
PROGRESS REPORT FOR THE PILOT ACTION: DEFINING, PREVENTING, AND REACTING TO PROBLEM BEAR BEHAVIOUR IN THE ALPINE REGION

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1 DEFINING, PREVENTING, AND REACTING TO PROBLEM BEAR BEHAVIOUR IN THE ALPINE REGION – PROGRESS SUMMARY

1.1 SUMMARY OF CURRENT KNOWLEDGE

Throughout the history people have been coming into conflicts with bears. Good understanding of causes for human-bear conflicts is the first step for their effective resolution.

Human-bear conflicts are very diverse and are mainly connected with bear's opportunistic foraging and consumption of food. Several factors affect risk of human-bear conflict and probably most important is access to anthropogenic food (garbage, slaughter remains etc.). Key factor is also the number of problem bears. Although such bears represent only a small part of bear population, they usually cause majority of all human-bear conflicts, while most other bears come into conflict only rarely or never.

Common characteristic of problem bears is that during their lives they have changed their behaviour through the processes of habituation to human presence or conditioning to anthropogenic food. Habituation is a process involving a reduction in response over time as bears learn that there are neither adverse nor beneficial consequences of the occurrence of the stimulus, in this case presence of a human. Operant conditioning is a learning process, in which a behaviour is strengthened or weakened via consequences, such as reward or punishment. Food-conditioning is a type of operant conditioning, in which an animal learns to associate a given neutral stimulus (e.g. a presence of people) with reward in a form of high caloric food (e.g. various anthropogenic food sources, such as garbage). Operant conditioning can also be applied for management of human-bear conflict situations. Most common is aversive conditioning, which denotes procedure when a negative stimulus is used to prevent unwanted behaviour. Effectiveness of aversive conditioning depends on several factors, such as context in which learning process took place, immediacy of a consequence of given behavioural response, consistently and magnitude of these consequence and rewarding of alternative behaviour.

There are several factors that have been reported to affect the probability of occurrence of human-bears conflicts and other bear incidents: season, natural food availability, cover for bears, sex and age of a bear, habituation to human presence and food conditioning, availability of anthropogenic food sources, livestock husbandry, hunting and several factors that affect the probability of attack on humans (wounded bear, presence of cubs, presence of carcass used by a bear, proximity to a den, and the presence of dog).

People developed various measures to prevent human-bear conflicts. Review of reported measures and their effectiveness is presented. Aversive conditioning of bears, as well as other wildlife, was in general met with mixed results. Measures were usually effective for a short-term, while long-term behavioural changes were often limited. However, certain patterns that emerged through the review indicate that in specific situations some of the aversive stimuli can

be effective when applied properly. Good understanding of the benefits and drawbacks, as well as factors affecting effectiveness of this approach is needed in order to successfully apply aversive conditioning techniques. Higher success was observed when very specific behaviour was targeted in comparison to the attempts that required the animal to generalize aversive conditioning to less specific unwanted behaviours. Effectiveness was lower when undesired behaviour was already strongly established or when benefits gained through this behaviour were higher. Well-established monitoring that quickly detects such behaviours is therefore crucial for successful application of aversive conditioning. Pain stimuli (e.g. rubber bullets) proved to be the most successful, although also taste aversion can be effective for specific foods. Prevention of access to anthropogenic food sources must be assured in order to achieve full effectiveness of aversive conditioning. It must be understood that application of aversive conditioning can be very costly and demand considerable effort. Based on current knowledge, aversive conditioning of bears is most warranted in the following cases:

- when potential conflict behaviour is detected early in the development of a problem bear
- when short-term solution is needed
- when adequate resources are available for continuous treatments for each problem bear
- when possibilities for lethal removal are limited

Lethal removal can be effective short-term solution for individuals strongly habituated to human presence or conditioned to anthropogenic food. However, these measures must be coupled with effective measures to prevent development of new problem bears. Limiting access to anthropogenic food is regarded as the most effective way to prevent conflicts with bears, with success rates up to >90% conflict reduction. Experiences suggest that this approach gives best results when local inhabitants are actively involved. Other potentially effective measures for preventing human-bear conflicts include use of bear spray to deter bear attacks on humans and adjustments in land-use practices (e.g. transition from sheep to cattle farming, maintaining open landscape around human settlements). Compensations can, when well-designed, address inequities of distribution of damages caused by bears across society and improve tolerance towards bears, but do not affect occurrence of bear incidents.

Table 2: Overview of main types of human-bear conflicts and most effective measures to mitigate them according to the experiences reported so far. Underlined are measures used to prevent conflicts before they occur. Normal writing is used for reactive measures that have been used to prevent reoccurrence of conflicts.

