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ORIGINAL PAPER

Conflicts between humans over wildlife management: on the diversity of stakeholder attitudes and implications for conflict management

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Abstract Conflicts involving wildlife are, in essence, often conflicts between human parties with differing wildlife management objectives. However, the study and management of wildlife conflicts often focuses on the ecological context without addressing disagreements between people over these objectives. This research uses quantitative approaches to examine actors' views on a complex wildlife-related conflict: a raptor of conservation concern that impacts on game-bird management. Four dominant elements of the debate emerged from initial semi-structured interviews: perceptions of conflict related issues; perceptions of each other; perceived barriers to consensus within the debate; and assessment of proposed practical management solutions. A quantitative survey that built on these elements demonstrates the degree to which perceptions differ between groups and how local variation in these elements may be obscured in a regional or national level debate. The findings emphasise the importance of understanding the social issues involved in wildlife related conflicts if management aims are to be agreed and achieved.

Keywords Attitudes · Biodiversity · Conflict · Conservation · Hen harrier · Red grouse · Stakeholders · Wildlife management

Abbreviations

UK	United Kingdom
RSPB	Royal Society for the Protection of Birds
RSG	Raptor study group
SNH	Scottish Natural Heritage

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PCA	Principal Component Analysis
ANOVA	Analysis of variance
SPA	Special protection area
SEERAD	Scottish Executive Environment and Rural Affairs Department

Introduction

Biodiversity or wildlife-related conflicts are often described as situations where wildlife comes into conflict with humans over common resources (Conover 2002; Graham et al. 2005). However, in many situations, particularly in those where conservation organisations are active, conflicts take the form of disputes between different stakeholder groups over wildlife management goals or priorities, and this is increasingly being acknowledged (e.g. Woodroffe et al. 2005). In this study, biodiversity conflicts are defined as situations in which the interests of two or more parties towards the goods and services provided by a wildlife-related resource differ, and when at least one of the parties is perceived to assert its interests at the expense of another party's interests (Bennett et al. 2001; Young et al. 2005). This definition emphasises the significance of actors' perceptions of each others' values and goals, and their roles and responsibilities in relation to the situation in question: thus a conflict emerges due to actors' attributions and interpretations of the situation rather than as a direct consequence of competition over resources (Yasmi et al. 2006).

Conflicts and disputes arising from predators and their impact on commercial or conservation interests have prompted research efforts, principally from an ecological perspective, focussed on how such situations might be better managed (e.g. Packer and Birks 1999; Redpath et al. 2004; Thirgood et al. 2000). Whilst undeniably important in defining the problem and for the development of wildlife management solutions, such studies often ignore the presence of social and economic factors that have an influence on which solutions are considered acceptable. Young et al. (2005) reviewed the various drivers of biodiversity change and their impacts, and the mechanisms through which conflicts have been studied and managed. Their conclusions highlight the importance of interdisciplinary approaches to understanding such problems and finding sustainable solutions to them. This corresponds with evidence that even a combination of ecological and economic perspectives is often not sufficient given that conservation-related conflict may not derive from differing economic or technical land-use objectives, but rather on more complex factors including social aspects such as psychological reactance and social identity (Stoll-Kleemann 2001). Recent qualitative research shows that the development of conservation management schemes is affected by a complex range of criteria and this has implications for the design of such schemes, and the way in which their aims are communicated to those affected (Schenk et al. 2007). The need for this participation is now argued to be essential; Sarewitz (2004) suggests that the process in which stakeholders are involved is as important to the management of controversial environmental situations as the transparent use of robust ecological research findings. There is now a growing awareness amongst conservation biologists that sociological and psychological approaches are often required to achieve an understanding of such issues. If management actions are to be accepted by stakeholders

and prove successful in setting and achieving their aims then consideration must be given to how such management will affect peoples' lives and elements of their culture, identity and relationship with the environment (Endter-Wada et al. 1998; Mascia et al. 2003; Clayton and Brook 2005).

In line with the definition of biodiversity conflicts given above, we suggest distinguishing between two different, but necessarily related dimensions of actors' views on the situation in question: (i) their perception of how the natural resources are affected and the implication of this for their livelihoods, and (ii) the perceptions they have of their own position in the debate, and that of the other actors involved. Recently, research on the first dimension has been increasing, addressing, for example, the question of how individuals' values inform their attitudes towards resource management in the contexts of National Park designation (Cihar and Stankova 2006) and livestock and carnivore management (Marker et al. 2003; Bagchi and Mishra 2006). Decision modelling and decision analysis have been undertaken with stakeholders both in order to better understand their perceptions of the ecological aspects of particular conflicts and to explore pragmatic approaches for finding solutions (Maguire and Boiney 1994; Redpath et al. 2004).

