a two-way



Fig. 5. Schematic representation of the multi-disciplinary effort by the Wildlife and Conservation Biology Research Foundation to foster human-sloth bear coexistence in Gujarat.

conversation, sharing information with them while also learning about their traditional knowledge (Fig. 6). The primary goal is culturally sensitive education for all ages, fostering coexistence.

The programme built on interviews with local residents and forest field staff to understand sloth bear perspectives. It established a cross-sector collaborative framework involving the university, local community and forest department for conservation. Restrictions imposed due to the COVID-19 pandemic precluded initial outreach meetings. Instead, a virtual awareness campaign was implemented and proved highly successful as younger people prefer digital communication and, during lockdowns, older people were also able to participate in online meetings and activities [28]. When restrictions were lifted, visits to schools were conducted as well as street education, training for forest staff and building relations with locals.

To help spread information effectively, awareness and education materials were prepared in Gujarati and En-



Fig. 6. WCB Team interacting with local people (Photo: Pratikkumar Desai).



glish and given to villagers. An information booklet for local people was prepared on *Living in the sloth bear landscape*<sup>4</sup>. For children, there is an activity booklet and a comic-style leaflet (Fig. 7). The latter was based on entries to a writing competition aimed at engaging local people by inviting them to describe their personal experiences or to write a fictional story with a meaningful message. The aim was to create a two-way exchange of knowledge about the sloth bear and to publicise it in a creative form. A broad range of contributions were received in various languages and the best three were included in the community education programme. The first-placed entry was made into an animated film on sloth bear conservation<sup>5</sup>.

We invited people across the world to send us short clips of themselves talking about bears. We compiled many of these into a video, *Speak for the bears*<sup>6</sup>, which was launched, together with the animated film, during a virtual meeting with students and stakeholders to celebrate International Happy Bear Day on 10<sup>th</sup> May 2021. By spring 2022 the animated film had 1,841 views and *Speak for the bears* had 572 views, which is encouraging in terms of our project goal of promoting human–bear coexistence. Several other virtual programmes were organised such as radio talks, webinars and live feeds on Facebook.

Online events have been very useful in spreading and collecting knowledge while doing conservation outreach. In addition, a sloth bear conservation outreach centre was set up at Ratanmahal wildlife sanctuary, which was a pioneering move in India [27]. This centre provides educational resources about the ecology and behaviour of sloth bears, suitable for both locals and visitors (Fig. 8). A documentary titled *Sloth bear: the bear of the Indian subcontinent*, with a message from legendary Bollywood star Amitabh Bachchan, has been shown at the centre as well as in schools and at various gatherings. Its reach has been further expanded by making it available on YouTube in Hindi, Gujarati and English<sup>7</sup>.

The WCBRF team visited schools to engage with students, provide basic information about the sloth bear and other wildlife in the area such as the leopard (*Panthera pardus*), show the animated film and distribute child-friendly educational activity booklets to foster appreciation of sloth bears (Fig. 9). During the first year of the programme (2021 – 2022), 18 schools in 13 of the 40 villages in the area were included in the outreach education programme. A total of 367 children (up to 10 years old) and 26 teachers from primary schools plus 400 students (aged 11 – 17) and 31 teachers from secondary



Fig. 7. Awareness-raising and education materials for school children.

<sup>4</sup> [https://www.researchgate.net/publication/359237626\\_Living\\_in\\_Sloth\\_bear\\_landscape\\_An\\_information\\_booklet\\_for\\_locals](https://www.researchgate.net/publication/359237626_Living_in_Sloth_bear_landscape_An_information_booklet_for_locals)

<sup>5</sup> <https://www.youtube.com/watch?v=q9WRWkcoH5I>

<sup>6</sup> [https://youtu.be/X81XO2K\\_y9Y?si=Mf4v1RNWU84GzyL](https://youtu.be/X81XO2K_y9Y?si=Mf4v1RNWU84GzyL)

<sup>7</sup> <https://youtu.be/y5EqLlza0TQ>



Fig. 8. Sloth bear conservation outreach centre at Ratanmahal wildlife sanctuary (Photos: Pratikkumar Desai).

schools were involved. Most (60%) of the primary school pupils indicated (when completing the activity book) that they had seen sloth bears in their locality; of these, 76% said they liked them while 19% disliked them. A small minority (4%) of them reported that a family member had been attacked by a bear [17].

Besides materials for children and the general public, a pocket guide on *Working in the sloth bear landscape* was

also produced specifically for forest field staff (Fig. 10) and a manual is in development for those trained to monitor sloth bear populations. Moreover, a simple set of instructions and safety measures was developed for people



Fig. 9. Visits to schools for conservation education and distribution of sloth bear fun learning activity booklets help to foster greater appreciation for the sloth bear (Photos: WCBRF).

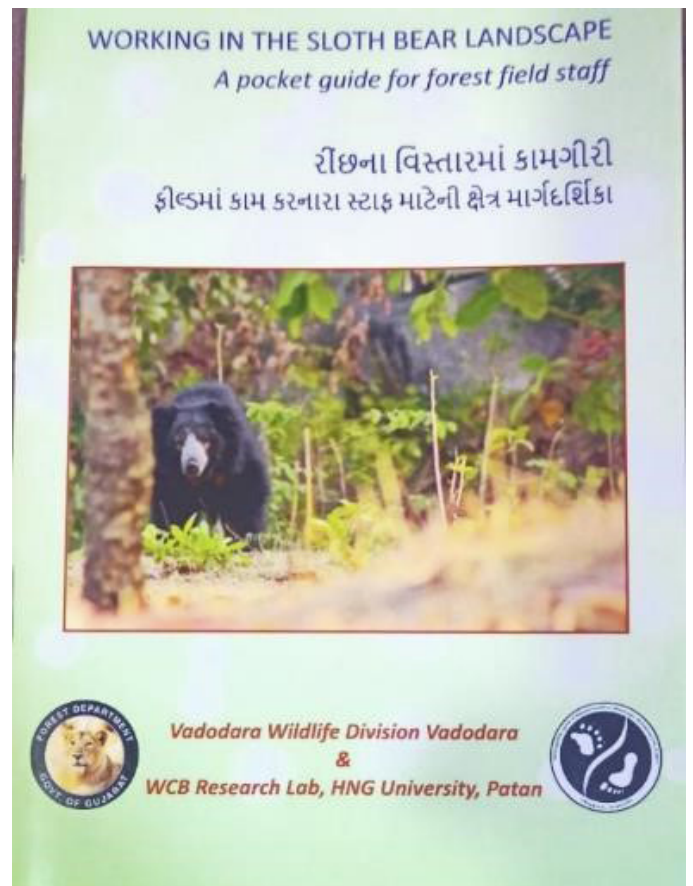


Fig. 10. A field guide for forest staff in sloth bear areas.

living, working or recreating in areas with sloth bears (Fig. 11).



Fig. 11. Instructions and safety measures for people in sloth bear range.

## Conclusions, discussion and future direction

Local people in the Chhota Udepur district of Gujarat, India, were engaged in the process of conflict resolution through the development of community-based initiatives in order to foster a sense of ownership and responsibility. A programme of education and awareness enlightened residents about the ecological importance of sloth bears and the significance of their conservation. Participants were also taught how to respond appropriately and safely when encountering a sloth bear, reducing the likelihood of confrontations leading to attacks. The effectiveness of the community outreach programme should be evaluated in terms of the extent to which there is a measurable

change in local people's attitudes toward sloth bears and other predators and a decline in the number of attacks. These findings should guide further improvements to the programme, which can be replicated in other conflict-prone areas.

Coexistence of humans and sloth bears is a multi-faceted challenge that demands innovative and adaptable strategies. Conflict mitigation strategies can vary significantly depending on their nature, the location and context [29]. While passive, non-intrusive prevention measures are generally preferred, there are often situations where active intervention becomes necessary [30,31]. Regardless of the specific approaches chosen, the most effective solutions typically involve engaging local communities in their planning, execution and ongoing maintenance.

It is often essential to adopt a regional approach [8], customising the response to the specific situation at hand. Technology can play a pivotal role in the early detection and prevention of conflicts. For example, the development of Smartphone applications that allow communities to report sloth bear sightings or incidents quickly can facilitate a rapid response from wildlife authorities (*Editor's note: see the article in this issue on establishing a bear smart community in Romania*).

In conclusion, to address human-wildlife impacts and conflicts successfully warrants a multi-pronged strategy, incorporating both ecological and socio-economic dimensions. By involving local communities in the decision-making process, their traditional knowledge and perspectives can be integrated, leading to more culturally sensitive and locally acceptable solutions and refining mitigation strategies to ensure long-term success in minimising conflicts and promoting more harmonious coexistence [18,32].

## Acknowledgements

We thank Gujarat Forest Department and the Wildlife and Conservation Biology Research Foundation for providing necessary information and logistic support. We are grateful to Bears in Mind and The Serenity Trust for financial support. Our thanks also go to the Department of Life Sciences at HNG University for providing infrastructure and laboratory facilities.

