Understanding mental constructs of biodiversity: Implications for biodiversity management and conservation

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\textbf{ABSTRACT}

The participation of the public in environmental decision-making and management is increasingly seen as essential for the success of conservation initiatives. Ecological scientists and conservation practitioners have, however, argued that a lack of understanding of biodiversity issues by the public is a barrier to their effective participation in decision-making processes. These arguments are often based on studies where scientific knowledge is used as the sole measure of public understanding of biodiversity, and therefore fail to account for individuals' constructs of biodiversity and related issues such as biodiversity management.

We examined individuals' mental constructs of biodiversity, and their conceptual contexts, through a series of focus group discussions with members of the general public in Scotland. To gain a fuller picture of public understanding of biodiversity, we distinguished between mental associations with the term 'biodiversity', and the meanings associated with biodiversity-related concepts independent of scientific terminology.

We found participants to express rich mental concepts of biodiversity, irrespective of their scientific knowledge. These included notions of balance, food chains and human–nature interactions, and showed strong normative dimensions that were used to define desirable or ideal states of nature. These concepts of biodiversity were, in turn, strongly related to their attitudes towards how best to manage biodiversity.

This study highlights that a better understanding of individuals' mental constructs of biodiversity, which are linked to their attitudes towards biodiversity management, is essential for the design of biodiversity-related policies that are supported by the public.

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1. Introduction

With the tailwind of the sustainability debate, views of the general public on the management of species and habitats have recently been gaining importance in the development of environmental policies (UNECE, 1998; Renn, 2006). Public consultation and participatory approaches are now frequently considered as central elements in identifying conservation priorities (SNH, 2006; Stewart, 2006) and in the management of protected areas (Martin et al., 2000; Mulongoy and Chape, 2004; Barber, 2004; CNPA, 2006). However, despite increasing efforts in the social and interdisciplinary sciences to shed light on the way members of the public perceive and evaluate biodiversity-related issues (Hull et al., 2001; Stoll-Kleemann, 2001; Kaczensky et al., 2004; Christie et al., 2006), the understanding of public views on biodiversity management remains limited, often leading to serious doubts about the significance of public opinion (Parsons and Daniel, 2002).

Previous studies have often been limited to an analysis of public knowledge and concern about biodiversity against the...
yardstick of scientific intelligence (Spash and Hanley, 1995; DEFRA, 2002; Hunter and Brehm, 2003), qualifying individuals’ knowledge as either ‘correct’ or ‘incorrect’ in relation to scientific definitions. In contrast, we follow here the lines of sociological and psychological research on related issues such as wildlife and landscape management that suggests that public views are best understood in their cultural, social and individual contexts (Kellert, 1979; Schultz, 2001; Skogen, 2001; Ericson and Heberlein, 2003). In particular, our research is influenced by the theory of concepts (e.g., Graf, 1989; Medin, 2005). We assume that mental concepts as held by individuals are complex constructs that may include (i) specific terms that label a concept, (ii) definitions of a concept, and (iii) prototypical images that encapsulate typical examples for representatives of the concept. While some of these elements may often be missing, the main body of a construct will consist in its other connotations. The term ‘connotations’ is here used to refer to mental associations that relate a concept to other ideas and evaluations. These can take various forms and may include normative aspects that capture what should or ought to be, own experiences, and emotional evaluations. For example, previous studies suggest that members of the general public may hold rich mental concepts of biodiversity although they might not be familiar with the scientific terminology (Elder et al., 1998; Menzel, 2004; Holl, 2005). In particular, there is some evidence that paradigms such as ‘interconnectedness’ and systemic thinking are important elements of mental constructs related to biodiversity; however, this has so far not been analysed in detail (Elder et al., 1998; Menzel, 2004). Other potential components of mental constructs related to biodiversity include the value judgements implicit to conservation biology (Harrison, 1993; Barry and Oelschlaeger, 1996; Matsuda, 1997; Fischer and Van der Wal, 2007) and individuals’ ideas of nature, which have been found to underlie attitudes towards wildlife and landscape management (Fulton et al., 1996; Buiks et al., 2006; Van der Windt et al., in press). However, little is still known about the way in which individuals’ concepts of biodiversity and nature are related to their attitudes with regard to these issues (Henwood and Pidgeon, 2001; Clayton and Brook, 2005), a crucial aspect with regard to public acceptance and support of biodiversity management measures.

The aim of our study is thus to contribute to a better understanding of the ways members of the general public reason about issues of biodiversity change and management, to shed light on the factors that determine public acceptance of concrete biodiversity management measures, and to facilitate the development of suitable ways to communicate these.

