Adaptive co-management of conservation conflicts — An interactional experiment in the context of German national parks

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Abstract

Social-ecological systems are characterized by complexity, uncertainty, and change. Adaptive co-management may help to improve adaptability and resilience and to develop ‘no-regret strategies’ for a sustainable management. It is a dynamic, inductive, and self-organized process based on social learning and collaboration. In this regard, conservation conflicts, conflicts between humans about wildlife, are a contemporary environmental management issue. Their management may be facilitated through adaptive co-management. However, adaptive co-management typically emerges because of a crisis or changing context and is difficult to be applied intentionally. We hypothesize that it may be possible to lay the ground for an adaptive co-management process by activating stakeholders to interact experimentally without a prescriptive application of adaptive co-management criteria. We examined conservation conflicts in the context of three German national parks, where we triggered interaction between 68 stakeholders in nine moderated focus groups. These were recorded and analyzed. Stakeholders discussed similar conflict issues and conflict management suggestions.
Subsequently, we conducted a literature synthesis, resulting in 13 adaptive co-management characteristics, and analyzed concurrancies between these and stakeholders’ management suggestions. Management suggestions reflected collaborative, interactional, structural, and practice-oriented adaptive co-management characteristics, while political context, rules, adaptability, learning, and monitoring were underrepresented. These underrepresented adaptive co-management characteristics may be harder to be recognized by stakeholders. An implementation of stakeholder-based management suggestions may prepare the systems for change. However, policy windows and resilience have to be observed, underrepresented characteristics have to be examined, and political context, long-term support, monitoring, and facilitation have to be considered. The approach fosters conservation conflict solution. The results could help protected area managers to further develop a local process. The experiment empowered stakeholders and resulted in case-specific suggestions, backed up by adaptive co-management literature. Research should focus on bridging knowledge between case studies as well as between politics, management, stakeholders, and scientists and on further examining stakeholders’ capabilities to develop adaptive co-management approaches.

Keywords: Environmental science, Political science, Psychology, Sociology

1. Introduction

Social-ecological systems, encompassing different environmental management issues, are often characterized by complexity, uncertainty, and change (Armitage et al., 2009). In this regard, adaptive collaborative management (adaptive co-management) may help to improve adaptability and resilience and to develop ‘no-regret strategies’ for a sustainable management. It can be defined as a process in which institutional networks and social-ecological knowledge are tested and re-worked in a consecutive, dynamic, and self-organized manner of learning-by-doing (Armitage et al., 2007; Berkes, 2009). It “forges links (both horizontal and vertical) for shared learning-by-doing between various actors, over a medium to long time horizon. It is multi-scale in spatial scope and concerned with enhancing and including the capacity of all actors with a stake for sustainably managing the resource at hand” (Plummer et al., 2012, p. 1). Characteristics of an adaptive co-management process include context and rules, interaction, knowledge exchange and collaboration, conflict resolution mechanisms, and practice-oriented management plans as well as adaptability, flexibility, learning, and monitoring (e.g., Armitage et al., 2009; Plummer et al., 2013). Competing interests and values, present conflicts as well as complex relationships and rules are typical conditions of adaptive co-management (Armitage et al., 2009). The process helps to develop trust, resolve
conflicts, and arbitrate power imbalances (Baird et al., 2014). “The result is a flexible system of resource management, tailored to specific places and situations, supported by, and working in conjunction with, various organizations at different scales” (Armitage et al., 2009, p. 96). One important area of environmental management are conservation conflicts. Conservation frequently clashes with other land use goals, whereby conflicts between humans about wildlife are a contemporary issue. Incidents emerge between people who hold divergent values and interests and are involved with, for example, agriculture, forestry, fisheries, hunting, and conservation (Madden, 2004; Redpath et al. 2013, 2015b). As a result of these stakeholder goals, humans may impact negatively on wildlife or wildlife may have negative impacts on humans and their livelihoods (Young et al., 2010). As conflicts basically occur between humans and not between humans and animals, it has been argued that ‘conservation conflicts’ may be a more appropriate term for these issues instead of ‘human-wildlife conflicts’ (Redpath et al., 2015a). Conservation conflicts are of high relevance for research and policy, considering that they bring along intractable issues and may result in negative consequences for biodiversity as well as for human livelihoods and wellbeing (Dickman, 2010; Redpath et al., 2013). Various wildlife species are objects of these conflicts. Smaller organisms, such as insects, cause greater economic impacts, but large terrestrial mammals (carnivores and herbivores) often attract greater attention because of their iconic status, physical threat, and higher impacts in single events (Treves et al., 2006). Conservation conflicts tend to occur most frequently in and around protected areas, where areas for conservation border areas used and inhabited by humans and where encounters between wildlife species and stakeholders are common (Treves, 2009; Harich et al., 2013). Conflict causes are often obscured by interactions and world views of conflicting parties as well as by socio-political issues which need to be investigated to understand conflicts (Moore, 2003, pp. 61—66; Young et al., 2010). A conflict management approach has to be implemented to solve conflicts between stakeholders, treat wildlife ethically, and prevent the development of future conflicts (Chase et al., 2000; Messmer, 2000; Sirivongs and Tsuchiya, 2012). Conflict management can be facilitated through adaptive co-management (Carlsson and Berkes, 2005), but to date, there is limited knowledge about the applicability of adaptive co-management for conservation conflicts (Butler et al., 2015). It is discussed whether adaptive co-management typically emerges autonomously because of a crisis, shock or changing political context (Olsson et al., 2004; Butler et al., 2015). Every adaptive co-management process, including conservation issues, is unique and characterized by its inductive dynamic (Plummer and Hashimoto, 2011), and it is difficult and often ineffective to apply the concept intentionally (Butler et al., 2016b; Smedstad and Gosnell, 2013). We hypothesize that it may also be possible to lay the ground for an adaptive co-management process by activating involved stakeholders to interact experimentally. Without a prescriptive application of adaptive co-management criteria, the inductive dynamic of the process would not be inferred.
Hence, stakeholders may be capable to develop management suggestions for their own context, which can afterwards be examined with regards to their consistency with adaptive co-management characteristics discussed in scientific literature. Likewise, factors may be revealed which are not recognized by stakeholders or countered by higher-order (political or structural) processes. In this regard, it may be possible to distinguish which areas are possible to be managed by governance and where additional (governmental) actions may be necessary (Cundill and Fabricius, 2010; Butler et al., 2016b). To test our hypothesis, we selected three German national parks as case study areas, where no adaptive co-management processes had emerged yet. Conservation conflicts have been identified as a major problem field in German national parks, especially regarding even-toed ungulate species. Hence, a superordinate research project on wildlife management in German national parks had been implemented. We, being part of the research team, had the opportunity to initiate an interactive and transdisciplinary process between stakeholders to discuss the current conservation conflict situation and to learn about stakeholders’ development of conflict management suggestions. We acted as outside brokers or catalysts who initiate interaction between stakeholders in a prevalent conflict situation (Baird et al., 2014).

In this regard, different techniques are possible and have been applied in adaptive co-management research to survey and involve stakeholders. Methods of more consulting nature can be used for assessment purposes. This includes, for example, open-ended, in-depth interviews to survey experiences or perspectives of stakeholders in detail (Olsson et al., 2004) or structured interviews to evaluate an already ongoing adaptive co-management process and its outcomes, based on a specific set of measurement parameters (Butler et al., 2015). Likewise, more quantifiable methods, such as social network surveys, can be used to assess changing linkages in adaptive co-management over time (Baird et al., 2016).

However, for governance experiments, such as the one conducted in the study at hand, methods of participatory action research are particularly suitable. Interaction is a key element of evolving adaptive co-management processes. Therefore, providing a learning architecture and the opportunity for stakeholders to link with each other are important aspects (Loorbach, 2010, Bos et al., 2013, Butler et al., 2016). More specifically, suitable are methods such as Service Trips or focus groups (Smedstad and Gosnell, 2013), depending on the specific context. Overall, these methods provide the possibility to induce an explicit discussion of all issues and a joint and productive exchange of knowledge, leading to learning, trust, and capacity building (Stöhr et al., 2014). Therefore, we selected focus groups to conduct the research process.