## References

- [1] Distefano E (2005) Human-wildlife conflict worldwide: collection of case studies, analysis of management strategies and good practices. Food and Agricultural Organization of the United Nations (FAO), Sustainable Agriculture and Rural Development Initiative (SARDI), Rome, Italy. <https://www.fao.org/3/au241e/au241e.pdf>.
- [2] IUCN (2023). IUCN SSC guidelines on human-wildlife conflict and coexistence: first edition. IUCN, Gland, Switzerland. <https://doi.org/10.2305/YGIK2927>.
- [3] Seoraj-Pillai N & Pillay N (2017) A meta-analysis of human-wildlife conflict: South African and global perspectives. *Sustainability* 9(1): 1 – 21.
- [4] Nyhus PJ (2016) Human-wildlife conflict and coexistence. *Annual Review of Environment and Resources* 41: 143 – 171.
- [5] Tahoor A et al. (2021) Human wildlife conflict: nature and extent in Katerniaghat wildlife sanctuary, India. *International Journal of Ecology and Environmental Sciences* 3: 321 – 327.
- [6] Somu Y & Selvaraj P (2022) Human-wild animal conflict. In: Hung S-W et al., eds. *Animal welfare – new insights*. IntechOpen. <http://dx.doi.org/10.5772/intechopen.107891>.
- [7] Torres SG et al. (1996) Mountain lion and human activity in California: testing speculations. *Wildlife Society Bulletin* 24: 451 – 460.
- [8] Inskip C & Zimmermann A (2009) Human-felid conflict: a review of patterns and priorities worldwide. *Oryx* 43(1): 18 – 34.
- [9] Dharaiya N (2012) Evaluation & assessment of man-animal conflicts: with special reference to human injury & crop damage by wildlife in North Gujarat. Final Report. Gujarat Forest Research Institute, Gandhinagar. <https://doi.org/10.13140/RG.2.2.34629.70889>.
- [10] Redpath SM et al. (2013) Understanding and managing conservation conflicts. *Trends in Ecology & Evolution* 28(2): 100 – 109. <https://doi.org/10.1016/j.tree.2012.08.021>.
- [11] Conover MR (2001) *Resolving human-wildlife conflicts: The science of wildlife damage management*. Lewis Publishers - CRC Press LLC, Boca Raton.
- [12] Pamu S (2020) Documenting and analysing the human-wildlife conflict and its mitigation (species and region wise) of India on the basis of secondary data available. Summer Internship Report. Indian Institute of Forest Management, Bhopal.
- [13] Treves A & Karanth KU (2003) Human-carnivore conflict and perspectives on carnivore management worldwide. *Conservation Biology* 17(6): 1491 – 1499.
- [14] Garshelis DL et al. (1999). Sloth bear conservation action plan. In: Servheen S et al., eds. *Bears: status survey and conservation action plan*. IUCN, Gland, Switzerland, pp. 225 – 240.
- [15] Dharaiya N et al. (2020) *Melursus ursinus* (amended version of 2016 assessment). The IUCN Red List of Threatened Species. <https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T13143A166519315.en>.
- [16] Bargali H et al. (2020) Sloth bear (*Melursus ursinus*). In: Penteriani V & Melletti M, eds. *Bears of the world: Ecology, conservation and management*. Cambridge University Press, Cambridge, pp. 99 – 109. <https://doi.org/10.1017/9781108692571.010>.
- [17] Mesaria S et al. (2022) Conserving sloth bears in Central Gujarat through community outreach and education: a long-term solution to mitigate human-bear conflicts. Annual Report (2021 – 22). Wildlife & Conservation Biology Research Foundation, Patan, Gujarat. <https://doi.org/10.13140/RG.2.2.29979.54560>.
- [18] Rajpurohit KS & Krausman PR (2000) Human-sloth-bear conflicts in Madhya Pradesh, India. *Wildlife Society Bulletin* 28: 393 – 399.
- [19] Garcia KC et al. (2016). Assessment of human-sloth bear conflicts in North Gujarat, India. *Ursus* 27(1): 5 – 10.
- [20] Sharp TR et al. (2022) Sloth bear attacks: regional differences and safety messaging. *Scientific Reports* 12: 3943. <https://doi.org/10.1038/s41598-022-07974-y>.
- [21] Dharaiva N & Singh CP (2018). Habitat suitability and corridor analysis for sloth bear in Gujarat using remote sensing and ecological modeling. Final Technical Report. Space Application Centre, Indian Space Research Organization (ISRO).
- [22] Dhamorikar AH et al. (2017) Characteristics of human - sloth bear (*Melursus ursinus*) encounters and the resulting human casualties in the Kanha-Pench corridor, Madhya Pradesh, India. *PLoS ONE* 12(4): e0176612. <https://doi.org/10.1371/journal.pone.0176612>.
- [23] Mesaria S et al. (2023) Conserving sloth bears in Central Gujarat through community outreach. Wildlife & Conservation Biology Research Foundation, Patan, Gujarat.
- [24] Singh HS (2001) Natural heritage of Gujarat. Gujarat Ecological Education and Research Foundation, Gandhinagar.
- [25] Patel V et al. (2022) Attitude of local community toward sloth bear (*Melursus ursinus*): a case study from Central Gujarat, India. Book of Abstracts, National Conference on Climate Community and Conservation, 26 – 27<sup>th</sup> September, Navrachana University, Vadodara. <https://doi.org/10.13140/RG.2.2.31337.16480>.
- [26] Mesaria S et al. (2023) Food from the neighbors: sloth bear savoring the debris left by tourists and locals in eco-sensitive zone of Chhota Udepur district, Gujarat, India. *Proc. Zool. Soc.* 76: 202 – 204. <https://doi.org/10.1007/s12595-023-00484-3>.
- [27] Mesaria S et al. (2021) Promoting coexistence between people and sloth bears in Gujarat, India, through a community outreach programme Aatmavat Sarvabhuteshu. *International Bear News* 30(1): 25 – 27.
- [28] Mesaria S et al. (2022) Conservation undeterred: a virtual sloth bear conservation awareness program during the COVID-19 pandemic. *International Bear News* 31(1): 15 – 16.
- [29] Ahmad Z et al. (2021) Human wildlife conflict consequences, causes and future perspectives on mitigation, District Kupwara J&K, India. *International Journal of Scientific Research & Growth* 9(April): 1887 – 1892.
- [30] Gockeritz S et al. (2009) Descriptive normative beliefs and conservation behavior: the moderating roles of personal involvement and injunctive normative beliefs. *Eur. J. Soc. Psychol.* 40(3): 514 – 523. <https://doi.org/10.1002/ejsp.643>.
- [31] Morehouse AT et al. (2020) Carnivores and communities: a case study of human-carnivore conflict mitigation in southwestern Alberta. *Front. Ecol. Evol.* 8. <https://doi.org/10.3389/fevo.2020.00002>.
- [32] Manral U et al. (2016) Human wildlife conflict in India: a review of economic implication of loss and preventive measures. *Indian Forester* 142: 928 – 940.

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](mailto: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

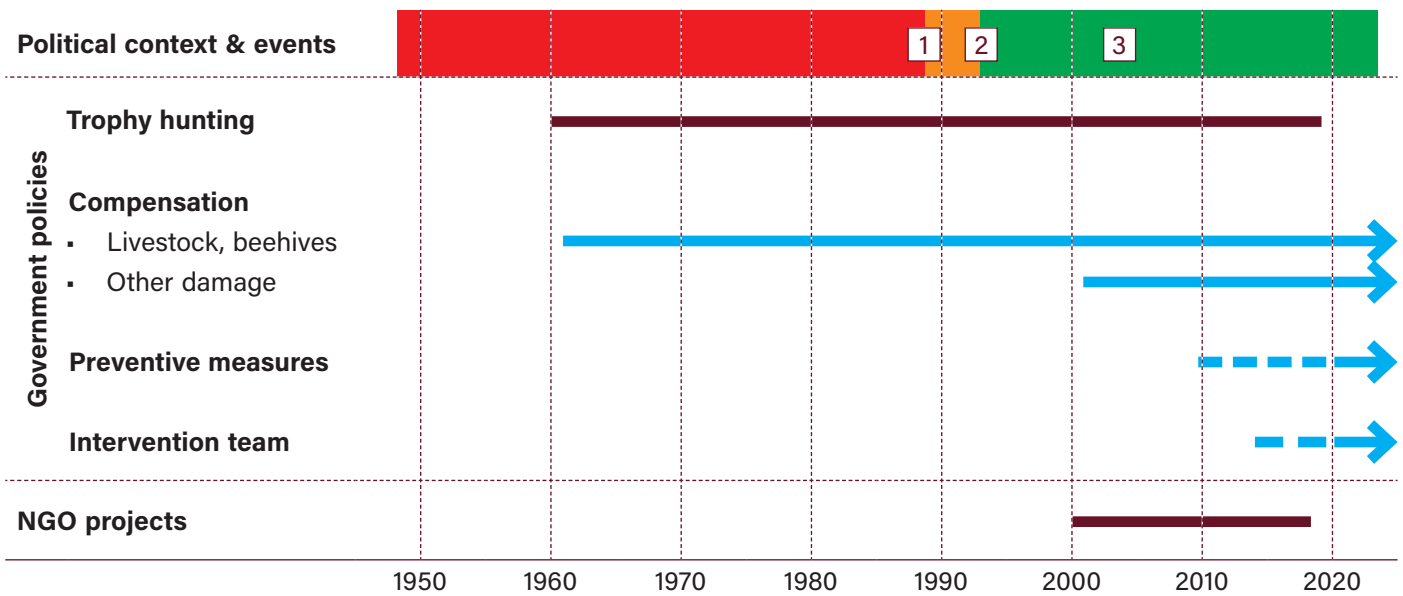


Fig. 1. Timeline of changes in bear management policies in Slovakia in relation to the political context and the NGO projects described in this article. Shading: red = Czechoslovak Socialist Republic; orange = Czech and Slovak Federative Republic; green = independent Slovak Republic. Numbers: 1 = 'Velvet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