We applied qualitative group discussions that involved members of the general public from the Cairngorms area in Scotland, Britain’s largest national park, to obtain insights into the ways in which individuals form their attitudes towards biodiversity in relation to their constructs of biodiversity, particularly focussing on the values they hold and their views on nature. Following the concept theoretical approach mentioned above, we first describe individuals’ mental associations with the term ‘biodiversity’, and then focus on their connotations with biodiversity issues independent from technical terminology, addressing (a) participants’ own perceptions of diversity in nature, (b) connotations relating to other concepts, (c) normative evaluations of these connotations, and (d) connotations concerning the relationship between humans and nature. We then provide evidence on how these constructs are linked to individuals’ attitudes towards biodiversity management.

2. Methods

2.1. Study site

Our study centred on the Cairngorms National Park in central Scotland, established in 2003 and currently undergoing a process of public consultation to develop a park management plan. The Cairngorms National Park covers an area of 3800 km², and is Britain’s newest national park. The Cairngorms massif constitutes one of the largest and most unspoilt upland areas in Britain (Warren, 2002) and is considered to be the most important mountain area in Britain for nature conservation. It contains a number of rare habitats, including the largest expanse of Old Caledonian pine forest in the British Isles (Curry-Lindahl, 1990), covering approximately 12,000 ha and home to the endemic Scottish crossbill (Loxia scotica), the crested tit (Parus cristatus) and capercaillie (Tetrao urogallus) (Dennis, 2002). Other priority habitats include Northern Atlantic wet heath containing Erica tetralix, European dry heaths, Alpine and Boreal heaths, blanket bogs and bog woodland (JNCC, 2006). The National Park was chosen as a thematic focus and common reference of our group discussions to allow participants to relate to their own experiences of biodiversity in the area, and to gather information on their attitudes towards biodiversity management. Discussions thus centred on local biodiversity rather than on global biodiversity issues.

2.2. Focus group approach

We used a qualitative approach to explore the context in which biodiversity-related issues are perceived by members of the general public. Qualitative research methods include, for example, ethnographic or participant observation, qualitative interviews, focus groups, and discourse and conversation analysis. These do not aim to produce quantitative data and test hypotheses in a strict sense but to explore phenomena in depth.

Focus group discussions are a form of group interview using a relatively open, non-directive qualitative technique to explore topics as perceived by the participants (Merton, 1987; Fontana and Frey, 2000; Madriz, 2000). As well as understanding interactions between the members of the group, an important aspect of the focus group is to examine the joint construction of meaning (Bryman, 2004).

This technique is increasingly applied to understanding participants’ views on environmental issues (Gobster, 2001; Henwood and Pidgeon, 2001; Hull et al., 2001). We adopted this method to allow an identification of the issues important to participants and a qualitative analysis of their understandings of biodiversity and attitudes towards biodiversity management and change. As the aim of the study was to understand the way in which the participants reasoned rather than to obtain a representative overview of attitudes held or to compare the views of sub-groups with statistical means, this approach was considered most appropriate.
Consequently, sampling was designed to cover a cross-section of the general public from a wide range of backgrounds including urban and rural dwellers, laypeople, citizen-stakeholders and professionals in relevant fields. In order to ensure that a wide range of views on biodiversity was captured by the focus groups, we adopted their “experience of biodiversity” as our main stratifying criterion.

Overall, eight group discussions with a total of 43 individuals were held from May to October 2005. Discussions lasted between one and two hours. Participants’ ages ranged between 19 and 76. Group sizes varied between two and ten participants (Table 1), with six of the groups mixed in gender (groups T1 and T2 contained only men). The local residents (T5) were a mixed group with participants from a variety of professional backgrounds that were all living in the National Park area, whereas all other discussants were either residents of adjacent areas or (potential) visitors of the Cairngorms. Most discussion groups were recruited from pre-existing groups which either participated as an entire group (T1, T8) or in parts (T2, T6, T7), while groups T3–T5 included individuals recruited through posters and local newspaper announcements that asked for volunteers to participate in a group discussion on nature in the Cairngorms. By these means, we aimed to reduce participant self-selection with regard to prior knowledge specifically relating to biodiversity. Readers unused to qualitative research may be surprised by the seemingly small sample sizes (Table 1), but it should be borne in mind that not statistical and quantitative analysis, but an exploration of the diversity of mental constructs of biodiversity within the general public, here represented by a broad range of interest groups, are the aim of this study.