Subsequently, we carried out a synthesis of scientific literature on adaptive co-management characteristics and contrasted these with stakeholders’ management suggestions to examine consistencies. Hereafter, we classified the results, derived
lessons learned for management, and discussed opportunities and limitations of such an interactional research approach as well as implications for further research.

We formulate the following hypothesis and three subsequent research questions:

- Involved stakeholders are capable of developing approaches for the adaptive co-management of their own conservation conflict context

  (1) Which kind of suggestions for conservation conflict management are developed by involved stakeholders, using an interactional and transdisciplinary research approach?

  (2) Are these results consistent with adaptive co-management characteristics found in scientific literature?

  (3) What can be learned from this approach for conservation conflict management and adaptive co-management research?

2. Methods

2.1. Case study areas and stakeholder analysis

In the following, we describe the case study areas and stakeholders based on the context, structures, and indicators characteristic for German national parks and based on an analysis with regards to stakeholders’ tasks, goals, and concern. The stakeholder analysis was conducted according to various building blocks as outlined by the Deutsche Gesellschaft für Technische Zusammenarbeit (2007), especially regarding questions of legitimacy (institutional positions, ascribed rights), resources (knowledge and capabilities, but also in terms of being affected by or engaged in wildlife management), connections (relationships and dependencies between stakeholders), as well as interests and values related to the issue in question. This set of indicators is also linked to typical areas or types of conservation conflicts as described by Redpath et al. (2015b).

We selected the Hainich, Kellerwald-Edersee, and Mueritz national parks. Here, the even-toed ungulate species red deer (*Cervus elaphus*), roe deer (*Capreolus capreolus*), wild boar (*Sus scrofa*), fallow deer (*Dama dama*) and European mouflon (*Ovis orientalis musimon*) are the objects of conflict. We will refer to these species as ‘wildlife’ in the following. The national parks share the goal to preserve and develop natural ecosystems and to protect natural processes. Silvicultural interventions for production purposes are restricted to a minimum and measures to control wildlife populations are only allowed in order to ensure the achievement of national park-specific goals, to avoid unjustifiable levels of wildlife damage in adjacent areas, and to prevent the spread of wildlife diseases. In this regard, the national parks are designated as Category II “national park”, following the protected area category system of the International Union for Conservation of Nature and Natural Resources.
According to that, 75% of the national park areas have to be free of controlling measures. However, today only 20–30% of the national parks’ areas are free of these.

The case study areas share similar political and legal frames regarding management regulations and administrative responsibilities. German Federal laws like the Basic Law (original version: 1949, latest amendment: 2017), the Federal Nature Conservation Act (original version: 1976, latest amendment: 2017) or the Federal Hunting Act (original version: 1952, latest amendment: 2017) are legal frameworks which are valid for the German Federal Republic. As a result of the federal system, national park areas are predominantly owned by the state in which they are located. Every national park and its administration are subordinate to a ministry responsible in the fields of nature conservation and hunting, which is critical in decision making and coordination of political processes. National park designation as well as legislative and administrative issues are a matter of the individual states. The state parliaments and the responsible ministries develop an individual national park act, a national park plan, and a wildlife management directive. Likewise, administrations on a district level are involved in decision making, such as forest and hunting administrations.

A certain proportion of the adjacent area is also owned by the states, but it is mainly under private or municipal ownership. The national parks are located in rural areas; therefore, adjacent areas are primarily composed of agricultural and forested land, under usage, and hunted. Additionally, whoever owns land also possesses the right to hunt there. It is possible for land owners to hunt the area themselves or to lease the hunt to another person. Forested areas in state property or large private property are often hunted by their owners or personnel who are hired. Forested areas in municipal property or small private property as well as agricultural areas are often hunted by leaseholders of hunts. Likewise, agricultural areas are often not used by their owners but are leased for farming to another person. Accordingly, there are different goals and obligations applicable to the same area. Foresters and farmers aim to produce timber or crops, whereby wildlife damage poses a problem. Hunters demand sufficiently large wildlife populations but also have an obligation to hunt enough, so that the extent of wildlife damage remains acceptable. Furthermore, stakeholders are often organized in associations of, for example, land owners, farmers, hunters or nature conservationists. These associations are led and coordinated by heads and executive secretaries. If a national park is embedded in this neighborhood, conservation conflicts are likely to occur because of impacts caused by wildlife populations if they cross boundaries between different areas but also because of stakeholders’ relationships and different attitudes. As became apparent during preliminary research, and as stated by national park administrations, history, conflict development, and participation have differed between the case study areas. Additional details about the characteristics for each national park are listed in Table 1.
Table 1. Basic data of the three case study areas.

| National park          | Hainich               | Kellerwald-Edersee | Mueritz          |
|------------------------|-----------------------|--------------------|------------------|
| Year of implementation | 1997                  | 2004               | 1990             |
| Size                   | 7.518 ha              | 5.738 ha           | 32.200 ha        |
| Federal state          | Thuringia             | Hesse              | Mecklenburg-Western Pomerania |

Ownership of national park area:
- State: 94% 97% 80%
- Municipal: 5% 0% 6%
- Private: 0% 0% 8%
- Other: 1% 3% 6%

Ownership of adjacent area:
- State: 1% 20% 38%
- Municipal: 4% 10% 7%
- Private: 95% 70% 55%
- Other: 0% 0% 0%

Biotope in the national park area:
- Forest: 64% 94% 72%
- Open country: 36% 4% 7%
- Waters: 0% 2% 21%

Land use in the adjacent area:
- Forest: 30% 30% 37%
- Pasture: 25% 30% 13%
- Field: 40% 30% 35%
- Waters: 0% 10% 12%
- Other: 5% 0% 3%

National park area without hunting:
- 24% 32% 21%

Even-toed ungulates:
- Red deer: X
- Roe deer: X
- Wild boar: X
- Fallow deer: X
- European mouflon: X

Summary of history of the national park area:
- 1935: military training
- Development of near-natural beech forest over time, free of land use activities (except military training)
- 1993—1997: discussion about implementing national park
- Examination of the possibilities to establish a national park included in the coalition

(continued on next page)
The idea and the process of involving stakeholders started from scratch by realizing the idea of testing the capability of stakeholders to develop adaptive co-management approaches for their own conservation conflict context, as explained in the introduction (chapter 1). In Table 2, a list of stakeholder groups and their tasks and goals with regards to the national parks and wildlife management is shown. Based on this framework, we identified stakeholders in the context of each national park and communicated with the respective national park administrations as well as with the stakeholder groups to gather personal information and contact data. Moreover, in the subsequent focus group discussions, we asked participants to list all stakeholders and to identify ones that might not be present in the respective event.