CONFLICT TYPE	MAIN MEASURES FOR CONFLICT PREVENTION
Livestock depredations	<ul style="list-style-type: none"> - <u>protection of livestock using electric fences and/or livestock guarding dogs</u> - <u>night enclosures for livestock</u> - removal of the problem bear - <u>transition to species less vulnerable to bear attacks</u>
Damage on beehives, crops, orchards and other human property	<ul style="list-style-type: none"> - <u>protection of property using electric fences</u> - removal of the problem bear - aversive conditioning - <u>removing dense vegetation (cover for bears)</u>
Damage in forestry	<ul style="list-style-type: none"> - <u>supplemental feeding</u>
Bear occurrence near human settlements	<ul style="list-style-type: none"> - <u>preventing bear access to anthropogenic food</u> - removal of the problem bear - <u>education of local inhabitants</u> - aversive conditioning - <u>removing dense vegetation (cover for bears)</u>
Attacks on humans	<ul style="list-style-type: none"> - removal of bear exhibiting aggressive behaviour towards people - <u>public education</u> - <u>decreasing bear habituation to humans and food conditioning (e.g. through preventing access to anthropogenic food and aversive conditioning)</u> - use of bear spray - <u>temporary limiting public access to most critical bear habitats and bear dens</u>
Vehicle collisions	<ul style="list-style-type: none"> - <u>appropriate planning when constructing transportation network</u> - construction of safe under- or over-passes for bears in combination with electric fences - <u>removing or preventing access to attractants (e.g. garbage bins) near roads and railways</u> - <u>measures used to prevent bear habituation to humans</u>

1.2 OVERVIEW OF EXISTING FRAMEWORKS

Bear experts and managers from 13 different European countries provided information on how their national management plans define **habituated and food conditioned** bears and what are the management approaches used in dealing with habituated and food conditioned bears.

Terms “habituated” and/or “human food conditioned” bears are very rarely used in the official management documents. Most often a term that would roughly translate to “**problem bear**” is used to describe a habituated or food conditioned bear, but in some countries this includes practically any conflict-causing bear behaviour (i.e. not related to repetitive behaviour). A range of **problematic bear behaviours** is usually described, and proposed management measures are linked to those behaviours.

How and when a bear is considered to be a problem bear varies considerably between the countries. The “diagnostic tools” range from **simple definitions** (e.g. a bear that is repeatedly approaching anthropogenic food sources) and individual **ad hoc expert assessments** to **complex classification systems** used for risk assessment. Overall, countries with smaller (more endangered) populations tend to have more complex and better defined risk assessment protocols which include management recommendations.

Although the overview of the theoretical background would suggest that preventive proactive measures should be a priority, management plans mostly deal with **reactive management**. Documents provide variable level of detail, but generally foresee following management measures: close monitoring, aversive conditioning, removal or fencing of the attractant, removal of individual animals (lethal or translocations to nature/captivity), compensations for the damages, information campaigns, emergency teams. **Proactive management** aimed at preventing occurrence of problem bears is often related to implementation of individual projects and is not systematically organized. Such measures include: prevention of damages to agriculture, prevention of access to organic waste, enhancing the trophic value of bear habitat (i.e. feeding of bears at feeding stations, planting of wild fruit trees), information campaigns to influence problematic human behaviour (intentional or unintentional feeding or disturbing of bears), dialogue with stakeholders, emergency teams, green bridges and specific road signs, abandoning the practice of rehabilitation of orphaned bears.

Considering the diversity of management approaches it is evident that **public perception** plays a considerable role both in identifying a “problem bear” and in selection of the appropriate reactive management measures.

1.3 RISK ASSESSMENT PROTOCOL AND MANAGEMENT RECOMMENDATIONS

European brown bear experts and managers were brought together in two workshops to discuss and develop a general approach to risk assessment regarding brown bear behaviours which can pose threat to human safety. Below is the most recent output, organized in a risk assessment protocol.

Degree of problem and urgency of action	Individual bear behaviour	Recommended management actions	Recommended public communication actions
	the bear unaware of your presence is continuing its natural behaviour.	no action towards the bear	Provide information on bear biology. Provide information on of human-bear encounters to the inhabitants and visitors of the bear areas.
	upon an accidental close encounter bear is retreating immediately	no action towards the bear (surveillance)	
	upon an accidental close encounter bear is rising on his hind legs	no action towards the bear (surveillance)	
	bear is causing damages in uninhabited areas	damage prevention and basic monitoring to assess the effectiveness of damage prevention	Provide targeted information on why damages happen and how to prevent them (including where to get help).
	bear is repeatedly causing damages in uninhabited areas in spite of prevention measures	intensive monitoring, re-evaluate and adjust damage prevention measures, (deterrence).	Provide targeted information on why damages occur and how to improve damage prevention.
	the bear is aware of your presence but is not running away and ignoring your presence in the natural bear habitat	intensive monitoring (deterrence)	Provide targeted information on human-bear encounters to the inhabitants and visitors
	bear is repeatedly coming close to continuously inhabited houses	intensive monitoring, remove attractants and dense vegetation – cover for the bears, if appropriate (damage prevention), deterrence	Provide targeted information to increase understanding of habituation and food conditioning processes and its consequences; information on avoidance of human-bear conflicts