Here we explore both the first and the second dimension, and investigate the values underlying individuals' positions and interpretations with respect to a situation in Scotland. We focus on the current debate between those interested in managing moorland for grouse (*Lagopus lagopus scoticus*) for driven shooting (where quarry are flushed over stationary guns by 'beaters'), and those supporting the conservation of a protected raptor, the hen harrier (*Circus cyaneus*). Research has suggested that there has been a positive association between grouse management and the rate of recorded raptor persecution (Etheridge et al. 1997), and that this persecution increased between 1993 and 2000 (Whitfield et al. 2003).

Aspects of the predator–prey-habitat interactions involving hen harriers, their main prey meadow pipits (*Anthus pratensis*) and field voles (*Microtus agrestis*), and their impacts on red grouse have been studied in the UK (Redpath 1991; Thirgood et al. 2000, 2002). This work has supported the perception that harriers can, under certain circumstances, have a major impact on grouse stocks. A review of European research showed other examples of the impact of raptors on game species (Valkama et al. 2005). Various wildlife and habitat management solutions have been proposed (Thirgood et al. 2000) and a decision modelling exercise was undertaken that gathered stakeholders to discuss alternative management options (Redpath et al. 2004). This work demonstrated that uncertainty regarding the efficacy of proposed management solutions may make decision making more difficult. For example, results of field testing one of the proposed methods (diversionary feeding) showed that it could reduce hen harrier predation on grouse chicks, but the study was unable to test whether feeding would lead to increased numbers of grouse available for shooting later that year (Redpath et al. 2001).

Our research aims to go beyond these ecological issues and examines the actors' (both those involved in grouse management and those involved in hen harrier monitoring and conservation) perceptions of each other and their natural environment and livelihoods, and the variation in their attitudes towards the hen harrier—grouse conflict in relation to their affiliation and geographical location. Research into how actors' perceptions of their own and others' positions and roles within a debate can impact on natural resource conflicts is uncommon (Stoll-Kleemann 2001), and our aim here is to demonstrate the relevance of such research to understanding and managing

conflicts. We distinguish between (a) the position that an individual holds with regard to certain issues related to the conflict, and (b) the importance that these issues are perceived to have in the debate. We also assess actors' perceptions of what they consider to be barriers to consensus, i.e., the procedural dimension of the conflict, and relate these findings to views on the practical management solutions proposed to date.

Methods

Research on stakeholders' views in conflictive situations has tended towards a qualitative perspective (Bennett et al. 2001; Stoll-Kleemann 2001). Whilst grounded on exploratory qualitative work, we choose here to apply quantitative techniques for several reasons. Firstly, quantitative methods are more suitable to reduce the complexity of results when large-scale perspectives are required. Secondly, they allow testing of hypotheses using statistical techniques and thus comparisons between sub-samples. Thirdly, they provide results compatible with the majority of economic and ecological data, and often easier to communicate to natural scientists, resource managers and many economists. We aimed to explore the spectrum of actors' perceptions of each other, the management of hen harriers and grouse, and the process of conflict management, as well as the reasons for variation in their perceptions and attitudes.

Sampling

We conducted interviews with a range of different actors selected on the basis of belonging to one of two pre-defined groups:

(i) those with hen harrier conservation or protection interests (raptor study group (RSG) members, Royal Society for the Protection of Birds (RSPB) officers, Scottish Natural Heritage (SNH) area officers, Police Wildlife Crime Officers)
(ii) those with grouse management/ shooting interests (landowners/estate managers, grouse managers).

Respondents were selected using a snowballing procedure where researchers identified key initial interviewees and these individuals subsequently provided contact information for further interviewees that they considered appropriate. It is the range of responses that was of interest across the respondents, and the application of complex statistical procedures was not intended, so uneven numbers in each group do not represent a significant problem. Overall, 44 individuals were interviewed. Of these, 27 were defined as having grouse management backgrounds and 17 as having hen harrier conservation interests (Table 1).

Study sites

Both of the above groups were represented in each of three study areas (Fig. 1, Table 1). These areas were selected on the basis that, in general, they had different land management histories, different types of moorland habitat, different densities of grouse and hen harrier numbers, and different approaches to grouse management (Redpath *pers. comm.*). These factors were assumed to play a role in shaping the conflict and led to the following selection;

Table 1 Sample composition by affiliation to pre-defined groups and study sites

		North Scotland	NE Scotland	Southern Scotland	Total
Grouse	Grouse keeper	5	5	8	27
	Estate manager/landowner	2	5	2	
Hen harrier	Volunteer		2	3	17
	Statutory agency employee	2	2	2	
	Conservation body employee	2	1	1	
	Police		1	1	
Total		11	16	17	44

(i) East Sutherland and Caithness in Northern Scotland are known to have low densities of grouse, some breeding harriers and few estates involved in actively managing moors to provide grouse for either driven shooting or the less intensive walk-up shooting.
(ii) Estates in NE Scotland possess relatively high densities of grouse, very few harriers, and many estates employ keepers who aim to provide high densities of grouse for shooting.