2.2. Inquiry

2.2.1. Interactional and transdisciplinary approach

We used an interactional and transdisciplinary approach to design the participatory process and followed the concept of stakeholders co-constructing their reality (Dewulf et al., 2009). We considered that stakeholders evaluate conflict differently (Adams et al., 2003), and that conflicts are often imbalanced and are not experienced the same way by various stakeholders (Sauer, 2008). The approach provides the opportunity to analyze context-dependent knowledge. This can be achieved through an inclusion of stakeholders, consideration of their perspectives, and promotion of discussion between them regarding different values, goals, and interests. In this way, complexity and uncertainty can be approached and delineative, normative, and practice-oriented insights can be provided (Mobjörk, 2010). Focus groups are a common tool for initiating interaction, where stakeholders discuss the issue in question. These are often guided by an external moderator who acts as broker (Borrini-Feyerabend et al., 2007; Baird et al., 2014). Interactional and transdisciplinary research create a ‘common reality’ of stakeholders (Dewulf et al., 2009). Following the idea of interactional issue framing (Dewulf et al., 2009), a subsequent analysis of discussions can reveal interaction outcomes. Here, these outcomes are suggestions for the management of conservation conflicts.
### Table 2. Stakeholder groups and their tasks and goals with regards to the national parks and wildlife management.

| Stakeholders                                                                 | Tasks and goals                                                                                                                                 |
|------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| Higher forest, hunting, and nature conservation administration, located at the governmental department or ministry | Execution of the goals of the state parliament and the state government; coordination of regulative processes regarding the national park as well as forestry and hunting in its neighborhood; coordination of communication processes between stakeholder groups and associations |
| National park administration                                                 | National park management, including planning, maintenance of infrastructure, public relations, guidance, wildlife management, research, and monitoring |
| District level forest administration                                         | Management of forests in state property, including wildlife management; sometimes support of private and communal forest owners; sometimes coordination of district-wide wildlife management activities |
| District level hunting administration                                        | Administration of hunting licenses; coordination and permission of hunting plans and quotas                                                  |
| State forest owners                                                          | Differing focus on production of timber and avoidance of wildlife damage, nature conservation measures and provision of recreational space for the public, depending on the area; areas are mostly hunted by employees and sometimes by leaseholders of a hunt |
| Municipal forest owners                                                      | Differing focus on production of timber and avoidance of wildlife damage, nature conservation measures and provision of recreational space for the public, depending on the area; areas are mostly hunted by leaseholders of a hunt |
| Private forest owners and forestry enterprises                               | Particular focus on production of timber and avoidance of wildlife damage; areas are mostly hunted by the owners or enterprises themselves |
| Farmers and agricultural enterprises                                         | Cultivation of crops like wheat and corn and avoidance of wildlife damage; areas are mostly hunted by leaseholders of a hunt |
| Leaseholders of hunts                                                         | Hunting success, sufficiently high wildlife populations; conservation, species protection; responsible for control of wildlife populations and fulfillment of hunting quotas |
| Nature conservationists and national park supporters                          | Conservation, species protection, protection of natural processes and decrease of hunting quotas                                               |
| State and district level associations of land owners, farmers, hunters, nature conservationists, and national park supporters | Organization and representation of the respective interests on a state or local level, political activities |

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2.2.2. Conduction of moderated focus groups

We organized a one-day event for each national park and invited the stakeholders which had been identified in the stakeholder analysis. In a letter, stakeholders were invited to the event, termed as workshop, to discuss important issues in the context of even-toed ungulate species and their management in the national park in its neighborhood as well as possible future ways of management. Furthermore, they were informed about the superordinate research project and about the importance of considering the multifaceted interests of stakeholders to achieve a satisfying and advantageous development of a national park region.

In the following, we will refer to stakeholders taking part as participants. We started with an introductory presentation of a leading moderator about the context, goal, and program of the event, focusing on the identification and discussion of local conservation conflict issues as well as management suggestions. Subsequently, we conducted a short introduction of participants. Afterwards, we divided participants into three to four focus groups. Each group was assembled heterogeneously, mixing participants from different stakeholder groups, to bring together different viewpoints in discussion. Each focus group lasted approximately 80 minutes in the morning and 80 minutes in the afternoon, interrupted by a common lunch break. At the end, results of focus groups were presented by the moderators and a closing round was conducted. Participation, beverages, and food were for free and were paid by the research project. In total, five different moderators helped with moderating the focus groups, with up to four of them taking part in one event. The moderators, including the authors, were part of the research project. All moderators had an interdisciplinary background and work experience in forest science and wildlife management as well as in political and social aspects of natural resources management. Prior to the events, we tutored the moderators how to conduct the focus groups. They were instructed to use a list of subsequent guiding questions with regards to even-toed ungulate management issues:

- Introduction of focus group participants; ask for permission to record their words
- Who are relevant stakeholders?
- What are important issues, challenges, and controversies?
- How can the identified issues be described in detail? What are the underlying causes or drivers of each issue? Which stakeholders are involved and what role do they play in each issue?
- What are solutions, suggestions, opportunities, and necessary measures for managing the discussed conflict issues? What developments are preferred for future management?

Moderators had the objective to ensure that all questions are discussed by the end of the day and to note interim results on a flip chart to build upon these in the following
discussion. Apart from this, we instructed them to let discussion between participants evolve relatively free so that participants are enabled to develop their own ideas and conversation, including disagreements and debates. However, we asked moderators to interrupt the development of personal disputes and to ensure a fair and respectful communication with everyone getting a chance to speak. In total, we conducted 11 focus groups, comprising 80 participants, whereby no person participated in more than one focus group. We were allowed to record nine focus groups, comprising 68 participants, which resulted in 21.5 hours of audible data (see also Table 3 as well as Supplementary Table 1, Supplementary Table 2, and Supplementary Table 3). Our research included experimentation on human subjects. Therefore, the study was conducted according to and complies with all regulations established in the ethical guidelines by the German Sociological Association (GSE) and the Berufsverband Deutscher Soziologen (BDS) (2017) in the “code of ethics”. Informed consent was obtained from all participants.

2.3. Analysis

Recorded data was transcribed, imported to MAXQDA 10, and analyzed, conducting a structuring qualitative content analysis (Thomas, 2006; Kuckartz, 2012, pp. 77–98). Passages which could be identified as representing a conflict issue (Glasl, 2013; Redpath et al., 2013) were coded; the same was done for passages where stakeholders discussed conflict management suggestions, which were coded using an inductive approach (Saldaña, 2009; Plummer and Hashimoto, 2011). Subsequently, we created an overview of focus groups. We listed primary and secondary conflict issues, based on the number of words attributed to them in each focus group, as well as participants, their stakeholder groups, and occupational positions. We also counted words spoken by each participant to compare the amount of contribution. Likewise, we noted qualitative differences, which became apparent in the development of the focus groups, regarding the course of conversation. Additionally, we examined if participants contributed to the development of management suggestions. Based upon these results, we created a synoptic table of the focus groups and used coded passages to create a description of conflict issues and conflict management suggestions. Therefore, the description of results represents the aforementioned interactionally framed ‘common reality’ of participants.

2.4. Synthesis of scientific literature

To examine adaptive co-management characteristics, we collected scientific literature on adaptive co-management and conservation conflicts using search engines and databases Web of Science, Google Scholar, and Research Gate. We searched publications using the terms “adaptive management”, “co-management”, “adaptive co-management”, “governance”, “collaborative natural resource management”,

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Table 3. Number of focus groups and participants in each case study area. For additional information see Supplementary Table 1, Supplementary Table 2, and Supplementary Table 3.

| National park | Hainich | Kellerwald-Edersee | Mueritz |
|---------------|---------|-------------------|---------|
| Focus group   | Participants | Focus group | Participants | Focus group | Participants |
| 1             | 8        | 1                 | 7       | 1             | 7           |
| 2             | 4        | 2                 | 6       | 2             | 5           |
| 3             | 11       |                   | 3       | 9             |             |
| 4             | 9        |                   |         |               |             |

“social-ecological system”, “management of natural resources” as well as “conservation conflicts”, “human-wildlife conflicts”, “biodiversity conflicts”, “protected areas”, “national parks”, and different combinations of these (e.g., “adaptive co-management” AND “conservation conflicts” AND “national parks”). Additionally, we examined scholarly journals related to environmental management, biodiversity conservation, and wildlife management. In total, 114 references were identified. We particularly considered review papers and often cited papers (based on numbers of “times cited” in Web of Science and on our own overview during the study). We analyzed collected sources in the literature management software Citavi 5 and summarized adaptive co-management criteria, resulting in a list of characteristics with detailed descriptions. We compared the contents of the management suggestions and of the adaptive co-management characteristics. Every criterion of the adaptive co-management characteristics which was reflected in participants’ locally adapted descriptions of management suggestions was recorded in a contrasting table, showing consistencies. Our research approach is based in qualitative social science and we use qualitative data and analysis methods to test our hypothesis. Therefore, the results mainly consist of qualitative and descriptive results. The opportunity to provide quantitative information is limited, and no statistical analysis can be conducted.