As previous research suggests that respondents’ insecurity with regard to technical terminology can hamper and constrain the elicitation of individual perceptions (Christie et al., 2006), we used both verbal and visual methods to elicit responses. In addition to the verbal debate that revolved around the open-ended questions in our discussion guideline (Table 2), participants were also asked to draw a picture of what they had in mind when they heard the word “biodiversity”. The drawings (n = 33) provided participants with the opportunity to individually reflect upon their mental concepts and represent them through a non-verbal approach that allowed an expression of thoughts independent from the confidence individuals might or might not feel with regard to the scientific terminology (Matthews, 1985; Gobster, 1998; Alerby, 2000). We also asked the respondents to explain their drawings briefly, in order to interpret them as they were intended (Alerby, 2000).

2.3. Data coding and processing

All focus group discussions were digitally recorded and subsequently verbatim transcribed and checked. Broad coding categories were defined according to initial research questions that had also been used to design the discussion guidelines. These categories were modified, refined and specified in an iterative process to obtain a hierarchically organised coding scheme (Ryan and Bernard, 2000; Rogan et al., 2005), while concurrently being validated through comparisons and discussions with colleagues from other European countries working on related qualitative studies. Final main coding categories included the understanding of biodiversity, concepts of nature, views on the role of humans in nature, values related to nature and biodiversity, attitudes towards biodiversity management measures and the perception of changes and threats to biodiversity. The transcripts were coded using these categories by both authors with intermittent exchanges and discussions (Hull et al., 2001).

Table 1 – Focus group participants: group sizes and main characteristics

<table>
<thead>
<tr>
<th>Group code</th>
<th>n</th>
<th>Groups</th>
<th>Age groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>19–39</td>
</tr>
<tr>
<td>T1</td>
<td>6</td>
<td>Mountaineers on a training course</td>
<td>3</td>
</tr>
<tr>
<td>T2</td>
<td>4</td>
<td>Mountaineers resident in adjacent areas</td>
<td>1</td>
</tr>
<tr>
<td>T3</td>
<td>2</td>
<td>Tourists (from England)</td>
<td>2</td>
</tr>
<tr>
<td>T4</td>
<td>2</td>
<td>Tourists (from Germany)</td>
<td>2</td>
</tr>
<tr>
<td>T5</td>
<td>10</td>
<td>Local residents</td>
<td>1</td>
</tr>
<tr>
<td>T6</td>
<td>4</td>
<td>Foresters resident in adjacent areas</td>
<td>2</td>
</tr>
<tr>
<td>T7</td>
<td>6</td>
<td>Birdwatchers resident in adjacent areas</td>
<td>0</td>
</tr>
<tr>
<td>T8</td>
<td>9</td>
<td>Farmers (Agricultural college students)</td>
<td>9</td>
</tr>
</tbody>
</table>

Table 2 – Focus group discussion guide

1. What are your personal experiences in the Cairngorms? Probing, for example: Do you have a favourite plant or animal in the region? How often have you been in this area? What is your general impression of the area? What were your expectations before you came?
2. Have you heard about the Cairngorms National Park?
3. Have you ever come across the term “biodiversity”, or biological diversity? If not, provide information: “Biodiversity means the variety of life. Biodiversity includes all living things and the environment of which they are part.”*
4. What does ‘biological diversity’ mean to you? What first comes to your mind?
5. Please draw a symbol or a diagram representing your idea of biological diversity.
6. How important is biological diversity to human beings? How important is biological diversity for your everyday life?
7. How do you think biological diversity could best be maintained or managed?
8. Would you like to add anything?

3. **Results: constructs of biodiversity**

3.1. **Associations with the term ‘biodiversity’ – “It’s what it says on the tin, isn’t it?” [T7]**

In the first part of the discussions, we asked participants directly for their understanding of and their mental associations with the term ‘biodiversity’. We identified three types of reactions from participants, (i) confusion, (ii) definitions and (iii) critical comments. Whereas some participants, especially among the tourists and the young farmers, articulated their lack of knowledge (I don’t really know, I have only heard the word [Group T3, see Table 1]), others, especially among the mountaineers, offered definitions such as:

[Biodiversity means] the number of species and variety of species that are present. Species right across the board, not just vegetation [T2].

Many responses by local residents and foresters took a meta-perspective and commented on the strategic use of the term:

It has become a buzzword [T5];

I tend to think biodiversity is just a fancy name for nature [T6].

Although these individuals assessed the term biodiversity in a critical way, its positive impacts on political support for conservation were also recognised:

I personally don’t like the word, but I think it’s a good rallying call because I think it was something that was getting extremely neglected internationally [T6].