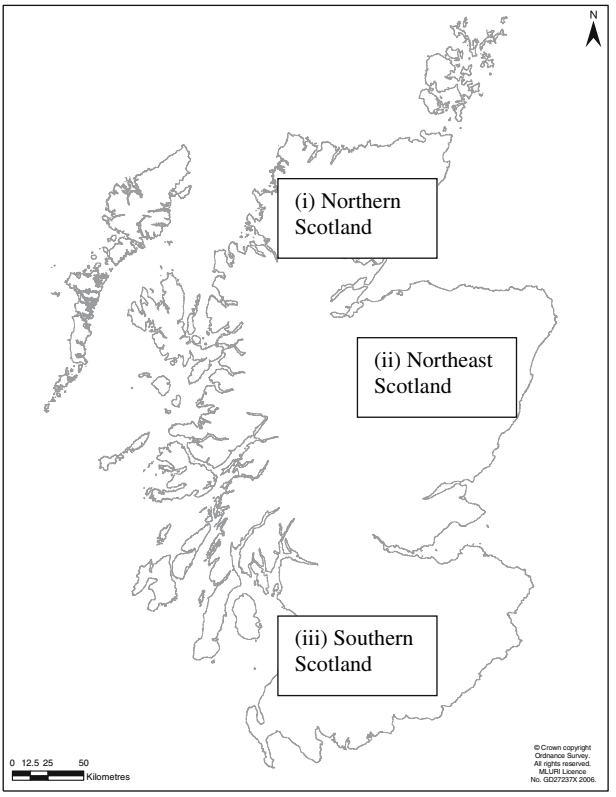

Fig. 1 Location of the three study areas in Scotland. © Crown Copyright Ordnance Survey. All rights reserved. MLURI licence number GD27237X 2006

(iii) In Southern Scotland, driven grouse shooting has declined considerably in the past decade and the moors now support few grouse. Hen harriers have occurred locally at high densities in this region, but are now restricted in range and number, normally on non-grouse moors.

Survey design: scoping study and main survey development

A qualitative scoping study involved semi-structured interviews with 15 individuals from the three fieldwork areas: seven with hen harrier conservation interests and eight with grouse management backgrounds. Interview topics were derived partly from the conclusions of previous research on this debate (Redpath et al. 2004; Thirgood et al. 2000) and involved:

- values associated with grouse moors, raptors etc.,
- practical issues relating to grouse moor management,
- perceived relationships and trust between individuals of the same group and between individuals as members of different groups,
- perceptions of the use, dissemination practices, relevance and quality of scientific information and,
- perceived impact of current legislation and potential legislative changes.

By means of a qualitative content analysis we identified those elements of the debate that were repeatedly raised.

These findings informed the design of the main survey. This quantitative, questionnaire-based survey was administered face-to-face and consisted of three main components:

(i) perceived importance of relevant issues and attitudes towards them,
(ii) perceptions of what factors constitute barriers to consensus in the debate and
(iii) preferences for different potential management solutions.

The research design allowed identification of the extent to which attitudes towards the conflict, perceptions of the barriers and opinions regarding proposed management solutions varied between individuals or groups and differed within and between the three interview locations.

Survey design: individuals' perceptions of the debate

The first part of the survey aimed to assess individuals' perceptions of important issues identified during the scoping phase. These included, for example, attributions of certain features to stakeholder groups, the perceived role of traditional rural livelihoods, moorland management and public spending and support, and were operationalised as 16 items (statements, see Table 2). Respondents indicated their level of *agreement*with each item (i.e. their position with regard to a certain issue) on a five-point Likert scale (strongly agree through neutral to strongly disagree). A separate five-point scale enabled them to score how *important* they perceived the issue raised by each item to be in relation to the debate (not important through neutral to extremely important). To reduce complexity and to identify groups of statements that might reflect the same underlying issue, a Principal Component

Table 2 16 Items used in the survey grouped to factors according to Principal Component Analysis

Underlying Issue (*Factors* identified using PCA)	Item (*statement*)	Item number
1 Perceptions of different actors	I believe that most keepers have a good understanding of their local habitats and wildlife, and they manage grouse within this context.	4
	I believe that private landowner investment in grouse moorland management provides valuable benefits to wider society that would not be achieved otherwise.	8
	I think that most raptor conservationists are narrow-minded zealots.	12
	I think that managers of driven grouse moors are the most suitable people to manage heather moorland in general.	13
	I think that it is important to try to maintain driven grouse shooting for future generations of managers and shooters.	15
2 Perceptions of public funding and support	I think that public money should be used to support the management of moors for biodiversity in general.	6
	I believe that hen harriers and other threatened raptors deserve more conservation effort than other wildlife.	7
3 Priorities given to raptor conservation as opposed to rural livelihoods	I believe that maintaining the rural upland way of life in Scotland is more important than honouring European bird conservation priorities in these areas.	1
	I believe that the protection of internationally rare birds such as the hen harrier should be prioritised over protecting shooting related jobs.	2
	I feel that management aimed at achieving high grouse densities on managed moors is more important than protecting raptors in these areas.	5
4 Perceptions of grouse management	I think that most gamekeepers are stuck in their ways and resistant to change.	3
	I think that moorland that results from management for grouse (in line with 'Moorland Management Guidelines') is preferable to that which results from current management for sheep.	10
	I think that legislation should change to allow raptor species, known to regularly kill commercial game, to be humanely controlled.	14
5 Perceptions of land management rights and viability of rural livelihoods	I feel that modern conservationists want to change the traditional rural way of life in order to achieve their aims.	9
	I believe that upland rural communities are not dependent on the continued management of grouse moors for driven shooting.	11
	I have the impression that landowners want to maintain their right to do what they wish on their land.	16