3. Results

3.1. Participants and course of focus groups

In most focus groups, different stakeholder groups were represented by participants, and the number of participants taking part was similar. Most participants took part in the focus groups they were assigned to. However, some decided to participate in another one, whereas others came late to the event and entered one of the running focus groups. Because of the conflict situation and to avoid refusal among participants, we allowed these deviations. Some participants contributed more than others in most of the focus groups. Participants often described conflict issues from their respective stakeholder group’s viewpoint. Accordingly, they expressed differing opinions regarding relevant topics. Conflict and non-cooperation between
participants were influenced by their differing interests and positions, which were mainly linked to the stakeholder group they represented or they belonged to. Additionally, past experiences of miscommunication or lack of communication and relational problems became apparent as critical variables influencing tensions between participants. Finally, perceived power imbalances contributed to conflict development. Nevertheless, participants discussed the same conflict issues as being most prevalent in all three national parks. Additional information about the participants in each focus group and their contributions as well as about the contents of the focus groups are provided in Supplementary Table 1, Supplementary Table 2, and Supplementary Table 3. Conflict issues are described in chapter 4.2.

Participants developed five different conflict management suggestions, but not all focus groups contributed evenly to the development of every single one. The appearance of a management suggestion depended on the presence of the conflict issues which were discussed before. For example, a focus group which mostly discussed issues of interactional problems or inadequate involvement mainly contributed to the development of suggestions about a regional consortium or exchange and communication. Management suggestions are described in detail in chapter 4.3. Not all criteria which are summarized in the descriptions were mentioned in every focus group.

Focus groups evolved differently. First, the course of conversation differed between a description of problems, an expression of opinions, an evaluation or accuse of stakeholders, a description of processes and coherences or a search for solutions. Second, type of conversation and atmosphere differed, with different degrees of kindness and solidarity or controversies and accusations. No focus group escalated into an open conflict, refusal or non-cooperation of participants, but different levels of frustration and anger or optimism and confidence became apparent. In comparison of focus groups, it stands out that these different developments are linked to participants’ respective stakeholder groups and positions as well as their relationships with each other. Besides, boundary conditions such as the introduction of participants, the common lunch break and the payment of beverages and food helped to foster a positive and constructive atmosphere. During the lunch break, participants interacted more freely and socialized with each other in a positive manner, whereby they tended to sit with other participants they probably already had known before.

After the end of the study, stakeholders were informed about the results of conflict analysis and the management suggestions they had developed by sending them a report. They had the possibility to give feedback to the researchers. Moreover, a regional consortium on wildlife management, as suggested by participants, was implemented in at least one national park (see chapter 4.3.1). There, stakeholders continue to meet on a frequent basis to cooperatively discuss and to work on their local issues. Overall, the research led to discussions about necessary and possible changes in management on both local and nationwide levels, also due to the results
of the introductory mentioned superordinate research project on wildlife management in German national parks.

### 3.2. Conflict issues

As a first conflict issue, participants argued about wildlife damage in agriculture and forestry, such as bark peeling or browsing on rejuvenation of trees by red deer or browsing on corn fields by wild boar. Participants disagreed about its severity and the cause of increasing wildlife populations. Both the decrease of hunting within the national parks and the cultivation of corn or rapeseed in adjacent areas were deemed responsible. Procedures and responsibilities for compensating wildlife damage were also discussed. Another issue related to strategies for wildlife population control, which were considered to be both expedient and insufficient. Likewise, stakeholders held different opinions about the question if measures for controlling wildlife populations should be executed in the national parks or in adjacent areas. In this regard, they also expressed that the formulation of national park hunting acts, ensuring a sufficient wildlife management, was insufficient and that these acts contradicted with other regulations in the neighborhood of the national parks.

Furthermore, participants argued about the lack of a consistent monitoring system for wildlife populations and their impacts as well as about problems of data distribution. In this context, conflicts about the veracity of information became apparent, too. Another prevalent issue was the protection of natural processes. Some participants considered it to be no measurable goal and assumed that it could result in an increase of wildlife populations and diseases and in a decrease of biodiversity, given that some species may be dependent on cultivated landscapes. Others stated that natural processes could develop freely and that typical and threatened species could be protected. In this regard, a decrease in hunting was a contentious topic of discussion, too. Additionally, interactional problems — between opposing stakeholders, between interdependent stakeholders and inside stakeholder groups — became apparent. Different local and federal levels of exchange and the role of the media were also discussed critically. Finally, participants argued about participation and complained that actions were undertaken without adequate involvement. Opportunities to participate in decision-making were discussed contentiously. Existing consortiums for cooperation and involvement in the development of acts and regulations were evaluated as deficient.

### 3.3. Management suggestions

#### 3.3.1. Regional consortium on wildlife management

Participants agreed that implementing an institutionalized regional consortium on wildlife management would be important to deescalate the conflict situation and
to provide a neutral space for interaction. It was discussed if a consortium for all national park-related issues would be appropriate, but an assessment was made that this sort of forum would be unsuitable for addressing the specific issue. Participants emphasized that a consortium should also be based on rules. Responsibilities for coordination and execution should be defined and an administrative office should be implemented. Cooperation and communication should be undertaken locally, directly, and with stakeholders on equal footing. While it was agreed that all affected stakeholders should be represented, there was discussion around whether or not the number of people should be restricted by nominating representatives, for example, of hunters from one municipality. Additionally, it was argued that different communication levels should be considered, for example, between a local private leaseholder of a hunt and a local state-employed forester as well as between the state level hunters’ association and the ministry responsible for forestry. Participants stated that possible tasks could be a regular distribution of information and an exchange about current issues and specific hotspots to prevent conflict development. Furthermore, they stated that a consortium could serve as a framework for an exchange of goals and problems and for a balancing of interests in order to develop and implement joint management strategies and measures.

3.3.2. Exchange and communication

Participants further suggested developing and strengthening relationships. They noted that stakeholders should be better connected, such as hunters and foresters or nature conservationists and land owners, but also the national park administrations and adjacent stakeholders. Moreover, governmental departments or ministries should help with moderation and developing strategies. Additionally, existing institutions, such as hunting communities and advisory boards, should be strengthened or changed in a way that they support local conflict resolution processes. Participants also argued that greater public awareness of topics such as forestry, hunting, agriculture, species conservation, and protected areas should be promoted. They also suggested improving exchange between stakeholders about concepts and goals. Finally, several rules for communication and cooperation were formulated such as respect, acceptance, listening, equal representation, and inclusion. Participants expressed the desire to communicate directly and demanded transparency from each other. They emphasized that it would be better to allow the expression of worries and differences rather than to aim for an enforced unity. Overall, the suggestion was made to address stakeholders’ reservations, to (re-)build trust, and to improve communication between opposing parties. It was noted that all communication levels and stakeholders, ranging from local to state level, should be considered. A regional, direct, and problem-oriented interaction was proposed. Participants expressed the desire for more possibilities to have a say and to make personal contributions.
3.3.3. Management strategies

It was suggested to develop joint management strategies, whereby stakeholders’ goals should be aligned, such as farmers’ cropping plans, foresters’ silvicultural plans, national park administrations’ plans for protecting certain areas, and an overview of tourism hotspots and infrastructure. It was also suggested that national park hunting acts and regulations from adjacent areas should be adjusted to ensure a sufficient legal basis for decisions and actions. Subsequently, specific strategies for influencing the spatial use of wildlife and for wildlife control should be defined while recognizing legal frameworks and wildlife biology. Buffer zones between national parks and adjacent areas were considered to be important localities for coordinated area management. It was noted that vegetation dynamics should be considered, for example, through increasing natural dynamics inside the national parks which influence how wildlife uses space. Additionally, it was emphasized that research, planning, and monitoring should be aligned with stakeholders’ goals and that quotas of wildlife, which are hunted in each hunting season in different areas, should be more effectively negotiated between stakeholders. The importance of formulating short-term, annual, and long-term goals, benchmarks, and recommendations was also noted.