Others observed that in their view, the biodiversity concept was being misunderstood by land managers and conservation organisations and used as a label to gain public support for the preservation of particular species:

I was in [a forest] the other day and it was actually full of bird boxes and you think, what is the point of a bird box? It’s a forest that has more dead wood oak trees than any other forest, I think. What’s the point? You just felt like saying “No, that’s not the point, that’s not what biodiversity is about, it’s not about sticking up bloody bird boxes. It’s about getting the base right”[T6].

This critical stance was mainly taken by individuals with a professional background in land management issues, for example by a retired gamekeeper, a ranger, and a geographer in the group of local residents. Already in 1996, Takacs found similar reactions for many of the conservation biologists that he interviewed. However, while at that time the concept of biodiversity was widely unknown to the public (Elder et al., 1998), the responses of the mountaineers in our study suggest that the term ‘biodiversity’ has been communicated recently from science to parts of the interested public, who now make use of the term. Individuals who deal with these terms on a more professional basis, in contrast, view the terminology in a more ambivalent manner and emphasise the strategic use of the word.

3.2. **Perception and appreciation of biological diversity – “Open your eyes” [T4]**

During the course of the discussions, numerous statements that were independent from our direct questions on the definition of ‘biodiversity’ (Table 2) revealed that many participants had rich concepts in mind that addressed issues of diversity not necessarily linked to the technical term. Many participants, among them both “experts” and “non-experts” in natural history, indicated that they perceived and appreciated diversity in their surroundings:

The grasses are very different here; there are lots of different grasses [T3];

Great secrets that are hidden away, small pockets of particular species, just a different atmosphere, just a mixture of the hills, the water… [T2].

Especially the tourists, but also the young farmers, mountaineers and some of the birdwatchers appreciated diversity for aesthetic reasons:

Let’s imagine there were only heather and broom, it surely wouldn’t look that nice… for example, up in the mountains we saw funny plants, very small things, I don’t know, (...) but it was very nice [T4];

If everything was of the same colour that would be boring [T4].

On a larger scale diversity was perceived to turn a site into a unique and recognisable place, indicating that diversity in its spatial patterns can contribute to individuals’ sense of place (Rogan et al., 2005):

You could be helicoptered blindfold to a Scottish hill and if you could look down at the vegetation you could say roughly what part of Scotland you were in [T2].

This was also reflected in the drawings, in which participants highlighted the habitats and species they perceived as representative of the region (Figs. 1, 2 and 4). These drawings often included iconic elements of the environments, usually subjectively representative of Scotland such as thistles, red deer (Fig. 1), or deer grass *Scirpus cespitosus* (Fig. 2). Elements of cultural diversity were also portrayed in these drawings, particularly by the tourists who also saw castles and stone walls as a part of the biodiversity of the area.

The tourists also emphasised how their perception of the diversity of plant and animal life depended on their mindset and the attention directed to their natural environment:

Countryside-wise and scenery-wise it is absolutely fantastic all the way, but the diversity of plant life is huge as well, but it is not that obvious, until you start to think about it [T3].

However, some mountaineers and farmers also expressed that they did not know or did not care about species diversity, as it had no relevance to them personally:

In terms of vegetation I know nothing about it other than it is all heather. I have rarely looked at what I have been stepping on [T1].
Others raised questions on the relevance of conservation for themselves as non-experts, as they felt that they personally did not notice and did not suffer from any changes in biodiversity:

As a recreationalist I don’t know much about some of these aspects [loss of biodiversity]; it has never detracted me from my enjoyment of the Cairngorms, so it does beg the question, is it important? [T2].

The way biodiversity and its changes were perceived thus differed considerably between the participants. Although we could not find any links between these perceptions and the definitions individuals had in mind as described above, an analysis of the context of the participants’ perceptions helps to understand their differences.

3.3. Biodiversity in context: associations with other concepts – “to keep the natural flow” [T5]

Numerous statements showed that participants’ understandings of biological diversity were deeply rooted in a variety of other, related concepts. Some of these statements emerged during the discussions as responses to direct questions about the implications of biodiversity loss and the reasons for conservation, while others were part of descriptions of experiences and perceptions of nature in the Cairngorms.

Among these concepts, ‘food chains’ were frequently and used in almost all the groups to argue for the conservation of diversity:

…because not every animal likes every plant I guess, a few feed on this, and a few on others [T4];
It is just to keep the natural flow! That is why it needs to be protected! If you do away with one species it affects another species [T5].

Closely related to the notion of food chains was the idea of ‘balance’:

[Biodiversity] should be preserved under all circumstances. To keep the equilibrium, the natural balance [T4];
It is the balance that keeps the environment healthy [T1].