'Underlying issue' provides short descriptions of the issue common to the statements constituting each factor. 'Item number' refers to the order in which respondents were given the statements

Analysis (PCA) was undertaken in SPSS relating to the level of importance that individuals gave to the issue raised by each statement. The total variance was best explained with five factors identified, together accounting for 67.5% of the total variance. Factor loadings for the items ranged from 0.544 to 0.847 following orthogonal rotation and can thus be considered acceptable. Factor scores that included the importance ratings weighted by the extent to which items loaded on each of the factors were calculated for each respondent. This enabled comparisons to be made between individuals in the two groups, and between the three regions.

Survey design: perceived barriers to consensus

This component of the questionnaire assessed the importance that was given to each of six potential barriers to a resolution as identified in the scoping study. These were:

(i) lack of trust and poor relationships between individuals or groups at local or national level (hereafter ''trust'');
(ii) disagreement about what management solutions are appropriate (hereafter ''management'');
(iii) legislative obstacles (e.g. prosecution procedures, derogations required) (hereafter ''legislation'');
(iv) inappropriate resolution process (lack of forum for debate, insufficient stakeholder representation) (hereafter ''resolution process'');
(v) availability, quality and use or misuse of scientific, management, political or other information by the parties involved (hereafter ''information'');
(vi) fundamental value differences between actors (hereafter ''values'').

To involve respondents in thinking about the underlying issue, they were first asked to rank three statements specific to each barrier relating in order of their significance as an obstacle in the debate. Following this process the respondents ranked the six main barriers in their order of significance using a pairwise comparison approach. Respondents were asked to cross-check the final ranking emerging from this process to ensure their agreement with the result, and to separate any barriers that had received equal rankings using the method.

Survey design: management option preferences

Respondents were asked to personally evaluate six different management options (Table 3) that have been proposed recently either at a national level by Scotland's Moorland Forum (http://www.moorlandforum.org.uk/) or for local trialling, plus a seventh—continuing the status quo. The interviewees were made aware that these solutions were to be considered in isolation, but in reality a combination of approaches might be more appropriate. Some of these options would not be permissible under current legislation, but the respondents were told to evaluate them under the assumption that they had been legalised. Where available, information relating to how effective each was currently understood to be was included to help individuals make their judgements. Each respondent scored the acceptability, i.e. the extent to which the method and its results would satisfy their needs and interests, on a scale from 1 (extremely acceptable) through 4 (neutral) to 7 (extremely unacceptable).

Table 3 Management option descriptions as presented to the respondents

1	Habitat manipulation. This involves reduced grazing levels to reduce prey items (pipits and voles) and thereby legally control harrier numbers and distribution. Improved heather cover would help to support grouse numbers (Thirgood et al. 2002).
2	Legal rear and release. This involves releasing captive-bred grouse onto shooting moors with low grouse densities.
3	Legal trap and transfer. This involves releasing translocated wild grouse onto shooting moors with low grouse densities.
4	Legal diversionary feeding to reduce grouse predation. Studies have shown that feeding hen harriers in spring and summer reduces predation on both adult and young grouse but this does not necessarily lead to an increase in grouse numbers.
5	Intraguild predation/competition. Hen harriers interact competitively with other raptors and are killed by golden eagles. Harrier densities may be reduced on moors where eagles breed. The territory of a pair of eagles would contain several harrier territories; the impact of a pair of eagles on grouse numbers would be significantly less than a harrier-dominated moor.
6	Legalisation for raptor quotas on grouse moors. This would allow for the translocation of eggs/adult hen harriers to areas of suitable habitat not managed for grouse. Agreement on the appropriate number of harriers is likely to be contentious and probably best agreed at a local level, and agreed and monitored by appropriate individuals.
7	No change from current situation.

Results

Role attributions and perceptions of moorland management

Firstly, our analysis focused on the perceived *importance* of the issues raised by the statements. Factors resulting from the Principal Component Analysis and the items associated to these factors are listed in Table 2.