areas with bears. At the beginning of the 21<sup>st</sup> 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)<sup>1</sup> 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<sup>2</sup>, 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<sup>3</sup> in a kind of human pyramid<sup>4</sup> 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

<sup>1</sup> 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.

<sup>2</sup> 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.

<sup>3</sup> [https://link.springer.com/chapter/10.1007/978-1-4471-0051-5\\_5](https://link.springer.com/chapter/10.1007/978-1-4471-0051-5_5)

<sup>4</sup> <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<sup>5</sup>.

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<sup>6</sup> 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<sup>7</sup> 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-

<sup>5</sup> For example: <https://www.truni.sk/news/medvede-prieskum-vysledky>

<sup>6</sup> [www.medvede.sk](http://www.medvede.sk)

<sup>7</sup> <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*<sup>8</sup> 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<sup>9</sup> 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 be-

tween 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<sup>10</sup> and several operators now offer bear watching trips<sup>11</sup> (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 20<sup>th</sup> 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-

<sup>8</sup> <https://www.medvede.sk/index1.php?action=film>

<sup>9</sup> <https://www.medvede.sk/index1.php?action=vystava>

<sup>10</sup> See: <https://prirodnaturizmus.sk/en/>

<sup>11</sup> 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<sup>12</sup> as well as controversies about possible negative effects of telemetry collars on bears<sup>13</sup> and doubts about the reliability of a recent genetics-based estimation of population size<sup>14</sup>.

<sup>12</sup> <https://domov.sme.sk/c/5819164/medvede-sledujeme-za-milion.html>

<sup>13</sup> <https://www1.pluska.sk/regiony/stredne-slovensko/pri-murani-tula-medvedica-tesnym-objekom-rocnym-mladatkom>

<sup>14</sup> <https://tvnoviny.sk/domace/clanok/849275-polovnici-spochybnilo-pocet-medvedov-zverejnili-vlastne-cisla>

## 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 14<sup>th</sup> to 17<sup>th</sup> centuries. However, agricultural manuals in Czechoslovakia’s post-war socialist period in-

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<sup>15</sup> 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).

<sup>15</sup> <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<sup>16</sup>. 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<sup>17</sup> 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<sup>18</sup>. 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<sup>19</sup> 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

<sup>16</sup> The Habitats Directive was incorporated into national legislation ahead of Slovakia joining the EU in 2004.

<sup>17</sup> <http://ferrumline.sk/>

<sup>18</sup> <http://www.medvede.sk/index1.php?action=kontajnery>

<sup>19</sup> <http://www.medvede.sk/index1.php?action=oplodenie>



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<sup>20</sup> 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<sup>21</sup>. During the last four years, a more systematic approach by authorities, aided by the recruitment of staff with experience gained through SWS proj-

ects, and sanctioning by the Slovak Environmental Inspectorate in cases of non-compliance, has seen instances of problem bears in the High Tatras fall substantially<sup>22</sup>. 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<sup>23</sup>, Slovak manufacturers<sup>24</sup>, a local refuse management company<sup>25</sup> 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<sup>26</sup> 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-

<sup>20</sup> <https://www.slov-lex.sk/pravne-predpisy/SK/ZZ/2015/79/>

<sup>21</sup> <https://spis.korzar.sme.sk/c/20603575/majko-stanicky-na-odpad-neplnia-svoj-ucel-byvaju-otvorene.html?ref=av-center>

<sup>22</sup> <https://sita.sk/nasvidiek/pod-tatrami-pribudne-vyse-sto-vylepsenych-kontajnerovych-stojisk-ci-nadob-na-odpad-zabezpecenych-proti-medvedom/>

<sup>23</sup> <https://haulall.com>

<sup>24</sup> [https://www.meva.sk/Medved-a-kontajnery-c45\\_0\\_1.htm](https://www.meva.sk/Medved-a-kontajnery-c45_0_1.htm)

<sup>25</sup> <http://www.vpstaty.sk>

<sup>26</sup> <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<sup>27</sup>.

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<sup>28</sup>. 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'<sup>29</sup>.

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

<sup>27</sup> <https://www.blesk.cz/clanek/zpravy-udalosti/145879/slovensti-geniove-zastrelili-tehotnou-medvedici.html>

<sup>28</sup> <https://spravy.pravda.sk/domace/clanok/433073-kaucha-odstrely-medvedice-ak-sa-vrati-zastrelte-ju>

<sup>29</sup> <https://www.noviny.sk/slovensko/160277-mimoriadna-situacia-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<sup>30</sup> and calls for a return to culling, for which the current government, elected in 2023, has shown support<sup>31</sup>.

### 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<sup>32</sup>. Nevertheless, attacks on humans have increased in frequency and featured prominently in political campaigns ahead of 2023 parliamentary elections<sup>33</sup>. 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.

<sup>30</sup> <https://www.aktuality.sk/clanok/KI5NifE/ludia-na-podpolani-zvolali-protest-pre-problem-s-medvedmi-v-intravilanoch>

<sup>31</sup> <https://data.consilium.europa.eu/doc/document/ST-5478-2024-INIT/en/pdf>

<sup>32</sup> <https://www.gearcheckers.com/sk/outdoor/test-sprej-na-medvede-najleps>

<sup>33</sup> <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<sup>34</sup>, 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).

<sup>34</sup> <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<sup>35</sup> 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, 14<sup>th</sup> International Conference on Bear Research and Management, Nord-Trøndelag 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, 19<sup>th</sup> 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) Medved' 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

<sup>35</sup> <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, 22<sup>nd</sup> 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, 24<sup>th</sup> 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, 24<sup>th</sup> 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, 4<sup>th</sup> 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, 2<sup>nd</sup> 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 Skrbínšek 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.



Focus

# Improving protection of beehives from bears in the Cantabrian Mountains, Spain

**Adriana Riesgo Robles**

Fund for the Protection of Wild Animals, Santo Adriano, Spain

Contact: [fapas@fapas.es](mailto:fapas@fapas.es)



## Background: bears in Spain

The conflict between humans and brown bears (*Ursus arctos*) is an old and complex one, fuelled by damage to livestock, beehives and crops as well as fear [1]. As a result, bears were hunted to extinction in many European countries, but are now slowly recovering some of their former range [2]. In Spain, bears historically occurred throughout the country, as mentioned in the 14<sup>th</sup> century *Libro de la Montería* of King Alfonso XI [3]. Mainly due to human persecution, rather than habitat destruction, their numbers declined to a low of around 40 animals in the mid-20<sup>th</sup> century [4].

The species is currently listed as endangered in the Spanish Red Data Book (*Catálogo Español de Especies Amenazadas*) and is fully protected [5]. Thanks to legal protection, public awareness and the fact that the bear is no longer seen as vermin but instead as a driver of tourism, its numbers have shown a steady increase, reaching 230 individuals in the second decade of the 21<sup>st</sup> century, although this does not mean that it is no longer endangered [6].

Bears are confined to the mountains of northern Spain

and occur in two separate populations: the Cantabrian and the Pyrenean (Fig.1). The Cantabrian population is the most numerous and is distributed across the regions of Asturias, Castilla y León, Cantabria and Galicia (Fig. 2). It is divided into two subpopulations, the western and the eastern, with a combined area of permanent presence of about 8,600 km<sup>2</sup>, which in recent decades has steadily expanded [7]. Nevertheless, the two subpopulations remain largely isolated, with only sporadic exchange of males and no increase in the breeding area that might lead to joining of the western and eastern subpopulations.

## Bears, bees and people

Bee larvae and honey have always been exploited by bears as a food resource. There is evidence of this and of beekeeping in prehistoric times from India to western Europe, for example in Mesolithic rock paintings in Spain [8]. For people in western Asturias, honey represented a source of food and an important economic commodity. To protect their hives, people built stone walls around them, two metres or more in height and topped with protruding slate slabs (*llábana*) to prevent bears from climbing in.