Notions of balance and food chains were again echoed in the drawings (Fig. 3):
I was much more interested in the interaction of everything. . . the key behind the whole system was that everything was interconnected, overlapping and more importantly inter-dependent. On top of that there was superimposed the influence of man [T2].

‘Balance’, perceived imbalance and the dominance of certain species played a major role when participants described situations that they perceived as negative:

I think it is the imbalance. There is nothing that eats rhododendron, so you end up with rhododendron everywhere. They don’t eat mink so there is mink everywhere [T2];
It can, things can dominate. [. . .] Look at rhododendron. If that takes over that takes over and there’s nothing else that grows near it [T6].

3.4. Normative dimensions of biodiversity – “it looks like it should look” [T2]

Many participants had implicit states of reference in mind when arguing for biodiversity conservation:

And when you go to the bits that do still have the native woodland, they are the most attractive places to be and there is things to see and it looks like it should look. It just seems more correct in some indefinable way [T2].

For these respondents, there was clearly a normative dimension to the state of habitats and ecosystems. Our analysis thus also addressed the issue of how individuals judged the ‘right’ and the ‘wrong’ states or species, and the reasons behind these judgements. For some participants, ‘what should be there’ seemed to be somehow naturally determined by climate and habitat, preferably without any human intervention:

You need to look at the whole, and maybe survey what is in there, and maybe think what isn’t there, and could be there, and maybe should be there.

[Moderator: So it’s defined by the habitat? By the ecosystem?] Well, yes I think it is, by the climate and by the habitat. It certainly shouldn’t be defined by the number of people who are clomping through it! [T7].

Consequently, some participants explicitly argued that humans should not interfere with nature:

It’s nature’s way, and evolution and that of species getting wiped out and changed and that, and we shouldn’t be meddling with that. There are too many do-gooders that are trying to save things and that. They should leave it and let it get on with its natural way [T8].

Here, nature, untouched by humans, defined the ‘right’ state of diversity. However, the participants also used other criteria to assess states and species. Whilst many participants, especially tourists, tended to consider native species that appeared unique and typical for the area as positive, (illegitimately) introduced species as well as overly dominant ones were evaluated as negative. However, the perceptions of what was dominant (Gorse! It’s everywhere here! [T3]), and what was unique and typical (The flowering of the gorse, that’s the reason why we came here this time [T4]), and what was defined by history as well . . . these ferns haven’t been here always and have spread quite a lot, it was the Englishmen [T4].

Examples from other discussion groups underscore these observations:

We did a survey [. . .] and asked people what they thought of the forest at [P] and what they suggested was that we should reduce the amount of Sitka spruce [. . .] because they hate that whole hillside being all Sitka spruce. Well, it’s all Scots pine. It’s just planted and grows. It’ll look good, but again it’s people’s perceptions . . . [T6].

In this case, the public claimed to dislike Sitka spruce on the hillside, a species introduced for reforestation, as it was perceived to be too monotonous and dominant. In fact the native Scots pine, as a mature tree perceived usually as a charismatic species, was growing on that hill but in this case seen as unaesthetic and thus labelled as Sitka spruce, a species associated with negative characteristics. This observation illustrates again how individual perceptions of diversity are informed by the participants’ beliefs and values.

Fig. 3 – “In biodiversity, everything is connected and contained in the same environment, but with no hierarchy” [T1].
Several respondents recognised these relationships and pointed out how their own knowledge influenced the evaluation of a certain landscape or habitat, referring to introduced species and to grazing impacts on the native woodlands:

Itself, it looks quite attractive, but when you start to understand the process that is going on, it just doesn’t belong there and that is what offends [T2].

These normative aspects were especially obvious in the drawings. Out of the 33 drawings, 20 showed an explicitly positive state of biodiversity, or were commented on in a way that pointed to the positive image that they tried to convey (Figs. 1 and 4). Ten drawings could not be classified as they seemed to be schematic or iconic with no particular normative implications (Fig. 2). Only two drawings included explicitly negative elements such as the extinction of species, while one drawing included both positive and negative elements. Other elements which were verbally described as negative, such as the non-native species mentioned frequently, were not depicted.

In those drawings that appeared to capture positive images of biodiversity, many participants – mainly mountaineers and birdwatchers – drew what they saw as an “undisturbed” or “wild” state of biodiversity. This contrasts strongly with the discussions, in which only one participant described the Cairngorms as one of the last, really THE last, wilderness left in Britain [T7], while the vast majority of participants concurred on the fact that wilderness no longer existed in Western Europe:

I think we would all agree that there is no true wilderness anywhere in Britain, there has been Homo sapiens and non-sapiens on every bit of it [T5].

