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Perceiving biodiversity changes in daily life – insights from an exploratory survey across Europe

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Abstract

Environmental problems are often constructed globally and through sophisticated instruments and methods. However, the extent to which these globally constructed problems correspond to ordinary citizens' perceptions of the environment is often unclear. We focus here on results from an exploratory survey in eight sites across Europe, targeted at ordinary citizens, to determine whether biodiversity changes are perceived in daily life, and, if so, whether the views derived from these perceptions coincide with the discourse about global loss of biodiversity. Our results indicate that while respondents acknowledged global biodiversity loss – a process which they could not observe – their own experiences of changes in animal and plant numbers in their local environment were much more diverse. Their own observations mainly related to animals and plants which were part of their "life world", which occurred in places familiar to them and were encountered during everyday activities not necessarily targeted at observing nature. These observations drew a complex picture of changes that is difficult to match with the discourse of global biodiversity loss.

Introduction

Following Gibson's seminal research on the ecological approach to visual perception (1979), there has been a growing recognition of the importance of the body and senses in the perception of the environment. Humans are seen as organisms who simultaneously construct their environments, and themselves as persons, by actively engaging, in a practical way, with the diverse components of these environments. According to this concept, we perceive the environment through permanent relationships with what surrounds us (Ingold 2000). This 'relational perspective' (idem) is shared by Latour (2004) who sees the body as that which enables you to 'be affected' by differences in the world. This perspective has increased the attention paid to the role of the sentient body in constructing the knowledge of nature (e.g. Lorimer 2008). At the same time, authors observe that science has profoundly changed our perception of the environment and that representations given by scientists and transmitted by the media are currently our main, perhaps even our only, access to the environment (Theys & Kalaora 1992). Environmental knowledge is increasingly constructed at a global level, through highly sophisticated equipment, and environmental problems are framed in a "global" perspective (Uzzell 2000; Macnaghten 2003). The direct link between citizens and their environments seems to have been severed.

This also holds true for the discourse about biodiversity (Chauvet & Ollivier 1993). Huge databases about biodiversity are being built by scientists (Bowker 2000) and environmental NGOs such as the IUCN construct and disseminate a discourse about worldwide biodiversity loss (see IUCN Red List). This discourse has been taken up by national and international governments, which have devised strategies (for example decision VI / 26 of the Convention on Biological Diversity) that aim to reduce or halt the decline of biodiversity (e.g. EC 2006), and by numerous mass media. European citizens are therefore very likely to encounter the idea of a drastic global biodiversity loss. How does this globally constructed idea relate to their own perceptions of changes in animal and plant numbers in their immediate environment? And do the views derived from these perceptions coincide with the discourse about a global biodiversity loss?

We carried out an exploratory survey in eight sites across Europe (Table 1) that offers insights to address these questions. As part of the survey, we asked

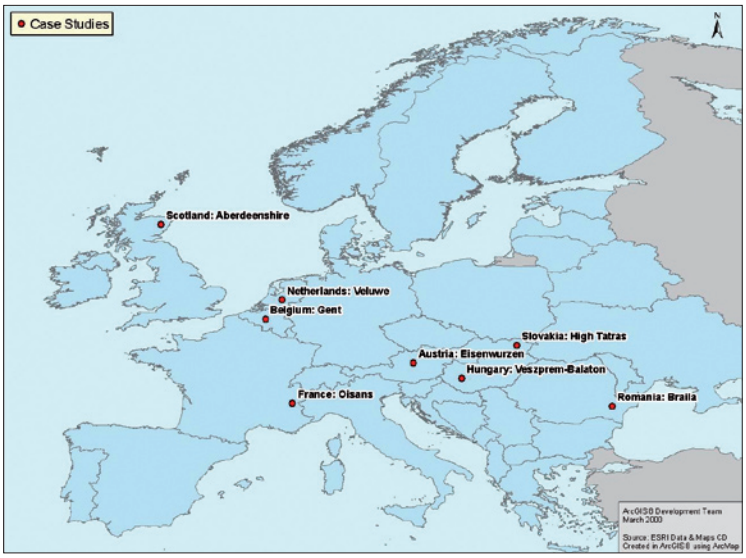

Figure 1 – Locations of the study sites.
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ordinary citizens if they had noticed changes in animal and plant numbers in their local environment and, if so, to describe them. Rather than comparing the respondents' observations with existing ongoing changes – this would have led to "true / false" statements – we wanted to examine closely how they were constructed. Surmising that the body is affected not only by differences between components of the world but also by differences over time, we also aimed to explore the ways in which respondents base their views about changes in their local environment on a sensory approach to nature.