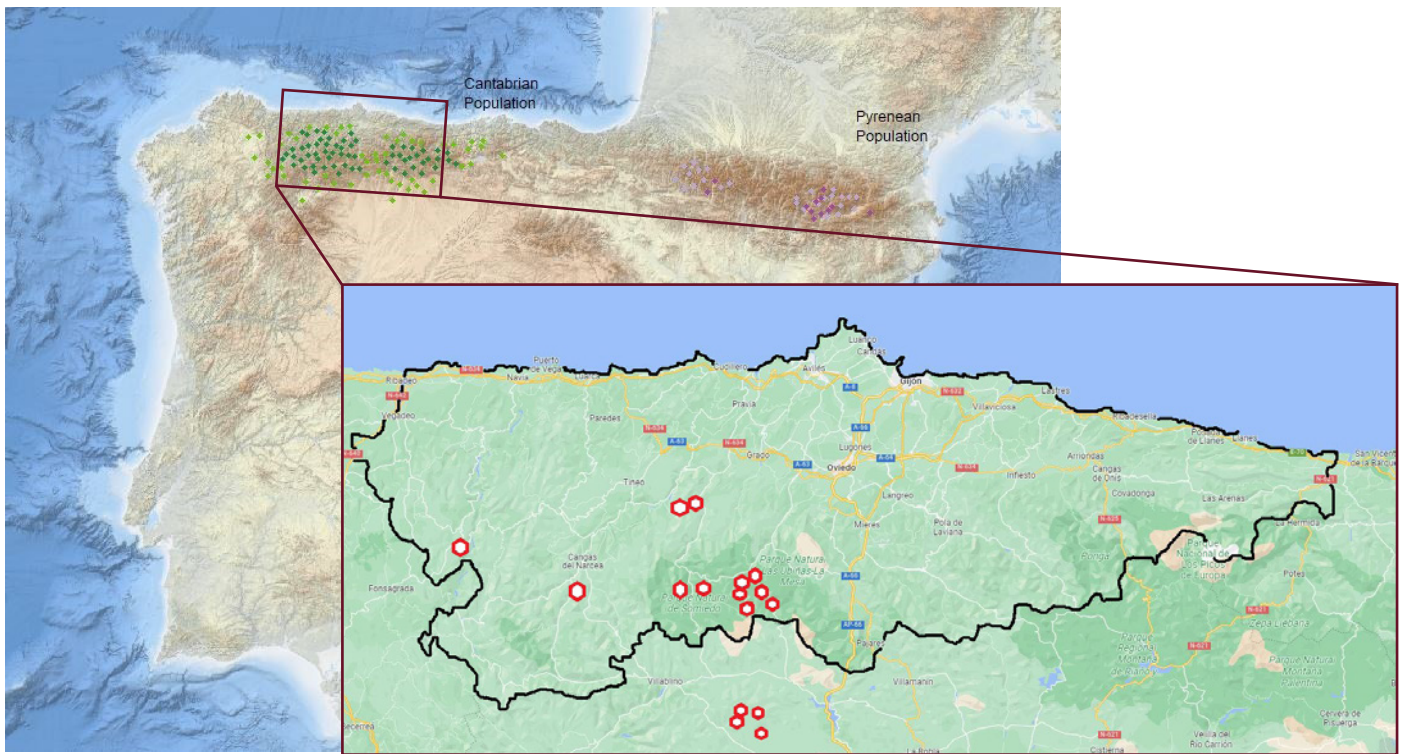


Fig. 1. Distribution of bears in the Pyrenees (purple dots) and Cantabrian Mountains (green dots). Darker colours indicate permanent presence, lighter colours sporadic presence (Source: FAPAS/FIEP [6]). The red and white polygons in the enlarged view show the locations of beehives protected with electrified enclosures as described in this article.

The access door was made of strong wood and just big enough for the beekeeper to get through. Another type of defensive structure resembled a tower, with access via a ladder that was removed when the beekeeper was not present. Depending on the area, the structures were known as *cortines*, *alvarizas*, *alvares* or *talameiros* (Fig. 3). They were abandoned when beekeeping declined and villages became depopulated. Many of them are now in a semi-derelict state but some are in good condition and a few can even be seen still in use.

As bears return to areas where they have been absent for decades and their numbers increase, there is a renewed need for effective means of protecting apiaries to avoid conflicts and the risk of people turning to other solutions such as poaching. In recent years, the highest rates of apiary damage per bear in Europe have occurred in the Cantabrian population [9,10]. Of €1.9 million paid in compensation related to bears in this region in 2009–2018, 60% was for damage to beehives, 23% for orchards and 13% for livestock [11]. Compensation for bear damage to apiaries is paid by regional administrations and linked to the use of prevention measures.

Restoring the use of traditional stone enclosures could be part of the solution. However, most of them are dam-

aged or located in places that are difficult to access and they would probably have to be adapted to the current needs of beekeeping. An alternative, and nowadays one of the most common measures used to protect beehives from bears in Europe and beyond, is electric fencing. However, there are various ways to build an electric fence and not all of them are effective at deterring bears. For example, simple fencing of the type used to contain or exclude livestock, with 1–3 wires spaced relatively far apart and high above the ground, is insufficient to deter foraging bears. On the other hand, some designs are too complex and expensive to be effective.



Fig. 2. Brown bears in the Cantabrian Mountains, Spain (Photo: FAPAS).



Fig. 3. Examples of stone structures built to protect apiaries from bears in the Cantabrian Mountains (Photos: FAPAS).

Here I describe a low-cost fence design developed by the Fund for the Protection of Wild Animals (FAPAS) and present some preliminary results of testing its efficacy in preventing bear damage to beehives. For more than 30 years, FAPAS has focused its efforts on the study and conservation of the Cantabrian bear population, to promote its expansion and facilitate coexistence with human activities. Our hope is that this simple, cost-effective approach will be readily accepted and implemented by beekeepers throughout the bear range.

## Design and installation

The FAPAS fence design consists of two main elements: a wire mesh barrier, approximately 1.70 m tall, and several electrified wires (Fig. 4). The purpose of the mesh, which is of a type commonly used to confine sheep or chickens, is to deter/prevent bears from passing through the fence. It ensures that, when a bear touches an electrified wire and receives a shock, it will move backwards instead of forwards.

The first phase of installation is to enclose the perimeter of the apiary with wire mesh. In addition to the vertical barrier, a 25-cm wide mesh skirt is laid horizontally on the ground around the outside of the fence and held in place with rocks. This is to prevent bears digging under the fence and to increase the grounding of electric wires when a bear steps on the mesh (Fig. 5).

Next, on the outer side of the mesh, a minimum of five electric wires are attached to posts. If the mesh is part of an existing fence, a second set of posts can be installed for the electric wires. Otherwise, when a new fence is built from scratch, a single row of posts is sufficient to support both the mesh on the inside and the electric wires on the outside (Figs. 4 and 5). The bottom wire is placed 25 cm from the ground and subsequent wires are fixed at intervals of 25 cm, 30 cm, 30 cm and 40 cm, ensuring they are all under tension. An entrance gate is made between two posts with insulating handles to allow easy opening. A solar-powered energiser is connected to the wires (Fig. 5)

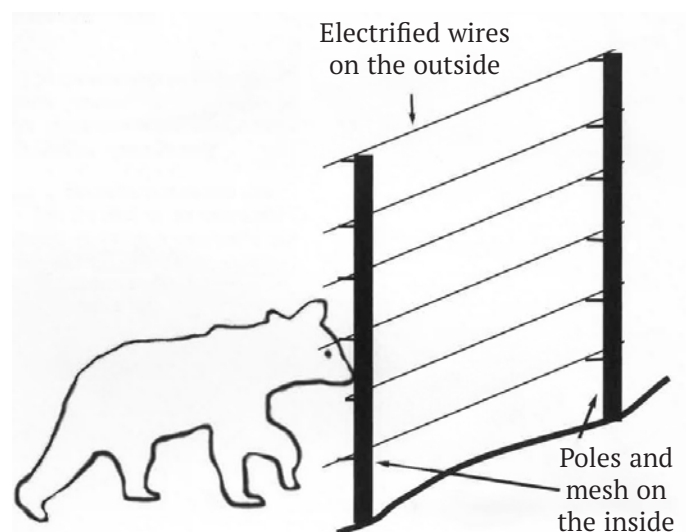


Fig. 4. Simplified schematic diagram of a 6-wire electrified enclosure for protecting apiaries from bears (Source: FAPAS).



Fig. 5. Electrified enclosures for protecting apiaries from bears showing outer mesh skirt held in place with rocks (Photos: FAPAS).

to generate pulses of 3,000–9,000 volts, which is sufficient to deter an animal that always has at least one paw on the ground to close the circuit.