In most drawings (n = 21) anthropogenic influence was omnipresent (Fig. 4), but their images seemed to be equally idealistic in a rather Arcadian, i.e., idyllic and peaceful type of landscape where humans and nature are in harmony (Buijs et al., 2006; Van der Windt et al., in press). Those individuals who saw human influence as beneficial for biodiversity conservation reflected this clearly in their drawings. In contrast, those participants who felt that humans were a direct threat to biodiversity through farming, tourism or invasive species, chose, for the majority, to omit these threats they so vividly exposed verbally from their visual representations of biodiversity. Normative aspects of biodiversity thus seemed to be a fundamental part of the participants’ biodiversity construct, which, as will be shown later, influenced participants’ attitudes towards biodiversity management.

3.5. The role of humans in biodiversity management – “And it can be a forgiving hand, or it can be a detrimental hand” [T7]

Views on the role of humans in nature appeared to be a distinct component of individuals’ constructs of biodiversity. These were closely related to the notions described above and had both descriptive and normative dimensions. In general, all groups involved in the study readily discussed perceived threats to biodiversity brought about by anthropogenic factors. In line with the notions of food chains and balance that many individuals had in mind, there seemed to be a general feeling that loss of a particular species would have knock-on effects on other species including humans, but the exact effects were unclear.

As I see it if you lose your biodiversity then you lose... you’ve lost all things, forget it! [T7]; Without it [biodiversity] we are nothing [T3].

Fig. 4 – “Just creating different habitats” [T8].
Despite the unclear consequences of biodiversity loss, most participants held strong opinions on biodiversity management, generally supporting the view that biodiversity per se needed to be conserved. Participants did however differ considerably in their attitudes towards how management should take place. These were found to be closely linked to their notions of diversity and their views on the role of humankind in nature. We identified three main views on the role of humans in biodiversity management, including (i) humans as potential enemies of nature, (ii) humans as users of nature and (iii) humans as active managers of nature.

For many participants humans were seen as a harmful influence on biodiversity. This viewpoint was particularly apparent in the birdwatchers’ group who viewed recreational activities and conservation as wholly incompatible:

They are all concerned about the erosion on the footpaths and the erosion of the slopes. Now why is that? Is it because the climbers go up? It is not. The tourist buses all stop there and all these doddering old tourists go pouring up there… The general public as a whole make a mess of things, because they don’t have an interest in where they are going [T7].

Interestingly, there seemed to be a distinction in the birdwatchers’ group of who should be “allowed” into the Cairngorms, depending on the level of knowledge and appreciation of the area and its biodiversity:

Now the area is full of people who in my opinion shouldn’t be there at all; the trouble is with these things, when you open them the mass of the people who come in have no interest in the wildlife [T7].

The tourists, however, had a very different view, highlighting the benefits of managing biodiversity for recreation and other purposes, and expressing a view of humans as legitimate users of biodiversity:

If people stay on the paths, which they normally do, most of the time, then it is helpful for nature, and moreover money flows into the area which they can use for the park, which is very important – without money you can’t do anything, that’s evident [T4].

They stressed that biodiversity should be preserved for the people [T3], not for its own sake.

Most participants saw humans as an integral part of biodiversity, required for the appropriate management of biodiversity:

It is as if we [human and nature] are all rubbing shoulders against each other [T1];

Because the impact on all these things is man’s hand, and it acts on everything. And it can be a forgiving hand, or it can be a detrimental hand [T7].

This view of humans as the active managers of nature included very different notions. Some participants saw humans as responsible for restoring the balance that they had disturbed or even destroyed previously:

If you want to get a proper balance back and bring back woodland and things like that you would have to introduce a large carnivore, or several large carnivores or whatever, to ape that [T2];

I think it depends on how far it has gone. If it has gone too far then people have to come in to bring it back… [T5].

The young farmers perceived humans as actively shaping and promoting biodiversity in the rural environment (Fig. 4):

If you didn’t have farming you wouldn’t have the different habitats [T8].

But despite the need for management expressed by participants, some warned against the risks of over-managing biodiversity, emphasising its resilience, and took a critical stance towards a forced maintenance of the status quo:

But it’s not fragile. Everybody seems to think it’s terribly fragile […] It’s not fragile, it’s extremely robust and if something does go something else will take its place [T6];

Just give it time. Forget looking at the clock… You don’t want it to stand still. In a lot of ways you want the area to move forward [T6].