Importance of issue: group analysis

Of the five main issues that emerged from the PCA, 'perceptions of grouse management' (Factor 4) obtained the highest average importance rating overall, with no significant differences between hen harrier and grouse supporters. The only issue that individuals from the two groups assessed significantly differently (T-test, $P < 0.001$) in terms of importance to the overall debate was 'perceptions of different actors' (Factor 1). Four of the five statements (items 4, 8, 13 & 15) constituting this factor relate to grouse managers' roles and responsibilities. This is reflected in the rank order of factor importance by group (Table 4), with grouse managers seeing their role as a primary issue in the debate, with the hen harrier group considering this the least relevant of the five issues. Factor 3 'priorities given to raptor conservation as opposed to rural livelihoods', was considered important by both groups. Within Factor 3, item 5, 'I feel that management aimed at achieving high grouse densities on managed moors is more important than protecting raptors in these areas' was considered significantly more important (T-test, $P < 0.05$) by the hen harrier group.

Importance of issue: regional analysis

There was no significant difference between the mean factor scores of the three regional sub-samples except for Factor 5. This relates to the importance of

Table 4 Rank order of factor importance by group (mean factor scores translated into ranks)

Rank	Pro-hen harrier (n = 17)	Pro-grouse (n = 27)
1	4 Perceptions of grouse management	1 Perceptions of different actors
2	3 Priorities given to raptor conservation as opposed to rural livelihoods	4 Perceptions of grouse management
3	2 Attitudes towards public funding and support	3 Priorities given to raptor conservation as opposed to rural livelihoods
4	5 Perceptions of land management rights and viability of rural livelihoods	5 Perceptions of land management rights and viability of rural livelihoods
5	1 Perceptions of different actors	2 Attitudes towards public funding and support

maintaining traditional rural ways of life, and was on average considered more important by those in the North-East and Southern Scotland than those in Northern Scotland who thought that this was less relevant to the debate (ANOVA, $P < 0.05$). Qualitative responses indicate that this may be due to the fact that estates in Northern Scotland are not as dependent on driven grouse and therefore rural communities and livelihoods are less threatened by any decline in management for grouse. More specifically, two of the items reveal a difference of opinion between the regions as to their importance in the debate: those in North-east Scotland indicated that the issue of public vs. private funding of moorland management (item 6) was less important than the other areas (ANOVA, $P < 0.05$), and those in Northern Scotland thought that item 11 (the dependence of rural communities on driven grouse) was less important than perceived elsewhere (ANOVA, $P < 0.01$).

Levels of agreement with statements: group analysis

Levels of agreement with the 16 items (statements) were then analysed by group and by region (Fig. 2). The mean of the scores for the two groups (pro-grouse and

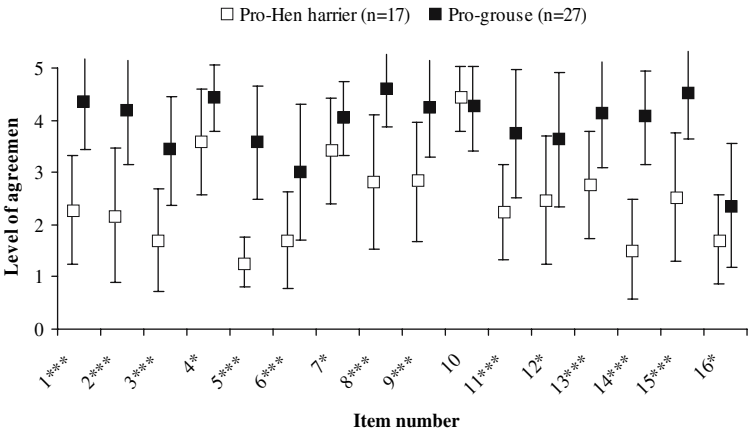

Fig. 2 Levels of agreement with statements by group. Scores on scale: 1 = strongly agree through neutral = 3 to strongly disagree = 5. Error bars indicate standard deviations. Item number refers to the statement as detailed in Table 1

pro-hen harrier) indicated that opposing views were held over 11 of the 16 statements. Groups shared the same view (i.e. both either agreed or disagreed with a statement) regarding item numbers: 4 (agreed), 7 (disagreed), 10 (agreed) and 16 (disagreed). The two groups' mean scores were significantly different (*T*-test $P < 0.05$) for all items, except for item 10 with which no individual disagreed.

Levels of agreement with statements: regional analysis

Responses to statement 10 indicated a significant difference (ANOVA $P < 0.05$) between the regions, with those in Northern Scotland being more sympathetic to moorland managed for sheep, thereby agreeing with this statement less so than individuals in the other two areas. There were no significant differences in the means for each of the three regions for the other statements. However, respondents in Northern Scotland ($n = 11$) agreed with the statement relating to economic dependency on grouse management (item 11) while this was disagreed with in the other two regions.

Barriers to consensus: group analysis

Individuals frequently distinguished between the types of barriers operating at the local and the national levels during the qualitative interviews. National level barriers relating to legislation, stakeholder representation and a process seeking a ''one size fits all'' solution were contrasted with a perceived breakdown in trust between individuals (between, and sometimes within, groups) at the local level, and a preference for solutions appropriate to local requirements. Individuals from both pro-grouse and pro-hen harrier groups frequently referred to what they perceived to be a poor resolution process at the national level being an important obstacle. This related to their perceptions of the focus and management of the debate itself, the willingness of representatives to reach an agreement, and whether they had sufficient authority to do so. This was confirmed by the ranking exercise, and holds for both the by-group and by-region analysis (Table 5). A major difference between the groups regards the importance of value differences between them, with hen harrier conservationists placing this joint second in the ranking, and grouse managers placing it last.