## Efficacy

Between 2013 and 2023, fences were installed at ten FAPAS apiaries in the core area of the Cantabrian bear population in Asturias (Fig. 2) and at six apiaries that had been repeatedly visited by bears in the Omaña region of León, where FAPAS technicians have documented considerable growth of the bear population. To choose locations, an initial inventory was conducted which identified 84 apiaries in the area, 32 of which were visited by FAPAS workers. The apiaries were found to be poorly protected, or unprotected, from bears. Some were surrounded by mesh fences (Fig. 6); some had two or three electric wires as if to exclude free-ranging horses or cattle but not enough to keep bears out.

Before the new enclosures were built, damage occurred at each of the 16 apiaries, year after year. The level of damage could be significant: in the year immediately prior to the installation of electric fencing, on average 50% of beehives were damaged and in several cases all the hives in an apiary were damaged (Table 1). Considering the costs of honey (around €300/hive), a bee colony (approx. €100) and hive (approx. €50), the estimated financial losses per apiary in the year before building new

fences ranged from €900 to €13,500. Since the installation of FAPAS fences, no further damage by bears has been recorded at any of the protected apiaries, despite the continued presence of bears in the surrounding area. The design has thus so far been 100% effective at protecting apiaries from bears in Asturias and León.



Fig. 6. Examples of fencing that does not offer sufficient protection from bears (Photos: FAPAS).



Table 1. Damage caused by bears at 16 apiaries in the year prior to installation of electric fencing. Financial loss is an estimate of the value of lost honey production, cost of damage to beehives and money invested in treating the bees that year.

Apiary	Beehives in apiary (n)	Beehives damaged		Financial loss (€)	Year fence installed
		n	%		
#1	30	5	17	2,250	2013
#2	11	11	100	4,950	2013
#3	10	10	100	4,500	2013
#4	26	2	8	900	2013
#5	32	6	19	2,700	2014
#6	16	16	100	7,200	2016
#7	20	12	60	5,400	2016
#8	25	20	80	9,000	2016
#9	43	17	40	7,650	2017
#10	14	14	100	6,300	2017
#11	30	13	43	5,850	2018
#12	32	6	19	2,700	2018
#13	26	4	15	1,800	2020
#14	25	6	24	2,700	2022
#15	76	30	39	13,500	2023
#16	19	8	42	3,600	2023

## Cost and value

To instal this type of electric fence around an apiary with a perimeter of 100 metres (providing enough space for 80 beehives) cost about €500. Considering a market price for quality honey of around €11/kg (varying according to the type of flower visited by the bees) and an average annual production of 20 kg per colony (beehive), an apiary with 80 beehives could be expected to produce 1,600 kg of honey with a value of €17,600 per year. Taking into account an average financial loss due to bears of more than €5,000 at apiaries with insufficient protection (Table 1), it is evident that the cost of investing in an effective electric fence can be quickly recouped from the savings made by preventing damage. Moreover, damage often involves not only lost honey production but also destruction of the beehives and colonies themselves. Support may be available to assist beekeepers with fencing. FAPAS provides some materials (reused from other fences) as well as free labour to help with installation. The Regional Government of Asturias occasionally provides aid for purchasing electric fences.

## Sharing know-how

From the results presented above it can be concluded that electrified enclosures of the type described greatly reduced damage by bears to apiaries, thereby improving the coexistence of beekeeping and bears, at relatively little cost. Implementing such measures is especially important at new apiaries to avoid high levels of losses if bears identify them as food sources and, potentially, even habituate to human presence. They should be implemented in advance of bear population expansion to prevent damage in areas where beekeepers are not used to bear presence and could resort to poaching, hindering population recovery. As improving the protection of one apiary may result in increased damage at neighbouring apiaries [12], it is important to protect all apiaries in an area at the same time. Furthermore, after installation and on an ongoing basis, it is essential to check and maintain fences regularly to ensure their proper functioning, including periodically checking the voltage and clearing any vegetation or objects in contact with electrified wires.

In order to share bear-related information and experi-



Fig. 7. Disseminating information on bears and damage prevention measures to members of the Leonese Association of Beekeepers (Photo: FAPAS).

ence, FAPAS was invited by the Leonese Association of Beekeepers to meetings with its members (Fig. 7). The goal was to raise awareness of the importance of proper prevention and to help professional and amateur beekeepers to minimise bear damage to their apiaries, preventing conflicts and avoiding animosity towards bears, thus contributing to bear conservation in the region. There was also a practical demonstration of the system at an existing apiary attended by several beekeepers from the area as well as environmental agents from the Junta

## References

[1] Krofel M et al. (2020) Human–bear conflicts at the beginning of the twenty-first century: patterns, determinants, and mitigation measures. In: Penteriani V & Melletti M, eds. Human–bear coexistence. Ecology, conservation and management. Cambridge University Press, pp. 213–226.  
 [2] Chapron G et al. (2014) Recovery of large carnivores in Europe’s modern human-dominated landscapes. *Science* 346: 1517–1519.  
 [3] Vega JG de la (1877) Libro de la montería del Rey D. Alfonso XI. Tomos I y II. Imprenta y fundición de M. Tello, Madrid.  
 [4] Couturier M (1954) L’ours brun, *Ursus arctos* L. Author’s edition, Grenoble.  
 [5] MITECO (2011) Situación actual del Listado de Especies Silvestres en Régimen de Protección Especial y Catálogo Español de Especies Amenazadas. Ministerio para la Transición Ecológica y el Reto Demográfico, Madrid. <https://www.miteco.gob.es/es/biodiversidad/temas/conservacion-de-especies/especies-proteccion-especial/ce-proteccion-listado-situacion.aspx>.  
 [6] FAPAS/FIEP (2017) El Oso: Pirineos y Cordillera Cantábrica. FAPAS/FIEP.

de Castilla y León and staff of the Biosphere Reserve of Omaña y Luna. Beekeepers in Omaña expressed their satisfaction with the results obtained.

## Acknowledgements

I would like to thank FAPAS members Jose Ramón Magadán, Iván Morales, Roberto Hartasánchez and Luis García for providing data, photographs and documents.

[7] López-Bao JV et al. (2021) Seguimiento de la población de oso cantábrico en un escenario de expansión. In: Palomero G et al., eds. Osos cantábricos. Demografía, coexistencia y retos de conservación. Fundación Oso Pardo. Lynx Edicions, pp. 23–38.  
 [8] Crane E (1983) The archaeology of beekeeping. Duckworth, London.  
 [9] Bautista C et al. (2016) Patterns and correlates of claims for brown bear damage on a continental scale. *J. Appl. Ecol.* 54: 282–292.  
 [10] Linnell JDC & Cretois B (2018) Research for AGRI Committee – The revival of wolves and other large predators and its impact on farmers and their livelihood in rural regions of Europe. European Parliament, Policy Department for Structural and Cohesion Policies, Brussels.  
 [11] Ballesteros F et al. (2021) Los daños atribuidos al oso. In: Palomero G et al., eds. Osos cantábricos. Demografía, coexistencia y retos de conservación. Fundación Oso Pardo. Lynx Edicions, pp. 39–63.  
 [12] Naves J et al. (2018) Patterns of brown bear damages on apiaries and management recommendations in the Cantabrian Mountains, Spain. *PLoS ONE* 13(11): e0206733.

# Abstracts of scientific articles

## Diverse prevention measures

### An investigation of factors influencing bear spray performance

Several studies have documented the effectiveness of bear spray in protecting users from aggressive bears. Bear spray failures, however, have also been reported along with speculation regarding the influences of temperature, wind, repeated canister use, and canister age on spray efficacy. We designed lab and field experiments to document the influence that temperature, wind, repeated discharges from the same canister, and canister age have on bear spray performance. To determine the influence of temperature on spray performance, we recorded canister head pressures at temperatures ranging from  $-23^{\circ}\text{C}$  to  $25^{\circ}\text{C}$  and found a strong, positive linear relationship. Even at the lowest temperature tested ( $-23^{\circ}\text{C}$ ), bear spray had a range  $>4$  m, though the plume was narrow and the spray was not well aerosolized. As canister temperature increased, head pressure, plume distance, and dispersion increased. We used computational fluid dynamics modeling and simulated the effect that headwinds, crosswinds, and tailwinds of varying speeds had on spray performance. Even under high headwind and crosswind scenarios ( $>10$  m/sec), sprays reached targets that were approxi-

mately 2 m directly in front of the user. Crosswinds affected spray plume distance similar to headwinds, but the effect was not as pronounced. Tailwinds improved spray performance with respect to speed and distance. By weighing unused canisters  $\leq 18$  years old, brands tested lost weight ranging from 0.65 g/year to 1.92 g/year, presumably because of propellant that escaped canister seals. We also documented that bear spray head pressure declines in a logarithmic, not linear, fashion; over half of a new (7-sec spray time) canister's pressure was lost in the first 1 second of spray. We recommend not test-firing cans, keeping cans warm when in the cold, and retiring them when  $\geq 4$  years of age. Our results provide no compelling reason to not carry bear spray in all areas where bears occur, even if it is windy or cold.