3.3.4. Joint implementation of measures

In addition to strategies, participants mentioned measures to be jointly implemented. They discussed if land use forms susceptible to wildlife damage could be adapted, for example, by altering cultivation of corn fields. Implementing the aforementioned buffer zones was also suggested, in order to execute joint wildlife management activities in these areas and to enable softer transitions between land use activities. Measures to control wildlife movements and impacts, such as partial fencing, were discussed, too. Moreover, there was discussion around a possible evaluation and reduction of human-made feeding sites (designed to attract wildlife for hunting or to provide a food source in winter months) in order to avoid luring wildlife into locations near agricultural or forestry areas. A suggested alternative was to implement rest and grazing areas to consider wildlife biology more effectively and to influence how animals use space. Participants also discussed minimizing disturbance of wildlife caused by human activities by regulating the use of paths, especially inside the national parks. Regarding lethal wildlife control, participants suggested that hunting activities should be better aligned with weather, forest structures, land management, seasonal land use changes, and wildlife biology. Moreover, it was suggested that new methods should be tested with regards to animal welfare, influence on wildlife behavior, efficiency, effectiveness, and disturbance and that hunting activities should be intensified in some areas, such as buffer zones. Additionally, joint hunting activities were suggested as a means of more effectively
controlling wildlife and building trust between, for example, national park staff and different hunters. Finally, participants discussed whether damage that is verifiably caused by wildlife moving from the national parks to used areas outside should be compensated by payments from the federal state or a joint fund of different stakeholders, associations, and institutions.

3.3.5. Monitoring and database

Participants suggested implementing a standardized, long-term monitoring system in the national parks and in adjacent areas to measure vegetation types and species’ habitats as well as wildlife populations and their impacts. Such a database would enable more responsible management decisions, for example, regarding time, space, and intensity of wildlife control measures. Furthermore, it would help to build trust by developing a data-oriented discussion in place of disputes. It would also allow intervention if conflicts emerged, for example, by adapting wildlife control strategies or land use before wildlife damage increases. Participants stated that it would be important to ensure funding, especially in adjacent areas, for example, by implementing a cross-territorial wildlife monitoring program in the related federal state. Additionally, it was noted that responsibilities and methods should be clarified and work to promote acceptance should be done prior to implementation. For example, participants stated that trying to gather information about wildlife on private land in cases of prevalent conflicts involving the owners or users (e.g., foresters, farmers, hunters) may be precarious. Finally, it was argued that improved transparency and communication of existing data should be sought.

3.4. Adaptive co-management characteristics

Adaptive co-management characteristics can be summarized into 13 characteristics which will be exemplified in the following. Because of the circularity and flexibility of adaptive co-management, these are dynamic in nature. They also encompass instrumental and rational as well as normative guidelines and attributes. References, where these descriptions are derived from, are listed at the end of each paragraph.

3.4.1. Well-defined user and resource context

Clear boundaries have to be defined between legitimate users and nonusers. Stakeholders should be connected to ‘place’ to build linkages and trust so that efforts are not undermined by non-local economic and political forces. Likewise, clear boundaries should be defined to separate a resource system from the larger biophysical environment. If possible, the resource system should be small-scaled to reduce competing interests, institutional complexities, and organizational layers. Systems characterized by relatively immobile resource stocks are likely to generate fewer
challenges, while creating an enabling environment for learning. Context should be tailored to case specifics by utilizing the flexibility of adaptive co-management (Ostrom, 1990; Armitage et al., 2009; Cox et al., 2010; Plummer et al., 2013).

3.4.2. Provision of auxiliaries and policy support

Auxiliaries, like funding and training, should be provided for local-, regional-, and national-level stakeholders to facilitate collaboration and sharing of decision-making power. Collaborative processes and stakeholder involvement should be supported through policy. Support can be articulated through legislation or land claim agreements and the willingness to distribute functions across organizational levels. Support across policy sectors enhances the likelihood of success and promotes clear objectives, provides capacities, and devolves power to local stakeholders. Policy support can also establish and enhance legitimacy and accountability (Armitage et al., 2009; Plummer et al., 2013; Cosens et al., 2017).

3.4.3. Reasonably clear appropriation and provision rules

Appropriation and provision rules should be congruent with local social-ecological conditions. Common property and individual rights to resource use should be reasonably clear. Benefits obtained by users from a common-pool resource, as determined by appropriation rules, should be proportional to the input required in the form of labor, material resources or money, as determined by provision rules. These rights need to be associated with responsibilities (e.g., for conservation practices or participation in resource management) and are therefore linked to legitimacy and accountability. Moreover, individuals affected by operational rules should be able to participate in modifying these. Clear rights enhance security of access and incentives and may better facilitate governance innovation and learning over the long term (Ostrom, 1990; Armitage et al., 2009; Cox et al., 2010).

3.4.4. Legitimacy

Legitimacy refers to the acceptance and justification of shared rules. It concerns who is entitled to make rules and how authority is generated. An authority’s validity to govern may be conferred by law or democratic mandate, earned through the acceptance of stakeholders or earned through long association with a particular place. It depends on the extent to which the governing body’s decisions and actions are consistent with its mandate and the objectives of the area for which it is responsible as well as on the integrity and commitment with which authority is exercised. Legitimacy is enhanced through stakeholder involvement, assists with coordination of information, supports the undertaking of new collaborations, and encourages compliance. Thereby, stakeholders’ rights to devise their own institutions should not be challenged by external governmental authorities (Ostrom, 1990; Plummer
3.4.5. Accountability and responsibilities

Accountability refers to allocation and acceptance of responsibility for decisions and actions. Accountability is generated as an outcome, given that responsibility is shared collectively and transparently by stakeholders and that consequences are collectively accepted. As such, responsibilities should be allocated to those institutional levels that match the scale of issues and values being addressed. Hence, stakeholders should fill a variety of roles to share responsibility and power in a democratic way. With decentralization, it has to be ensured that power is fairly distributed and not captured by local elites. Likewise, accountability refers to the extent of answerability. The governing body should be answerable to ‘higher-level’ authorities (upward accountability) and to its constituency (downward accountability) (Armitage et al., 2009; Berkes, 2009; Lockwood, 2010; Plummer et al., 2013).

3.4.6. Bridging knowledge and transparency

Multiple sources of knowledge should be incorporated. Knowledge should be co-produced by non-experts and experts, building on complementarities between local and scientific knowledge as well as skills and capacities of stakeholders at different organizational levels. This might include participatory scenario building to question different assumptions, routines, values, and governance. Bridging knowledge enhances the local capacity for creative ideas for problem solving, environmental decision-making, and the design of appropriate resource management strategies. It develops social-ecological understanding, social capital, trust, and learning. Knowing is dynamic and relies on observation, validation, and adaptation and is linked to networks and systems, communication, and learning. Consideration should be given to transparency regarding accessible information, the visibility of decision-making processes, the clarity with which the reasoning behind decisions is communicated, and the availability of information about a governance authority’s performance (Plummer and Armitage, 2007; Armitage et al., 2009; Berkes, 2009; Lockwood, 2010; Plummer et al., 2013).