Table 5 Barriers to consensus ranked by their perceived importance for 'All', 'Pro-grouse' and 'Pro-hen harrier' groups, and by region

Rank order	Ranking by group		Ranking by region			All ($n = 44$)
	Pro-grouse ($n = 27$)	Pro-hen harrier ($n = 17$)	NE Scotland ($n = 16$)	North Scotland ($n = 11$)	SW Scotland ($n = 17$)	
1	Resolution	Resolution	Trust	Resolution	Resolution	Resolution
2	Legislation	Trust & Values	Resolution	Management & Information	Legislation	Trust
3	Trust		Legislation		Trust	Legislation
4	Information	Management & Legislation	Values & Management	Trust	Management	Management
5	Management			Legislation	Information	Information
6	Values	Information	Information	Values	Values	Values

Barriers to consensus: regional analysis

Regional analysis revealed that a lack of trust is considered to be the most significant barrier in North-East Scotland (Table 5). This is considered less of an obstacle in North Scotland where the qualitative interviews suggested that the debate has had less of an impact on relationships, whilst the perception that the lack or misuse of information is a major obstacle is more prevalent here than in the other regions.

Management options results: group analysis

Significant differences in what the different groups consider to be acceptable management options occur relating to raptor quotas, diversionary feeding, intraguild predation, and rear and release of grouse (Fig. 3). These results contrast with mildly positive responses from both groups relating to trapping and transferring grouse from moors with abundant birds to those lacking birds, although there were often caveats attached to this, such as identification and management of the causal problem at the receiving moor, and local rather than national arrangements being preferable. The intraguild predation option was most acceptable to both groups, despite lack of confidence in its efficacy, because it was considered to involve little effort other than toleration of golden eagles. However, grouse managers are more resistant to the idea because of the risk of predation losses due to another predator. Maintaining and improving habitat for grouse was seen as a useful approach by both groups, but not sufficient on its own to resolve the issue.

The pro-grouse group expressed doubts about the viability of breeding grouse in captivity, some commenting that their role was that of habitat managers for wild birds, a point emphasised by the high importance that the pro-grouse group attaches to statements in Factor 1 (see Tables 3 and 4). Some of the hen-harrier group agreed with rear and release of grouse and others did not, being aware that gamekeepers saw their role as managing the habitat for wild birds and may not find captive breeding acceptable.

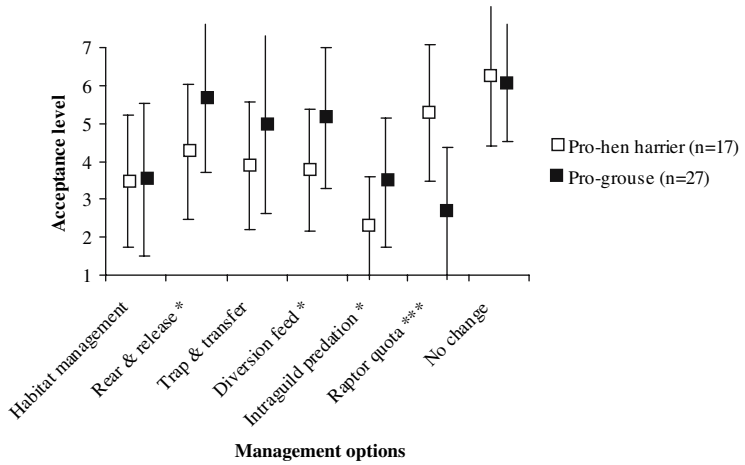

Fig. 3 Acceptability of management options by group where 1 = extremely acceptable through 4 = neutral to 7 = extremely unacceptable. *indicates sig. < 0.05, ***indicates sig. < 0.001. Error bars indicate standard deviations. See Table 2 for management option descriptions

The pro-grouse group were agreeable to some form of raptor quota system, with a common view that this would be most effective if the numbers could be agreed locally and the system managed by a statutory monitoring agency. Some felt that derogation in the law could be applied to allow some control of certain raptors, given that they may be shown to cause economic damage to estates' interests and that such derogation would therefore be legal under European Union law. Those with hen harrier interests generally oppose this option, particularly on the grounds that hen harrier are a protected species and their status is not secure enough to relax current legislation.

Diversionary feeding also splits the groups, with the pro-hen harrier group in favour and the pro-grouse group opposing. The pro-grouse group were generally opposed to the idea of feeding raptors, whether this relieved the pressure on grouse or not. They also suspected that by encouraging hen harriers to feed and breed in an area their numbers would increase, creating greater pressure on the grouse stocks. Overall, neither side find the current situation acceptable. The hen harrier contingent feel that although legislation exists to protect hen harriers, this is currently ineffective and that the police and judicial system are unable to deal appropriately with any illegal acts impacting on hen harriers. The pro-grouse group perceive that current lack of progress in the debate process is eroding trust between both individuals and groups.