Tom S. Smith et al.

Journal of Wildlife Management

January 2021

<https://doi.org/10.1002/jwmg.21958>



### Large carnivore conservation and traditional pastoralism: A case study on bear–reindeer predation mitigation measures

While wildlife and cultural preservation goals can be either complimentary or counteractive, the goals of large carnivore conservation and traditional pastoralist lifestyles are often at odds. Livestock depredation can negatively impact the economies of livestock herders, while subsequent lethal removals contribute to local carnivore population declines. Here, we collaborated with two Sámi reindeer herding communities (2010–2016) situated in Sweden's boreal forest to evaluate the efficacy and economic feasibility of three brown bear predation mitiga-

tion measures: corralling pregnant reindeer during parturition, lethal bear management removals, and public bear-license hunting. Calving corrals increased survival for reindeer calves born to average-sized females by 7%–15%, and by 14%–30% for calves born to small females. However, the realized cost of implementing calving corrals outweighed the financial gain for both our study areas (net losses ranged between €1111 and €6210 per calf saved from bear predation per year when using the updated 2021 calf value; 1€ [Euro]=US\$1.1), as well

as for almost every theoretical scenario we explored (net losses €234 and €13,995 per calf saved from bear predation). The exception was the theoretical scenario where small herding communities overlapped large bear populations, which crossed the breakeven efficacy bear/reindeer ratio of 13.5 bears/100 reindeer and had a potential net gain of €36 per saved calf. Similarly, the cost of lethal management removals of bears outweighed the potential financial gain from saved calves, with net losses between €75 and €239 per calf. License hunting, where the hunters voluntarily incur the monetary costs of removing bears, is in most cases the only economically viable mitigation measure where the cost of mitigation did not outweigh the financial gain from increased reindeer survival.

While the annual public license hunt was the most cost-effective mitigation measure, it may be less biologically effective, that is, bear hunting occurs in the fall and reindeer parturition the following spring which leaves time for the empty niche of harvested bears to be filled by survivors. Economically and biologically effective predation mitigation measures are key for promoting coexistence, and we suggest that potential mitigation measures should be studied in collaboration with local people.

**Aimee Tallian et al.**

**Ecosphere**

**June 2023**

<https://doi.org/10.1002/ecs2.4564>



## Factors influencing damage and conflicts

### Conservation and management of the culture of bears

Culture is widely accepted as an important social factor present across a wide range of species. Bears have a culture as defined as behavioral traditions inherited through social learning usually from mothers to offspring. Successful bear cultures can enhance fitness and resource exploitation benefits. In contrast, some bear cultures related to response to humans and human-related foods can be maladaptive and result in reduced fitness and direct mortality. In environments with minimal human influence most bear culture has evolved over generations to be beneficial and well adapted to enhance fitness. However, most bears across the world do not live in areas with minimal human influence and in these areas, bear culture is often changed by bear interactions with humans, usually to the detriment of bear survival. We highlight the importance of identifying unique bear cultural traits that

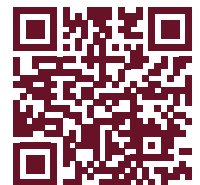
allow efficient use of local resources and the value of careful management to preserve these adaptive cultural behaviors. It is also important to select against maladaptive cultural behaviors that are usually related to humans in order to reduce human–bear conflicts and high bear mortality. We use examples from Yellowstone National Park to demonstrate how long-term management to reduce maladaptive bear cultures related to humans has resulted in healthy bear populations and a low level of human–bear conflict in spite of a high number of Yellowstone National Park visitors in close association with bears.

**Christopher Servheen  
& Kerry A. Gunther**

**Ecology and Evolution**

**April 2022**

<https://doi.org/10.1002/ece3.8840>



## Resource pulses and human–wildlife conflicts: linking satellite indicators and ground data on forest productivity to predict brown bear damages

Pulsed resources have prominent effects on community and ecosystem dynamics; however, there is little research on how resource pulses affect human–wildlife interactions. Tree masting is a common type of pulsed resource that represents a crucial food for many species and has important bottom-up effects in food webs. In anthropogenic landscapes, years of food shortage after mast years can have negative outcomes for both people and wildlife, for instance when an increased use of anthropogenic foods by animals exacerbates human–wildlife conflicts. Here, we used novel remote sensing indicators of forest productivity and phenology, together with weather cues and ground measures of mast production, to assess whether years of masting and crop failures lead to changes in human–wildlife conflict occurrence. We used a unique 14-year dataset including the production of European beech *Fagus sylvatica* seeds and brown bear *Ursus arctos* damage in the northeastern Carpathians as our model system. Linking these data in a panel regression framework, we found that temporal fluctuations in damage occurrence were sensitive to the year-to-year variation in beechnut production. Specifically, the number of

damages during bear hyperphagia (i.e., September to December, when bears need to accumulate fat reserves prior to hibernation) was significantly higher in years with low beechnut production than in normal or mast years. Furthermore, we provide evidence that beech masting and failure can be predicted through a combination of remote-sensing, weather, and field indicators of forest productivity and phenology. We demonstrate how pulsed resources, such as tree masting, can percolate through food webs to amplify human–wildlife conflict in human-dominated landscapes. Given the recent range expansion of large carnivores and herbivores in many regions, including Europe, predicting years of natural food shortage can provide a pathway to proactive damage prevention, and thus to foster coexistence between wildlife and people.

**Carlos Bautista et al.**  
**Remote Sensing in Ecology  
 and Conservation**  
**September 2022**

<https://doi.org/10.1002/rse2.302>



## Predictors of brown bear predation events on livestock in the Romanian Carpathians

Livestock depredation by brown bears is one of the main sources of human–wildlife conflict in rural Eastern Europe. Thus, identifying environmental and anthropogenic drivers of human–bear conflict, and developing spatial predictions for predation intensity are critical to mitigate such conflicts. We used 756 records of bear-caused livestock predation collected between 2008 and 2016 in the Romanian Carpathians and evaluated predictors and spatial distribution of bear livestock predation events (BPEs) using separate binomial generalized linear mixed models for cows, sheep, and other livestock. Despite differences in the direction and magnitude of the effect, the prevalence of BPE for all livestock was driven by the interaction between environmental drivers along with relative bear abundance. Distance from forest was a strong negative predictor for cows and sheep, while dis-

tance to villages was a strong negative predictor for cows. Landscape heterogeneity was positively associated with cow and other livestock predation and negatively associated with sheep. Relative bear abundance data collected by wildlife managers was a positive predictor for predation on all livestock. Livestock damage was more prevalent near villages, showcasing plasticity of food resources sought by bears. Our work informs brown bear and livestock management strategies to develop awareness and implement damage prevention measures.

**Mihai I. Pop et al.**  
**Conservation Science and Practice**  
**January 2023**

<https://doi.org/10.1111/csp2.12884>



## Financial mechanisms

### Not only seeds: a cultural ecosystem service provided by the Apennine brown bear

The unequal distribution of the costs and benefits of living with wildlife is one of the causes of human-carnivore conflicts. The existence of large carnivores is valued globally, but the costs of damages and management impacts human residents. The Apennine brown bear is endemic of central Italy and, besides its ecological value, it can attract tourists in search of nature and wilderness. The Advertising Value Equivalent of the bears' appearances in the national newspaper and on television from 2015 to 2020 was used to calculate the economic value of this flagship species as a destination image. The 11 million Euro of Advertising Value Equivalent estimated

largely exceeded the amount of reimbursements sustained by the Park to manage this carnivore in the same period. This evaluation of cultural value could be used to highlight the economic benefits provided by the bear and contribute to the discussions with managers and stakeholders.

Clara Tattoni et al.  
Human Dimensions of Wildlife  
March 2023

<https://doi.org/10.1080/10871209.2023.2176950>



## Human dimensions and attitudes

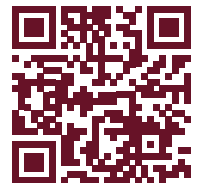
### Human dimensions of grizzly bear conservation: The social factors underlying satisfaction and coexistence beliefs in Montana, USA

Coexistence between large carnivores and humans is a global conservation concern. Montana (USA) is home to recovering grizzly bear (*Ursus arctos*) populations and increasing human-grizzly interactions. In 2019, we administered a survey of Montanans to investigate factors influencing normative beliefs about grizzly bear population sizes and quantify the relationship between these beliefs and satisfaction with grizzly management in the state. Using a linear regression ( $r^2 = .61$ ), we found that residents with positive attitudes and emotional dispositions toward grizzlies or who trusted the agency were more likely to believe grizzly populations were too low. Residents who believed hunting should be used to manage conflict, were themselves hunters, had vicarious wildlife experience with property damage, believed grizzly popu-

lations were expanding, or were older were more likely to believe populations were too high. We found a negative quadratic relationship between normative grizzly bear population size beliefs and satisfaction with management, suggesting an optimal “Goldilocks” zone where coexistence is most possible. In practice, if observed Goldilocks zones are incompatible with population numbers required to meet conservation goals, considering factors influencing these beliefs may help bolster acceptance of larger population sizes.