Thus, for land managers such as the foresters and the young farmers, biodiversity management was often seen as a constraint, interfering with agricultural and sylvicultural practices and contradicting their own view of nature as a resilient body interacting with humankind:

There could be regulations for people that are wrecking habitats, but I don’t think we have to go to the extent of having to reintroduce habitats. Because there’s still enough to maintain the wildlife as it is, without having to start spoiling good farmland really [T8].

4. Discussion

Through both verbal contributions and drawings, we found the participants of our group discussions to express rich views and concepts on biodiversity in their local environment irrespective of their knowledge about scientific definitions and technical terminologies. The drawings proved to be a particularly useful tool in eliciting these concepts. While many participants found themselves put on the spot with a direct question of what they understood by biodiversity, the drawing exercise enabled them to have a personal space for thought and time to represent their interpretation visually and develop it subsequently through dialogue.

At first sight participants sometimes seemed to have “strongly held but poorly defended concerns” especially with regard to biodiversity loss, resulting threats to humankind, and biodiversity management (Hull et al., 2001) – a phenomenon that might reflect the current controversial scientific debate on the role of biodiversity in ecosystem functioning (Naeem et al., 1995; Loreau et al., 2001; Hooper et al., 2005). An in-depth analysis of individuals’ verbal and visual contributions, however, revealed that these concerns were informed by very distinctive factors. The normative
connotations particularly proved to be very influential components of individuals’ constructs of biodiversity and nature. Our analysis suggests that individuals have certain, often concurrent, characteristics of biodiversity in mind that are clearly evaluated as either positive or negative. While balance was almost unequivocally considered as explicitly positive with food-webs being closely associated to the concept of equilibrium, dominance of single species was evaluated as negative. These notions might reflect the importance of equilibrium theories for ecological thinking in past decades that has now reached educational curricula and popular scientific programmes and publications as well as conservation practice (Wallington et al., 2005). Naturalness, i.e., the absence of human influence on biodiversity, was a particularly positive feature of nature and biodiversity for groups such as the mountaineers and birdwatchers. Wilderness was consequently also discussed as a potentially positive quality of nature, though the majority of the respondents did not consider the Cairngorms as true wilderness. In contrast, wilderness is a feature often attributed to Scotland and used in the marketing of some of Scotland’s tourist areas. The Cairngorms national park website for example boasts that the national park includes unique “mountainous areas of wild lands”, and Habron (1998) found that 89% of Scottish residents surveyed in a questionnaire (n = 459) thought that wild lands existed in Scotland.

The normative components of individuals’ concepts of biodiversity became even clearer when comparing drawings with verbal expressions, as we identified a gap between the ideal pictures of biodiversity that the respondents chose to show in their drawings, and the much more critical assessments of the actual state of biodiversity they expressed verbally. This reinforces the notion that drawings were, for many participants, a method of conveying their ideal image of biodiversity, a wilderness or idyllic Arcadian landscape where anthropogenic threats were absent, an observation that Alerby (2000) also made in her study on children’s views of their environment.

Takacs (1996) found in his interviews with professional conservation biologists that these evaluative aspects that were seen to have considerable normative and emotional power were clearly perceived as present, but confusing and unclear, thus hindering practical biodiversity management. Unravelling the value judgments that are part of individuals’ concepts helped to improve our understanding of how these normative associations relate to individuals’ attitudes towards biodiversity management.

Indeed, we found that the concepts individuals associated to biodiversity were closely linked to their attitudes towards biodiversity management in general. Here, we can distinguish three different stances, each informed by the participants’ constructs of biodiversity.

A first stance advocated biodiversity issues as the highest priority for land use considerations. Many of the mountaineers and birdwatchers in our sample knew a great deal about biodiversity. They tended to see humankind as separate from nature, natural systems as very fragile, and humans as generally harmful to their environment. They thus opted for an exclusion of humans from large natural areas. Their attitude towards the conservation of biodiversity was a protectionist, biodiversity-centric one, requiring a strong top-down approach for environmental governance:

We have no concept of management, we tinker with things. Somebody should draw the line and say ‘This is how we are going to do it’. Yeah well we should keep people out because people are just a bloody nuisance! [T7].

A second group of individuals, mainly tourists, often set biodiversity conservation on an equal par with other land uses, such as agriculture and recreation, and tended to see man as a user of nature who could potentially, but not necessarily, have negative impacts on nature. Aesthetic aspects of nature were emphasised alongside economic benefits of nature, while acknowledging that natural systems could be severely disturbed by human overexploitation:

I think environmental considerations should stand as an equal partner to financial considerations because you can’t continue to raid the landscape because it is the landscape that wins people back into the hills [T1].