3.4.7. Inclusiveness and fairness

All stakeholders should be able to participate in and influence decision-making processes and actions. Input should be sought from multiple sources, valuing stakeholders’ views and diversity. Moreover, it should be enabled by policies and structures which foster stakeholder contributions and involvement. Particular efforts should be made to involve marginalized and disadvantaged stakeholders and to develop respect between stakeholders. Debate, conflict, and dissent should be accommodated and respected. Human and indigenous rights and nature’s intrinsic
value should be recognized. Consideration should also be given to the intra- and intergenerational distribution of costs and benefits of decisions. Decision-making should be consistent and made without personal bias (Borrini-Feyerabend et al., 2007; Lockwood, 2010).

3.4.8. Participation, interactions, and institutionalized cooperation

Incentives and opportunities for participation should be implemented and cooperation building should be supported. Interactions between individuals and/or organizations are important — both within and across different scales and governance levels — and may forge horizontal and vertical connections. These should be coordinated between stakeholders of, for example, protected area authorities, tourism, forestry, agriculture, hunting, planning, and management. There should also be coherence in policy intent and the direction within and between levels of protected area governance. Cooperation-building tactics can include continuous physical presence, regular contact with people close to decision-makers, maintenance of multiple programs for different groups, and flexibility in resource allocation and schedules. Governance could then be organized in multiple layers of nested enterprises. New institutional arrangements may be formed to enable continuous cooperation. Commitments to a long-term institution building process can provide a degree of relative stability in the context of numerous changes and stresses from within and outside the system (Plummer and Armitage, 2007; Armitage et al., 2009; Ostrom, 2009; Cox et al., 2010; Lockwood, 2010; Plummer et al., 2013; Cosens et al., 2017).

3.4.9. Coordination by key leaders or bridging organizations

The process should be championed by key leaders or bridging organizations, to maintain a focus on collaboration and the creation of opportunities for reflection and learning. These individuals should have a long-term connection to ‘place’ and the resource, or, if they are within a bureaucracy, to policy and its implementation. Such individuals are also viewed as effective mediators in resolving conflict and act as intermediaries that develop key connections and facilitate group processes (Armitage et al., 2009; Plummer et al., 2013).

3.4.10. Conflict-resolution mechanisms and sanctions

Stakeholders should have rapid access to local arenas to resolve conflicts. The outcome of conflict resolution should be acceptable to all parties and no party should assert interests to the detriment of others. In this regard, stakeholders should also agree on graduated sanctions. Stakeholders who violate operational rules are likely to be subjected to graduated sanctions (depending on the seriousness and the context
of the offense) by other stakeholders, by officials accountable to them, or by both (Ostrom, 1990; Plummer and Armitage, 2007; Cox et al., 2010; Redpath et al., 2013).

3.4.11. Management plans and measures

Resource management plans and a codified statement of actions should be formulated. Hence, an adaptable set of management measures should be implemented. These measures should include economic, regulatory, and collaborative tools. Stakeholders must have flexibility to test and apply a diversity of management measures or tools to achieve desired outcomes (Plummer and Armitage, 2007; Armitage et al., 2009).

3.4.12. Adaptiveness, flexibility, and learning

Adaptiveness, flexibility, and learning are essential to address uncertainty and change and can effectively be combined with collaboration. Adaptive capacity should be sought, developing resilience and flexibly to live with uncertainty and to deal with cross-scale dynamics. Tools for anticipating and managing threats, opportunities, and associated risks should be developed. A balance between flexibility and security has to be found. New knowledge and learning should be incorporated into decision-making and implementation. Specificity is required in the employment of learning and attention needs to be paid to its definition, expectations, underlying mechanisms, participants, and ethical issues. Learning should also include systematically reflecting on individual, organizational, and system performance, which links directly to assessment and monitoring (Plummer and Armitage, 2007; Cundill and Fabricius, 2009; Lockwood, 2010; Plummer et al., 2013).

3.4.13. Assessment and collaborative monitoring

For assessment and monitoring, insights about the system are continuously generated, which are based on feedback, and should be used to adjust management. Monitoring should be conducted collaboratively and stakeholders should help in deciding what to monitor. Likewise, local ways of reading environmental signs can widen the range of information available. External drivers, stakeholders, resources, and the governance process should be monitored. At the same time, those who conduct the monitoring should be accountable to stakeholders. Assessment and learning can take place in a multiple loop learning framework (Ostrom, 1990; Armitage et al., 2008; Berkes, 2009; Cundill and Fabricius, 2009; Cox et al., 2010; Plummer et al., 2013).

3.5. Consistencies of management suggestions and adaptive co-management characteristics

Participants’ management suggestions show several consistencies with the description of adaptive co-management characteristics. However, not all criteria of the
description of each adaptive co-management characteristic are part of the management suggestions (Table 4).

Bridging knowledge and transparency, inclusiveness and fairness, participation, and interactions and institutionalized cooperation are represented to a high degree in the management suggestions. These characteristics are reflected in the regional consortium on wildlife management and in exchange and communication. For the most part, both management suggestions are virtually an adaptation of these characteristics to local case-specific conditions. The same is true of management plans and measures, which formed the core of the description of management plans and joint implementation of measures. Well-defined user and resource context, provision of auxiliaries and support, reasonably clear appropriation and provision rules, legitimacy, and accountability and responsibilities are reflected to a lesser extent. Several aspects of these characteristics are spread out especially in the regional consortium on wildlife management, exchange and communication, and management strategies. However, only some criteria are reflected, and these were often mentioned with regards to the interactional and collaborative aspects depicted above. Several basic characteristics regarding appropriation and provision rules as well as accountability and responsibilities are missing. Coordination by key leaders or bridging organizations and conflict-resolution mechanisms and sanctions are also included to a minor degree. These are mainly reflected in the regional consortium on wildlife management, in exchange and communication, in management strategies, and in joint implementation of measures. Regarding conflict-resolution mechanisms and sanctions, participants’ recommendations restricted to the importance of the suggestion to serve as areas for conflict resolution, but other elements are missing. Adaptiveness, flexibility, and learning and assessment and collaborative monitoring can be found in the joint implementation of measures and in monitoring and database. Several aspects of these characteristics were mentioned by participants in the context of the case-specific context. However, these characteristics were discussed with regards to the wildlife species and their impacts, whereas consideration of higher levels to monitor, such as stakeholders and governance processes, is missing.

4. Discussion

4.1. Classification of results

Similar conflict issues and management suggestions were identified for the three case study areas. These issues show a picture of conservation conflicts in the context of German national parks and are comparable to international case studies (Redpath et al., 2015b). Management suggestions are directly linked to conflict issues and build upon them. A central regional consortium on wildlife management is supported by broad exchange and communication between stakeholders. These two
suggestions are a frame where the other ones are embedded in, i.e., management strategies, joint implementation of measures, and monitoring and database, which are oriented towards on-site management and practical management processes.

Taking up the introductory hypothesis, stakeholders were partially capable of developing approaches for the adaptive co-management of their own conservation conflict context. The different degree to which adaptive co-management characteristics are reflected in participants’ management suggestions indicates that their ideas for conservation conflict resolution are mostly related to the interactional, knowledge-exchanging, collaborative, structural, and practice-oriented nature of adaptive co-management. Partially, this resembles aspects of an emerging adaptive co-management process, where knowledge is built, social networks are developed, and visions and goals are formulated (Olsson et al., 2004). Likewise, in various studies, where affected stakeholders were involved to find solutions for environmental problems, they also suggested institutionalized regional consortiums for exchange, provision of political and financial support, fostering communication and cooperation between stakeholders, and promoting respect and transparency (e.g., Olko et al., 2011; Zurba et al., 2012). They focused on the development of trust, knowledge exchange, networking, leadership, and community empowerment, too (Butler et al., 2016a).

At the same time, various characteristics of adaptive co-management were not captured by participants. Political context and rules were underrepresented which may be caused by the German situation. Compared to other social-ecological contexts, where appropriation and provision rules are not clearly regulated or unfairly distributed, the German system has clear regulations. However, it is also possible that participants perceived questions of political context and rules as frameworks which can only be addressed by superordinate political and legislative institutions. Political and legal issues are often components of adaptive co-management processes which can hardly be changed by local stakeholders but have a crucial influence on the success of the process (DeCaro et al., 2017).