Holly K. Nesbitt et al.  
Conservation Science and Practice  
February 2023

<https://doi.org/10.1111/csp2.12885>



## Perception and trust influence acceptance for black bears more than bear density or conflicts

**Introduction:** To sustain black bear (*Ursus americanus*) populations, wildlife managers should understand the coupled socio-ecological systems that influence acceptance capacity for bears.

**Method:** In a study area encompassing a portion of New York State, we spatially matched datasets from three sources: human-bear conflict reports between 2006 and 2018, estimates of local bear density in 2017–2018, and responses to a 2018 property owner survey (n=1,772). We used structural equation modeling to test hypothesized relationships between local human-bear conflict, local bear density, and psychological variables.

**Results:** The final model explained 57% of the variance in acceptance. The effect of bear population density on acceptance capacity for bears was relatively small and was mediated by a third variable: perception of proximity to the effects of human-bear interactions. The variables that exerted a direct effect on acceptance were perception of bear-related benefits, perception of bear-related risks,

perceived proximity to effects of human-bear interactions, and being a hunter. Perception of bear-related benefits had a greater effect on acceptance than perception of bear-related risks. Perceived proximity to effects of human-bear interactions was affected by local bear density, but also was affected by social trust. Increased social trust had nearly the same effect on perceived proximity as decreased bear density. Social trust had the greatest indirect effect on acceptance of any variable in the model.

**Discussion:** Findings suggest wildlife agencies could maintain public acceptance for bears through an integrated approach that combines actions to address bear-related perceptions and social trust along with active management of bear populations.

**William F. Siemer et al.**  
**Frontiers in Conservation Science**  
**February 2023**  
<https://doi.org/10.3389/fcosc.2023.1041393>



## Sharing land with bears: Insights toward effective coexistence

Cohabiting with large carnivores does not necessarily equate to coexistence. In human-dominated landscapes, an effective coexistence is necessary to ensure long-term viable and sustainable conditions for large carnivores and humans, respectively. To better understand how cohabitation may develop toward coexistence, we used some of the cognitive hierarchy constructs to compare (n = 196 questionnaires) stakeholders' attitudes, beliefs, and behavioral intentions, and their insights for bear conservation in a historical stronghold of the autochthonous and imperiled Apennine brown bear (central Italy). For all stakeholder groups, responses indicated positive attitudes toward bears, yet the strength of agreement between respondents varied. Specifically, attitudinal differ-

ences were from positive (shepherds and hunters) to strongly positive (foresters, rangers and hotel owners). There was a low willingness of hunters and shepherds to modify their practices to reduce potential negative impact on bears' survival and behavior. By highlighting the disconnection between holding positive attitudes and undertaking positive behaviors, we discuss ways to encourage solid engagement and participatory decision processes for effective coexistence.

**Jenny A. Glikman et al.**  
**Journal for Nature Conservation**  
**August 2023**  
<https://doi.org/10.1016/j.jnc.2023.126421>



# Management and policies

## Should we feed wildlife? A call for further research into this recreational activity

Independent human–wildlife feeding interactions (i.e., the feeding of wildlife by the public outside of organized ecotourism activities) represent an increasingly common way in which humans and wildlife are engaging with one another. It is important to determine what effects these interactions are having on the wildlife involved in order to ensure that optimum coexistence scenarios are being achieved, however the nature of these interactions makes them notoriously difficult to study. Extrapolation from ecotourism activities has suggested detrimental impacts on the health and fecundity of the populations involved. Moreover, recent findings indicate that bold individuals may actually gain reproductive advantages from this excess food supply, driving artificial selection of risk-taking behaviors within human-dominated landscapes. Humans may, therefore, be unknowingly manipulating wildlife populations, forcing them into unnatural states, and potentially decreasing future viability. Here, we outline key literature pertaining to the potential impacts of these self-led interactions on wildlife and address the need for further research into the associated effects. Due to the associated safety risks to the humans involved in these

interactions, and by applying the precautionary principle until further research can be performed, we recommend that management actions be employed to actively reduce their occurrence. We address current management practices in use and make recommendations for further research to adapt and improve them. Ultimately, we make a call for further research addressing two fundamental key areas: (i) to explore the effects of these interactions on the wildlife involved, across different species and habitats experiencing this phenomenon, with emphasis on the potential role of artificial selection, and (ii) to work to improve the management practices currently employed to reduce the occurrence of these interactions, at least until such time as the effects of these interactions on both humans and wildlife have been thoroughly disentangled, with the overall goal of improving coexistence.

**Laura L Griffin & Simone Ciuti**  
**Conservation Science and Practice**  
**May 2023**  
<https://doi.org/10.1111/csp2.12958>





# Videos

## Staying safe in bear country SIBCS with IBA, March 2021

This is the primary video in the *Safety in bear country* video series, and is a major educational tool for anyone living, traveling, or working in black and grizzly bear country in North America. It includes the consensus opinion of leading experts on bear behaviour and its relevance to human safety. Viewers will develop a better understanding of bear behaviour and how this knowledge can help them to minimize the chance of bear encounters and bear attacks. The video stresses that a much greater degree of co-existence with bears is possible if people understand and apply a few safety principles.



<https://www.youtube.com/watch?v=s-zkGuh42l4>

## Living in bear country SIBCS with IBA, June 2021

*Living in bear country* is another video produced by the Staying Safe in Bear Country Society in cooperation with the International Association for Bear Research and Management. This video presents the consensus opinion of leading experts on living safely in bear country. It provides practical advice on ways to minimize problems with bears in the places that people live. This program shows how making a few simple adjustments to our daily routine can reduce property damage and increase human safety. By living responsibly in bear country both individuals and communities can help prevent conflicts with bears; making things safer for themselves and the bears. It was filmed a number of years ago, but the information is still important for preventing or minimizing human bear conflicts.



<https://www.youtube.com/watch?v=PwF2sFYQOok>

## How to coexist with bears forum International Wildlife Coexistence Network, April 2022

Join the IWCN to learn about the successful nonlethal deterrents that work, from people who are on the ground working with grizzly bears and black bears. Whether you are a homeowner, farmer or rancher, you can take steps to prevent conflicts with bears and keep bears and people safe. And non-profits, along with federal and state wildlife agencies can provide education, training and resources to support sustainable solutions for both ranchers, farmers, communities, and bears.



<https://www.youtube.com/watch?v=INGyQDJYHqQ&t=1386s>



## Bear-resistant cans in North America IBA Managers Committee, August 2022

An open panel discussion about experience with bear-resistant refuse containers.



[https://www.youtube.com/watch?v=Gz\\_ZvDN3tSs](https://www.youtube.com/watch?v=Gz_ZvDN3tSs)



## Shocking! Deterring wildlife with electricity IBA Managers Committee, June 2023

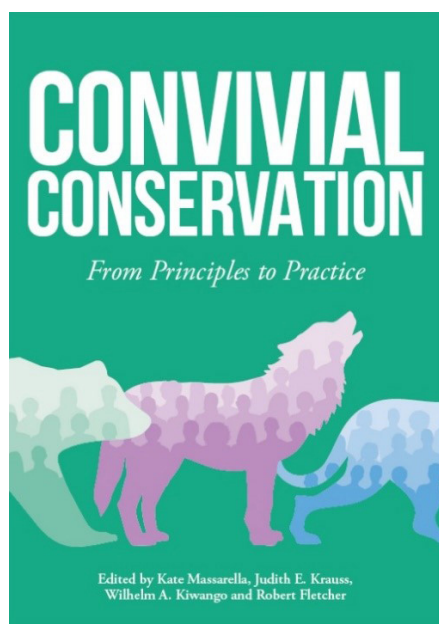
Presentation about experience with using electricity to deter bears.



[https://www.youtube.com/watch?v=qwJpX78Y\\_NE](https://www.youtube.com/watch?v=qwJpX78Y_NE)



# Books



Title: Convivial Conservation:  
From Principles to Practice

Editor: Kate Massarella et al.