	female with cubs starts a false attack	monitoring	Provide targeted information on avoidance of human-bear conflicts to the inhabitants and visitors and explain causes and possible consequences of the bear behaviour both for the bear and for people.
	bear starts a false attack when surprised or provoked	investigation, monitoring	
	bear is defending its food by threatening and false attacking	investigation, monitoring	
	bear is searching for food or is causing damages close to inhabited houses	monitoring, damage prevention (remove attractants), chasing the bear away, removal of the dense vegetation (cover for the bear)	Provide targeted information on avoidance of human-bear conflicts (including damage prevention) to the inhabitants and visitors and explain causes and possible consequences of the bear behaviour both for the bear and for people. Provide channels for two-way communication with the public (bear management hotline, online Q&A section,...).
	bear enters uninhabited buildings such as barns, stables and sheds close to inhabited houses several times	removal of attractants, intensive monitoring, deterrence, removal of dense vegetation (cover for the bear) - In populations classified as endangered (IUCN) or better or depending on the social context removal may be considered as the first option.	
	bear attacks (physical contact) a human after being provoked (e.g. by dogs, disturbance of the den)	intensive monitoring - In populations classified as endangered (IUCN) or better or depending on the social context removal may be considered as the first option.	Provide targeted information on avoidance of human-bear conflicts to the inhabitants and visitors and explain causes and possible consequences of the bear behaviour both for the bear and for people.
	bear is repeatedly intruding compact residential areas	- removal of attractants, - In populations classified as endangered (IUCN) or better or depending on the social context removal may be considered as the first option. - intensive monitoring and deterrence is preferred in critically endangered (IUCN) populations,	Provide targeted information and instructions on avoidance of human-bear conflicts to the inhabitants and visitors and explain causes and possible consequences of the bear behaviour both for the bear and for people. Provide channels for two-way communication with the public (bear management hotline, online Q&A section,...).
Injured bear attacks a human	removal of the bear	Rationalize management decision by explaining the causes and	

	bear cannot be deterred successfully by an expert team from compact residential areas or from repeatedly entering uninhabited buildings next to an inhabited house	removal of the bear	consequences of the bear behaviour both for the bear and for people. Provide channels for two-way communication with the public (bear management hotline, online Q&A section,...).
	bear is following humans in close distance	intensive monitoring, deterrence, removal of the bear if deterrence is not successful	Provide targeted information and instructions on avoidance of human-bear conflicts and rationalize management decision by explaining the causes and consequences of the bear behaviour both for the bear and for people. Provide channels for two-way communication with the public (bear management hotline, online Q&A section,...).
	bear enters inhabited buildings	Removal of the bear	
	bear is defending its food by attacking	intensive monitoring, (deterrence), possibly removal of the bear	Provide targeted information and instructions on avoidance of human-bear conflicts and rationalize management decision by explaining the causes and consequences of the bear behaviour both for the bear and for people.
	bear attacks a human without being provoked	removal of the bear	Rationalize management decision by explaining the causes and consequences of the bear behaviour both for the bear and for people.

1.3.1 CONSIDERATIONS FOR SPECIFIC BEAR CATEGORIES

1.3.1.1 INJURED/HANDICAPPED BEARS

An injured bear will more likely demonstrate a problematic behaviour. In a case when an injured or otherwise handicapped bear occurs, an ad hoc assessment should be carried out by a bear manager (intervention group) and a veterinarian. Taking into account the conservation status of the population and likelihood of the recovery following decisions can be made:

1. Bear will recover by itself, no other actions but intensive monitoring recommended.
2. Provide the bear necessary treatment if feasible, return it to nature and closely monitor its recovery.
3. If complete recovery is unlikely or treatment is not feasible and the population is considered vital, remove the bear from the population.

1.3.1.2 ORPHANED CUBS

Orphaned bear cubs are not self-sufficient for survival without their mothers until they are at least six months old. Bear cubs which have been raised by humans have a high chance of developing problematic behaviour due to their habituation to humans. Because of that the practice of rehabilitation of human-raised bears is generally not recommended.

1.3.1.3 FEMALES WITH CUBS AND SUBADULT BEARS

Females with cubs and subadult bears are more likely to become exposed to situations which lead to habituation and food conditioning. For these two categories it is especially important to implement habituation and food conditioning prevention measures (i.e. instructing the public not to offer food to the female with cubs) and aversive conditioning as soon as possible.

1.4 CONCLUSIONS

Human-bear conflicts are complex and diverse. Consequently there is no single one-for-all solution to effectively prevent all of these problems. Because often few problem bears cause large part of all bear incidents, special attention needs to be given to preventing development of repetitive conflict behaviour. According to available knowledge, preventing access to anthropogenic food in combination with public education is in many cases the most effective approach. Experiences from several regions suggest that this approach gives best results when local inhabitants are actively involved. Successful preventive management is also considerably more acceptable to public than reactive responses once the conflicts have already occurred. Once problem behaviour is developed in a bear, changing it can be considerable challenge. Well-established monitoring that quickly detects such behaviours is crucial for successful application of aversive conditioning techniques that revise the process of habituation to human presence and/or conditioning to anthropogenic food. Once this process has proceeded to higher stages, considerably more effort will be needed to prevent further conflict behaviour and in some cases bear removal may be the only option.

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