A third position was held by many foresters and farmer students who saw man as the manager of nature. While some farmer students expressed that biodiversity issues should not be considered as important as they currently were, the foresters saw their own influence on biodiversity as positive and an integral part of their professional remit. Natural systems were seen as robust. At the same time, change and evolution were considered as a constitutive part of nature. Correspondingly, biodiversity was considered a very dynamic and resilient entity:

I think it does a pretty good job itself. We don’t necessarily have to go to the lengths that we are at the moment [T6].

The more “functional” (Buijs et al., 2006) view of the foresters and farmers therefore adopted a more pragmatic approach to biodiversity conservation, acknowledging the need for conservation, while allowing for flexibility to incorporate farming and sylvicultural activities.

Our analysis shows that individuals’ attitudes towards biodiversity management in their environment are complex constructs that appear to be informed and characterised by their mental constructs of biodiversity, including normative associations, with regard to (a) humankind, (b) natural systems and (c) the interactions between humans and nature. While the participants’ views on nature and human–nature interactions were the explicit focus of this study, their concepts of humankind were only occasionally touched upon. However, this seems to be an important factor determining individuals’ attitudes towards biodiversity management and should thus be given more attention in future research.

Interestingly however, the group of local residents [T5] did not contribute to the debate of these general issues of biodiversity in the Cairngorms as much as the other groups in our sample did, and expressed their personal feelings with regard to certain species and habitats to a lesser degree. In contrast, institutional issues related to the National Park implementation dominated the discussion among these local
residents who felt most affected by what they viewed as a flawed top-down approach. The majority of local residents who attended the focus group had lived in the area for a long time, and had gradually seen a decrease in local species numbers, with many of the more charismatic species such as mountain hare and wild cat disappearing over the years. The discussions were often full of anger and resentment aimed at the institutional level:

The Cairngorms is the worst managed area there is probably in Europe [T5]; I think it is really vicious and the National Park are sponsoring the extermination of the wild cat [T5].

Local residents seemed dismayed at the effects of measures in the park. An integration of local knowledge and concerns was in their view non-existent at present, alienating them for the process of conservation in the Cairngorms. Procedural aspects of biodiversity management took centre stage in the debate, and participants’ values with regard to biodiversity management in general were hardly expressed. While an improved understanding of public concepts of biodiversity, including their normative notions, can thus be very helpful to predict and improve public support for biodiversity management in general, in specific local cases procedural aspects come into play and might be the dominant factors determining public attitudes. These have to be carefully taken into consideration to ensure the acceptance and ownership of management measures.

5. Conclusion

We examined public views on biodiversity and biodiversity management in the Cairngorms National Park in Scotland and found the participants to express complex mental concepts that included notions such as balance, food chains, dominance and the irreversible nature of biodiversity loss, as well as the role of humans in nature. Normative evaluations of these notions were directly related to individuals’ attitudes towards biodiversity management. To cover the complexity of these issues, a combination of methods, namely focus group discussions together with drawing exercises, proved useful.

Previously, public understanding of biodiversity has often been measured against knowledge of scientific terminology with regard to biodiversity, and the lack of scientific knowledge in members of the general public has been used to argue against public participation in decision-making and policy development. However, our results suggest that this is an unsuitable argument: Independent from scientific terminology, individuals expressed attitudes towards biodiversity management measures that were well grounded in complex mental concepts and corresponding normative evaluations.

We therefore argue that approaches that reveal such value judgments and their conceptual contexts are essential instruments for an improved design and communication of biodiversity policies that will be more likely to find public support. By the same token, critical reflection, communication and an open debate of the values implicit in biodiversity policies and expert opinions might also help to gain public acceptance (Matsuda, 1997; Fischer and Van der Wal, 2007). Consequently, discursive approaches that recognise and embrace the public’s multi-faceted and well-embedded views rather than educational programmes that impose a dominant environmental paradigm, are required to improve public support for biodiversity management and to reduce conflicts.

Our analysis also highlights the importance of two other aspects that are closely related to individuals’ attitudes towards biodiversity management. First, and so far neglected in social scientific research on environmental issues, individuals’ views of humankind appear to inform their perspectives on biodiversity management. Second, institutional and procedural aspects of environmental management play an influential role especially in those cases where the local population is directly affected by management measures. Studies that integrate both aspects are still lacking, but essential to understand the widespread lack of public acceptance for biodiversity management and to develop more sustainable approaches to biodiversity conservation.

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