Management options results: regional analysis

There was overall agreement between the three regions in their responses to the management options (Fig. 4). However, whilst all regions felt that maintaining the ''no change'' option was unacceptable those in North Scotland found it more acceptable than the other two ($P < 0.01$).

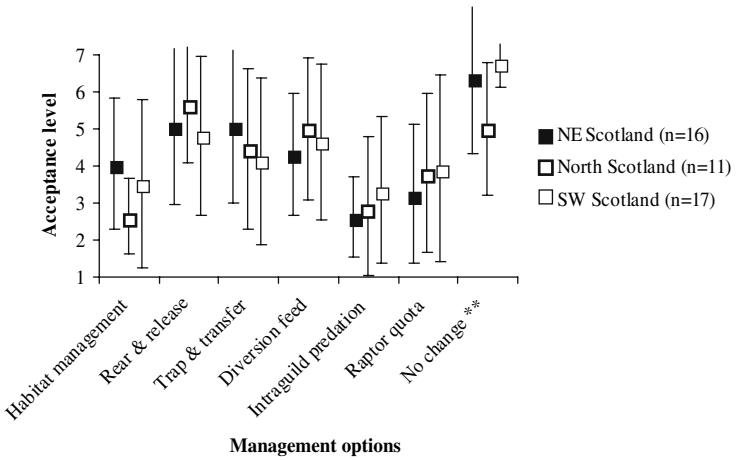

Fig. 4 Acceptability of management options by region where 1 = extremely acceptable through 4 = neutral to 7 = extremely unacceptable. **indicates sig. < 0.01. Error bars indicate standard deviations. See Table 2 for management option descriptions

Discussion

There are few examples of research into wildlife-related conflicts that focus on actors' perceptions of each other and the issues related to conflicts. As results from this case study demonstrate, the views and perceptions held by those responsible for the use, management and protection of the resources in a conflict, whilst varied, are integral to a debate (Schenk et al. 2007). These are important considerations, particularly in relation to conflict management, where an analysis of the complexity of how perceptions vary across sites, over time and between groups could improve understanding and thereby help in the development of potential solutions.

Our results indicate that actors perceive that trust, transparency, representation, scale, actors' roles, communication and information dissemination all contribute somewhat to the success or otherwise of a dialogue aimed at resolving contentious issues. Results from the regional analysis show variation in these elements and the qualitative interview results help to explain why. Of the three areas only NE Scotland reported lack of trust as being the most significant barrier. One of the reasons that respondents suggested for this was the polarisation of individuals' views in response to the actions and statements made by stakeholder groups at the national level, leading to more confrontational local dialogue. The importance of different issues within the debate also varies by region, with an interaction between ecology, rural economy and attitudes towards shooting and conservation. In North Scotland, where investment in management for driven grouse is generally lower than the other regions (primarily because of poorer potential for grouse habitat, and higher numbers of sheep) breakdowns in trust between individuals appear to be less of an issue than elsewhere. There is also an understanding that land management priorities in this region will change or diversify and that estates and rural communities are not reliant on grouse shooting for their viability, as reflected in the lower importance given to issues related to rural livelihoods (Table 4).

The above points relate to geographical variation in a debate. However results also indicate the variation in perceptions and attitudes within groups. Broader implications for conflict management that emerge from these results include recognition by stakeholder group representatives of this variation, the importance of engendering and maintaining trust between groups and individuals, and the acceptance that some form of facilitation or mediation of the debate may be beneficial in achieving this. Two options suggested by interviewees from both interest groups that are reflected in the general literature (e.g. Sidaway 2005, pp. 181–188) are:

(i) make small, positive decisions that both sides may agree on so as to engender trust and break deadlocks and;
(ii) assign a mutually trusted, impartial mediator/facilitator to co-ordinate the debate and the topics discussed, increase transparency and improve the decision-making process.

Our study helps to identify opportunities for such ''small, positive decisions'' as it reveals where individuals essentially coincide in their views, and where they disagree either substantively or in terms of the importance assigned to a particular issue. Whilst both groups agree that a poor resolution process acts as the main barrier to progress (Table 5), the relative rankings by group for value differences and legislation are particularly interesting. The pro-grouse group see legislation as being

more important than value differences. However, values are involved in the formulation of designations and it may be that new environmental legislation is seen to reflect the values of conservationists, with the result that grouse managers feel that their local scale management is impacted by pressures that originate from elsewhere. Qualitative results indicate that if the pro-hen harrier group has any issue with legislation, it is because it is not seen to be enforced properly. That they see value differences between the groups as a more fundamental barrier to progress may represent a belief that there is a difficult gap in understanding to bridge between the two groups. Our methodology highlights how different barriers can be confounded, and in different ways by the two groups. This raises further questions which could be addressed in a more intensive study of individuals understanding of, and attitudes towards such disputes.