Adaptability, flexibility and learning, and monitoring were considered by participants, but only with regards to resource-related issues, especially tests, adaptations, and measurements in wildlife management. It might be further away from participants’ experiences and thought processes to evaluate underlying causes and values, stakeholders, and governance processes as something that should also be monitored and approached adaptively. The same has been observed in adaptive co-management processes over longer time spans, where stakeholders lacked in double- and triple-loop learning and implementation of adaptive strategies (Butler et al., 2016a). Overall, participants were highly capable of developing collaborative aspects of adaptive co-management. However, political context, rules, and adaptiveness were underrepresented and, therefore, were probably hard to be recognized by stakeholders.
Table 4. Consistencies of participants’ management suggestions and adaptive co-management characteristics.

| Adaptive co-management characteristics | Participants’ management suggestions | Management strategies | Joint implementation of measures | Monitoring and database |
|----------------------------------------|----------------------------------------|------------------------|---------------------------------|-------------------------|
|                                        | **Regional consortium on wildlife management** | **Exchange and communication** | **Fit of context to case specifics** | **Provision of auxiliaries, like funding** |
| Well-defined user and resource context | Connection of stakeholders to ‘place’ Small-scaling of resource system Fit of context to case specifics | Connection of stakeholders to ‘place’ Small-scaling of resource system | | Provision of auxiliaries, like funding |
| Provision of auxiliaries and policy support | Support of collaborative processes and stakeholder involvement through policy Distribution of functions across organizational levels | Articulation of support through legislation or land claim agreements | | Support across policy sectors |
| Reasonably clear appropriation and provision rules | Congruency of appropriation and provision rules with local social-ecological conditions | Acceptance and justification of shared rule Consistency of the responsible governing bodies’ decisions and actions with their mandate and objectives of the area | | |
| Legitimacy | Stakeholder involvement, coordination of information, undertaking of new collaborations, and encouragement of compliance Development of an own institution by stakeholders | Stakeholder involvement, coordination of information Consistency of existing institutions’ decisions and actions with their mandate and objectives of the area | | |
| Accountability and responsibilities | Collective and transparent sharing of responsibility by stakeholders | | | |
| Bridging knowledge and transparency | Participatory scenario building to question different assumptions, routines, values, and governance Building on skills and capacities of stakeholders at different organizational levels | Incorporation of multiple sources of knowledge Building on skills and capacities of stakeholders at different organizational levels Consideration of transparency regarding accessible information, visibility of decision-making processes, and clarity of reasoning behind decisions | | |

(continued on next page)
| Adaptive co-management characteristics | Participants’ management suggestions | exchange and communication | Management strategies | Joint implementation of measures | Monitoring and database |
|---------------------------------------|------------------------------------|-----------------------------|----------------------|-------------------------------|-------------------------|
| Inclusiveness and fairness            | Possibility for all stakeholders to participate in and influence decision-making processes and actions  
Development of respect between stakeholders | Possibility for all stakeholders to participate in and influence decision-making processes and actions | Coordination of interactions between stakeholders  
Possibility for all stakeholders to participate in and influence decision-making processes and actions | Coordination of interactions between stakeholders |
| Participation, interactions, and institutionalized cooperation | Implementation of incentives and opportunities for participation, support of cooperation building  
Consideration of interactions between individuals and/or organizations within and across different scales and governance levels, forging of horizontal and vertical connections  
Coordination of interactions between stakeholders  
Formation of new institutional arrangement to enable continuous cooperation | Consideration of interactions between individuals and/or organizations within and across different scales and governance levels, forging of horizontal and vertical connections  
Maintenance of multiple programs for different groups | Coordination of interactions between stakeholders  
Flexibility in resource allocation and schedules | Coordination of interactions between stakeholders |
| Coordination by key leaders or bridging organizations | Advocacy of the process by bridging organization  
Long-term connection of it to policy and its implementation | Rapid access for stakeholders to local arenas for conflict resolution | Formulation of resource management plans and a codified statement of actions  
Implementation of an adaptable set of management measures  
Economic, regulatory, and collaborative tools  
Test and application of a diversity of management measures | Graduated sanctions |
| Conflict-resolution mechanisms and sanctions | Rapid access of stakeholders to local arenas for conflict resolution | Rapid access for stakeholders to local arenas for conflict resolution | Formulation of resource management plans and a codified statement of actions  
Implementation of an adaptable set of management measures  
Economic, regulatory, and collaborative tools  
Test and application of a diversity of management measures | Graduated sanctions |

(continued on next page)
Table 4. (Continued)

| Management strategies | Participants’ management suggestions |
|-----------------------|---------------------------------------|
| Adaptive co-management characteristics | Exchange and communication |
| Participants’ management suggestions | Regional consortia on wildlife management |
| Management strategies | Joint implementation of measures |
| Monitoring and database | Monitoring and collaboration |

| Management strategies | Participants’ management suggestions |
|-----------------------|---------------------------------------|
| Adaptive co-management characteristics | Exchange and communication |
| Participants’ management suggestions | Regional consortia on wildlife management |
| Management strategies | Joint implementation of measures |
| Monitoring and database | Monitoring and collaboration |

| Management strategies | Participants’ management suggestions |
|-----------------------|---------------------------------------|
| Adaptive co-management characteristics | Exchange and communication |
| Participants’ management suggestions | Regional consortia on wildlife management |
| Management strategies | Joint implementation of measures |
| Monitoring and database | Monitoring and collaboration |

| Management strategies | Participants’ management suggestions |
|-----------------------|---------------------------------------|
| Adaptive co-management characteristics | Exchange and communication |
| Participants’ management suggestions | Regional consortia on wildlife management |
| Management strategies | Joint implementation of measures |
| Monitoring and database | Monitoring and collaboration |

| Management strategies | Participants’ management suggestions |
|-----------------------|---------------------------------------|
| Adaptive co-management characteristics | Exchange and communication |
| Participants’ management suggestions | Regional consortia on wildlife management |
| Management strategies | Joint implementation of measures |
| Monitoring and database | Monitoring and collaboration |

| Management strategies | Participants’ management suggestions |
|-----------------------|---------------------------------------|
| Adaptive co-management characteristics | Exchange and communication |
| Participants’ management suggestions | Regional consortia on wildlife management |
| Management strategies | Joint implementation of measures |
| Monitoring and database | Monitoring and collaboration |
4.2. Lessons learned for conservation conflict management

The experimental examination of adaptive co-management provided unique insights into a specific conservation conflict context. It enabled participants to interact relatively free, without directing exchange by prescriptive frameworks. The approach promoted empowerment, because participants saw their contributions reflected in a set of suggestions which directly address their conservation conflict issues. Concurrently, it contributed to an emergence of linkages and a bridging of knowledge between participants (cf. Berkes, 2009). The developed management suggestions are most probably accepted by stakeholders, are adapted to the case-specific context, and are at the same time confirmed by adaptive co-management literature. Therefore, a proper implementation of these may prepare the system for change, a first stage in an adaptive co-management transformation (Olsson et al., 2004). However, for the development of a successful process, adaptive co-management characteristics not captured by participants have to be regarded, i.e., political context and rules as well as adaptability, flexibility and learning, and monitoring. Here, an analysis using a social-ecological system approach may provide further insights (McGinnis and Ostrom, 2014; Williams and Tai, 2016). Beyond, development of adaptive co-management processes over time was analyzed in various other scientific projects, comparing multiple case study areas. Like in the present study, these were located in similar settings or similar conservation-related issues were encountered. Process evolution differed between case study areas, depending on the development of adaptive co-management characteristics and contextual factors outside of specific, local processes (Cundill and Fabricius, 2010; Clark and Slocombe, 2011; Smedstad and Gosnell, 2013). Accordingly, further development of adaptive co-management processes in our case study areas may differ, even if participants’ management suggestions provide a similar starting point. Hereafter, general key aspects that have to be considered in further management as well as specific implications for protected area managers are discussed.