Publisher: Mayfly (2023)

ISBN (Print) 978-1-906948-65-8

ISBN (PDF) 978-1-906948-66-5

ISBN (ebook) 978-1-906948-67-2

<https://mayflybooks.org/convivial-conservation/>

## *Publisher's description:*

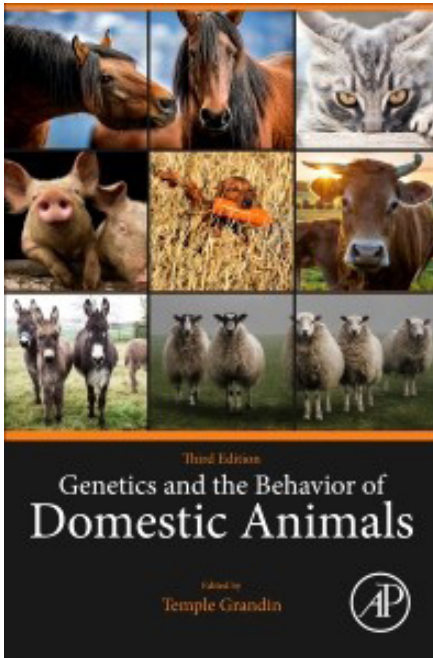
Global biodiversity is declining at an alarming rate, leading to calls for urgent change in how humans govern, conserve, and live with non-human species. It is argued that this change must be radical and transformative, and must challenge the structures and systems that shape biodiversity conservation. This book brings together a diverse group of authors to explore the potential for transforming biodiversity conservation, focusing on one particular proposal called convivial conservation: a vision, framework, and set of principles for a more socially just, democratic and inclusive form of biodiversity governance.

Drawing on a rich mix of disciplinary perspectives and diverse case studies centering on human-wildlife interactions, the authors demonstrate the potential for transformation in biodiversity conservation that supports human-wildlife coexistence. The authors argue that this desired transformation will only be possible if the status quo is truly disrupted, and that convivial conservation has the potential to contribute to this disruption. However, convivial conservation must evolve in response to, and in harmony with, a plurality of ideas and perspectives, and resist becoming another top-down mode of conservation. To this end, a rich mix of visions, ideas, and pathways are put forward to move convivial conservation from principles to practice.

The wealth of ideas offered in this collection provides important insights for students, academics, policy-makers, conservation professionals, and anyone who wants to think differently about biodiversity conservation and explore how it can be transformed towards a more just and abundant future.

## Contents:

- 1) Introduction
- 2) Pluralising and decolonising conservation
- 3) Rethinking human-wildlife interactions
- 4) Alternative governance and financing mechanisms



Title: Genetics and the behavior of domestic animals

Editor: Temple Grandin

Publisher: Academic Press, 3<sup>rd</sup> edition (2022)

ISBN: 9780323857529

ISBN: 9780323984461

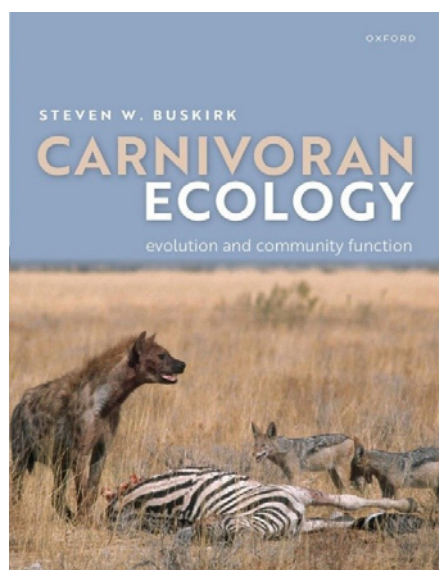
<https://www.elsevier.com/books/genetics-and-the-behavior-of-domestic-animals/grandin/978-0-323-85752-9>

*Publisher's description:*

*Genetics and the behavior of domestic animals*, Third Edition offers the latest and most valuable information on animal science and behavioral genetics, carrying on the book's legacy since its original publication in 1998. This book synthesizes research from behavioral genetics and animal and veterinary science, bridging the gap between these fields. The objective is to show that principles of behavioral genetics have practical applications to agricultural and companion animals. The continuing domestication of animals is a complex process whose myriad impacts on animal behavior are commonly under-appreciated. Genetic factors play a significant role in both species-specific behaviors and behavioral differences exhibited by individuals in the same species. Leading authorities explore the impact of increased intensities of selection on domestic animal behavior. Rodents, cattle, pigs, sheep, horses, herding and guard dogs, and poultry are all included in these discussions of genetics and behavior, making this book useful to veterinarians, livestock producers, laboratory animal researchers and technicians, animal trainers and breeders, and any researcher interested in animal behavior.

Contents:

- 1) Behavioral genetics and animal science
- 2) Behavioral genetics and animal domestication
- 3) How studying interactions between animal emotions, cognition, and personality can contribute to improve farm animal welfare
- 4) Genetics and behavior during handling, restraint, and herding
- 5) Reproductive and maternal behavior of livestock
- 6) Factors influencing the expression of behavior in the domestic dog
- 7) From mind to genome: the effect of domestication on dog cognition and genetics
- 8) Genetics of domesticated behavior in dogs and foxes
- 9) Behavioral genetics in pigs and relations to welfare
- 10) Behavior genetics of the horse (*Equus caballus*)
- 11) Genetic selection of poultry to improve welfare
- 12) Genetic influences on the behavior of chickens associated with welfare and productivity
- 13) Genetics and animal welfare



Title: Carnivoran ecology:

The evolution and function of communities

Author: Steven W Buskirk

Publisher: Oxford University Press (2023)

ISBN: 9780192863249

ISBN: 9780192863256

<https://global.oup.com/academic/product/carnivoran-ecology-9780192863256?q=Steven%20W%20Buskirk>

*Publisher's description:*

This unique synthesis uses examples from a diverse and expanding carnivoran literature, drawing from all carnivoran families and spanning the world's oceans and continents, to produce a clearly written and richly illustrated book that reviews our current state of knowledge of carnivoran ecology. It addresses all levels of biological organization and function, from genes to enzymes, organisms, populations, and ecosystems. Special attention is given to how carnivoran species interact with their prey, each other, and humans. There is an emphasis on community interactions and their importance in carnivoran evolution, showing how evolutionary constraints (morphological, physiological, and behavioural) structure communities today. The book's approach is strongly comparative, contrasting herbivores with carnivores, predators with scavengers, and cats with dogs. Carnivorans play important roles in many high-profile conservation cases, either as species of concern or agents of endangerment, and their importance is demonstrated in both contexts.

Contents:

- 1) Introduction
- 2) Functional morphology
- 3) Evolution and historical biogeography
- 4) Physiological ecology
- 5) Sensory biology and neuroanatomy
- 6) Community ecology
- 7) Interactions with non-prey animals
- 8) Interactions with prey
- 9) Cascades
- 10) Population ecology
- 11) How carnivorans affect humans
- 12) How humans affect carnivorans

# Events

## 3<sup>rd</sup> Mountain Livestock Farming Systems Meeting

5<sup>th</sup> – 7<sup>th</sup> June 2024 in Clermont-Ferrand, France

The general topic of this congress will be adaptation of mountain livestock farming to climate change. Different sessions will be jointly organised to cover various areas of knowledge related to interaction between farming systems and wildlife, product quality and mountain farming, and several other topics.

For details and updates see: <https://mlf2024.eaap.org/>

## International Conference on Bear Research and Management

15<sup>th</sup> – 20<sup>th</sup> September 2024 in Edmonton, Canada

IBA conferences showcase recent developments in research, management and conservation of all bear species worldwide. The 28<sup>th</sup> meeting will be the first in-person IBA conference since the COVID-19 pandemic.

For details and updates see: <https://conference.bearbiology.org/>

## Pathways Europe 2024: Human Dimensions of Wildlife Conference

13<sup>th</sup> – 16<sup>th</sup> October 2024 in Córdoba, Spain

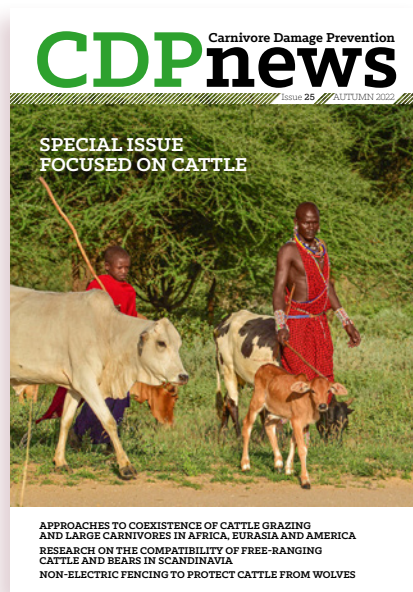
Pathways Europe is a part of the Pathways: Human Dimensions of Wildlife Conference and Training. The programme is designed to address the myriad issues that arise as people and wildlife struggle to coexist in a sustainable and healthy manner.

For details and updates see: <https://sites.warnercnr.colostate.edu/pathways-europe/>



(Photo: WWF Romania).

## Previous issues



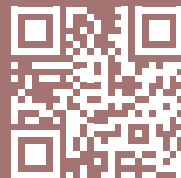
## Next issue

The next issue of *CDPnews* is due out in summer 2024.

We welcome your feedback and suggestions as well as news, articles and information from around the world.

To contact us, or be added to our mailing list, please write to: [info@cdpnews.net](mailto:info@cdpnews.net)

Past issues of *CDPnews* and our Guidelines for Authors can be downloaded from: [www.cdpnews.net](http://www.cdpnews.net)





**CDP** Carnivore Damage Prevention  
**news**