Here we describe a framework which allows the different issues within a debate to be categorised and understood in terms of their relative importance, and the extent of agreement with them. Figure 5 illustrates this framework for describing issues where an assessment of the perceived importance of an issue in the debate (rows) can be linked to an assessment of the actors' agreement with a stated position on that issue (columns).

Understanding where groups position themselves with respect to different issues is of use to dispute mediators, but what they do with this information depends on their experience and the approaches they deem appropriate to that situation. Thus the framework constitutes a useful indicator of tendencies within the debate, and not a concrete description of it or instructions for resolving it. Establishing the position of issues that are perceived as particularly important by the actors themselves, within the framework shown in Fig. 5, would allow conflict mediators to identify, for example:

(i) those issues around which trust could be built thereby moving the debate forward,
(ii) more controversial ones requiring longer term strategic approaches,

		Position (agree/disagree) with regard to issues:	
		In common	Differing
Perceived importance of issues: coinciding between individuals?	High importance (unanimous)	**Box 1**	**Box 2**
	Disagreement over importance	**Box 3**	**Box 4**
	Low importance (unanimous)	**Box 5**	**Box 6**

Fig. 5 Framework for identification and assessment of issues in a conflict. The numbered boxes represent different combinations of actors' attitudes towards issues in a debate. Rows show the level of *importance* that the different groups give the issues and whether or not these assessments are unanimous. Columns show degree of coincidence in individuals' or groups' *positions* with respect to the issues

(iii) those that require further technical information for clarification and
(iv) those about which there is no agreement and consideration of which would stall the process.

Examples are taken from our research to illustrate this:

Practical land management issues are ranked highly by both groups (Factor 4, Table 4) and there is consensus between the groups around item 10 (Fig. 2) where it might not have been expected. It represents an issue that both groups have been found to consider highly important to the debate, and are able to acknowledge that they have a goal in common. Such issues would fit in Box 1.

A potential starting point in a mediation process might be to address an issue falling into Box 6, where there is disagreement over a point that is considered of relatively low importance by both groups (Sidaway 2005, pp.179–187). An example from this study would be item 9 (Table 3) where both sides might work positively towards clarifying their objectives within an agreed context of maintaining rural livelihoods (Factor 5, Table 4).

Both raptor conservationists and grouse managers coincide in their view that the issue of traditional land management practices (Factor 4) is of central relevance to the conflict (Table 4). Specific elements of this, for example item 3 (Table 3) were disagreed upon (Fig. 2). Such issues, shown here to be particularly contentious, would appear in Box 2 of Fig. 5 and would perhaps require some careful reflection and consideration by the mediator before it can be tackled.

The above points are indicative of the types of issue that can drive a debate in different directions, and serve to emphasise the importance of understanding the ways in which different issues may affect a debate. However, a shortcoming of this study relates to limitations of sample size and representivity precluding a more detailed analysis of the data, meaning that we cannot generalise with full confidence. Possible links between social science perspectives on wildlife related conflicts and economic and ecological approaches would be facilitated by further exploration of quantitative techniques to gain a fuller understanding of conflicts, their dynamics and possible solutions. Our findings demonstrate that understanding the relationships, trust and communication types existing between individuals is extremely relevant, and methods such as network analysis of the individuals involved may be used to explore this further. Literature on social psychological approaches to conflict analysis outwith the environmental topic area might provide further inspiration (Steinberg and Bar-On 2002; Ybarra and Ramón 2004). In line with the results from our study, these approaches show that a better understanding of actors' social identities, and how these lead to a rejection of members of a different group (Stoll-Kleemann 2001), is needed to understand conflict dynamics. The management options results indicate that the options considered to be more acceptable were ones seen to be of low threat to the objectives of a group. This emphasises the potential impasse in which debates focussed on technical solutions may find themselves, and may be further complicated if there is little evidence of or confidence in a solution's ability to achieve a mutually beneficial result.

Conclusions

We have demonstrated the value of combining quantitative and qualitative methods to derive social scientific results for improving understanding of biodiversity

conflicts. Such methods facilitate interdisciplinary research and provide results that provide a context for interpretation of ecological and economic aspects of a debate. Specifically, our findings demonstrate the links between issue importance, barriers and practical management options. They show how people's underlying values and perceptions of contextual elements of the debate (e.g. livelihoods, land management, conservation), can affect their position on a specific issue, what process they think most suitable for managing a conflict, and the management measures they feel appropriate to consider. The work also reveals how a social-science perspective on wildlife related conflicts is able to provide both specific insights and a broad understanding of the dynamics of a debate and the issues concerned, and that when studying the different elements in a debate (e.g. issues, barriers and solutions) it is also essential to understand how they interact. In practical terms this awareness of the complexity of wildlife-related conflicts leads to the conclusion that their management should be addressed with appropriate tools, ones that can accommodate the subtleties of a situation (Wittmer et al. 2006).

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