Transition processes are characteristic for the different stages they pass through and their long-term nature (Olsson et al., 2004; Loorbach, 2010). Therefore, the development of a successful adaptive co-management process in our case studies may take up to five to ten years (Butler et al., 2016a). After priming stakeholders, the emergence of policy windows or windows of opportunity has been observed as a stage where the process reaches a crossroads. If enabling policies and programs are implemented in the German cases, the processes may further develop (Butler et al., 2016b). Equally, political and legal issues have to be addressed by superordinate governmental levels and laws have to be adapted towards more flexibility, even if regulations are clear, but rather steady in their current form (Cosens et al., 2017). Subsequently, resilience and adaptability may be built if an appropriate set of adaptive pathways has been developed. This requires to further examine possible
implementations of adaptability, flexibility, and learning in the case study areas (Olsson et al., 2004; Butler et al., 2016b). Thereby, it has to be considered that "adaptive co-management as a process should not be conflated with adaptive co-management as an outcome; one does not necessarily lead to the other" (Smedstad and Gosnell, 2013, p. 9). Therefore, a monitoring process has to accompany the process from the beginning. To accomplish these various tasks and to coordinate the process long-term, facilitation by skilled individuals is needed, who understand the theory and practice of adaptive co-management (Cundill and Fabricius, 2010). If results are interpreted and reflected to stakeholders appropriately, scientific insights and locally adapted solutions can be bridged (Clark and Slocombe, 2011). Likewise, facilitators provide the opportunity to anticipate obstacles which may counter the process. In summary, the further development in each case study area depends on the evolution of each local process and of contextual factors such as state level politics — even if similar conflict issues are encountered and similar management suggestions have been developed.

In our case study areas, chances are good that the protected area managers could take over the role of facilitators. Although being part of one of the conflict parties, many participants expressed their 'expectation' that the national park administrations took over responsibility for the further development of the process. Therefore, complementary to the aforementioned general key aspects for further management, there are specific implications these managers could recognize. First, they could directly build upon the jointly developed management suggestions of participations and implement a regional consortium on wildlife management, to take over the responsibility for further joining stakeholders cooperatively in the process. As exemplified above, the rules for exchange and communication could provide orientation for a proper way of communication with each other, with management strategies, implementation of measures, and monitoring as concrete tasks to be worked on by the stakeholders. Second, the outcomes of the study could be used for communication with, for example, higher-order decision makers but also with parties still skeptical towards the process. In this regard, the results could be used to show the potential for conflict solution by supporting a local process, but also to underline the importance of providing support in areas which were not captured or which cannot be changed by local stakeholders such as rules and laws. Third, managers could translate the results to a more practice-oriented language, for example, regarding the concepts and importance of adaptability, flexibility, and learning.

This also points to the importance of further linking science and practice, and the responsibility of science to translate the results so that local stakeholders could benefit from them — which in turn would require sufficient funding and political support to be realized. Finally, an evaluation of the adaptive co-management process could be applied by the managers by using indicators based on scientific criteria but which are also understandable to stakeholders, such as the ones developed by Butler et al. (2015).
5. Conclusion

5.1. Opportunities and limitations of the research approach

The interactional and transdisciplinary approach resulted in the description of a commonly framed reality by participants that probably reflects ‘the big picture’ of the case studies as they perceive it. Participants brought their viewpoints into discussion and had to deal with the perspectives of each other, leading to commonly developed conflict management suggestions. Similar to other studies, dialogue and knowledge exchange led to social learning and depletion of mistrust (Stöhr et al., 2014). However, by using an interactional and transdisciplinary approach, participants influenced each other. Social pressure could have led to incomplete or socially accepted statements which differ from those that might have been given in individual interviews. Likewise, since focus groups were moderated, the inquiry was possibly also influenced by the moderators (Treves et al., 2006). Moreover, in situations where conflicts escalated to a higher level, the conduction of focus groups may not have been possible (Butler et al., 2015).

Moderators acted as brokers who brought participants together. During the focus groups, they helped to structure the course by using guiding questions, noting intermediate results, and ensuring that everyone had the opportunity to speak. In this regard, they facilitated exchange between stakeholders as catalysts who helped with bridging communication and knowledge (Baird et al., 2014). They took over responsibility for the course of conversation and provided a neutral setting for discussion between participants. Yet, participants’ perceptions of and attitudes towards the moderators and their respective institutions as well as the general framing of the event might have influenced their contributions. Likewise, not all participants contributed evenly to the discussion; some of them remained quiet nearly all the time. Furthermore, one focus group would not have been sufficient to develop the management suggestions in their current extent. Course and interaction of focus groups depended on the presence of conflict issues as well as participants’ stakeholder groups, occupational positions, and relationships. Therefore, the conduction of several focus groups led to different interaction processes. We observed that bringing different stakeholders together to work and discuss throughout the day created a sense of a shared field of issues, although participants’ opinions differed. The development of a shared understanding has also been observed by Smedstad and Gosnell (2013). Likewise, the realization of the event signalized that local issues were noticed and valued. These findings reinforce the notion that conflicts (and their presence in discussion) are a triggering factor for adaptive co-management to emerge but also a challenge for the process (Trimble and Berkes, 2015).

Regarding the synthesis of adaptive co-management characteristics used to classify participants’ suggestions, we included data derived from review papers, conceptual
works, and case studies. By checking and comparing literature for similar characteristics and by combining definitions in a joint description, the overview contains redundancies which ensure reliability of these characteristics. Concurrently, we cannot claim that our synthesis is as comprehensive as publications which solely focus on a literature review. In scientific literature, different approaches have been used to organize adaptive co-management into conceptualizations (Stöhr et al., 2014). Therefore, our illustration of different characteristics does not outline a definite framework of adaptive co-management.

5.2. Further research on adaptive co-management of conservation conflicts

In general, we recommend that research should further examine local stakeholders’ capabilities to develop adaptive co-management processes if they are triggered to interact, particularly in a conservation conflict context. Continuation of such research helps to gain further knowledge about ways participative approaches can promote social learning and help in environmental decision-making (Reed, 2008). From our experience, consideration has to be given to several aspects in study design and execution that may influence the results. Prevalent conflict issues as well as stakeholder groups and their representation in research projects and in evolving adaptive co-management processes have to be regarded. Both aspects influenced the development and outcomes of our experiment remarkably. Likewise, ways to trigger interaction between stakeholders, for example, by the organization of events and workshops, as well as composition of focus groups and moderators’ background, role, and actions are crucial. The opportunity to learn about the autonomous development of adaptive co-management in particular cases can be provided by framing an interactional research approach in an open and free manner. It can be facilitated if no principles are applied prescriptively, while it is signalized towards stakeholders that conflicts should be analyzed and solutions be searched. Thereby, a reflection on focus group outcomes with regards to existing research helps to classify the results, to identify gaps or blind spots that need special consideration and to link the findings to current scientific discussions. In this regard, scaling up different local processes, linking knowledge and bridging networks between various case study areas, states or regions can create synergies to learn and adjust management with regards of each other (Weeks and Jupiter, 2013). At the same time, findings should be communicated with politics, local management and affected stakeholders, to connect research and further practical local processes and to build partnerships (Young et al., 2010; Butler et al., 2016b). For conservation conflicts, the approach provides the possibility to develop sustainable and flexible solutions which are adapted to specific contexts. Further results from various contexts can provide additional insights about key points of connection between case-specific processes and general adaptive co-management criteria.
Declarations

Author contribution statement

Stefan Ehrhart: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Wrote the paper.

Ulrich Schraml: Conceived and designed the experiments; Performed the experiments; Wrote the paper.

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Competing interest statement

The authors declare no conflict of interest.

Additional information

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