The survey

Questionnaire and respondents

A multidisciplinary group of scientists from all over Europe developed a questionnaire in order to understand how members of the general public in different sites across the continent perceived biodiversity changes, and how these views related to the discourses held in science, politics and the media. In this article, we only focus on the two first questions, which intended to capture the respondents' views on changes in the natural environment. In the first one, the respondents were asked a) what changes, in their view, had occurred during the last twenty years at different spatial scales (global and local), and b) how they felt about this on a scale from −2 (very worried) to +2 (very satisfied). This was followed by an open-ended question, asking: "Have you personally noticed changes in animal and plant numbers in your local environment? If so, what are these changes? Please describe them here." The wording of this question allowed our respondents to describe extreme changes, where species appeared or completely disappeared, and less extreme changes in species populations, including decreases and increases. As such, this wording allowed respondents the flexibility to mention changes in numbers within particular animal and plant species, and changes in species numbers, thus reflecting where they saw important changes taking place, and providing us with a differentiated picture of both extreme (disappearance / appearance) and more moderate (increase / decrease) changes.

The questionnaire was targeted at "ordinary" citizens. Two administration modes were implemented. In Slovakia, Hungary and Romania, face to face interviews were carried out based on previously very low response rates from postal administration in these countries. In all other countries, postal administration was employed, which, where necessary, was complemented by a "distribute-and-collect" stage to obtain a total of 300 completed questionnaires per site. Overall, we collected 2378 completed questionnaires during autumn 2007.

Our final sample was relatively balanced with regard to gender. Overall, 47% of our respondents were female (ranging from 40% in the French site to 51% in Scotland). The proportion of participants with a university degree varied considerably between sites, ranging from about 55% in the French and Scottish sites to 19% in Austria. The average age was lowest in the Hungarian site (mean = 37) and highest in the Scottish and Dutch sites (mean = 54). Thus socially, respondents were unevenly distributed in some sites, often with an under-representation of less educated people, foreigners, and young people. Where this occurred, we tried to counterbalance this bias by distributing questionnaires in particular parts of the study area (e.g. poorer city areas) in the distribute-and-collect stage.

The study sites

The eight study areas (Figure 1) were selected to contain a large city (by that the country's standards), to include a clear rural-urban gradient, and to be in the direct vicinity of a significant protected area. Following Uzzell's view that the rural/urban dimension could be an important factor in the perception of environmental problems (Uzzell 2000), we selected the respondents as follows: one third from urban communities (> 50 000 inhabitants), one third from rural communities (< 3 000 inhabitants), one third from semi-urban communities (3 000 – 50 000 inhabitants).

The study areas differed greatly in their biological, geographical and economic features (Table 1). The idea here was not to take these sites as representative of their countries but to cover a variety of areas across Europe.

The responses to the open-ended question and their analysis

Overall, 52% of the respondents stated that they had personally noticed changes in their local environment (Table 2). The descriptions of these changes varied substantially between administration modes: they tended to be very short in face-to-face interviews, whereas they were either short and abbreviated or long and detailed in the postal administration mode. All responses were translated into English but original versions were kept in order to check translations.

We analysed the responses according to five criteria:

- the categories of plants and animals mentioned, which ranged from broad groups (e.g. wildlife, plants, animals, birds, game, non-native species) to narrow ones focussing on a particular genus or species, e.g. the sparrow, the bluebell, the bee;
- the types of trends or states. We coded responses as expressing a decrease, absence, increase, or presence. For example, respondents described 'increases' using terms such as 'more', 'have increased', 'more frequent', but also using terms that were richer in connotations such as 'explosion', 'invasion', 'has become a plague', 'plagues of', 'infestation', 'proliferation';
- the feelings and values that were implicit in the respondents' descriptions of changes;
- the causes respondents held responsible for the observed changes;

Table 1 – Main features of study sites

Site	Sample size	Main landscape types	Main industries	Altitude (m)	City (number of inhabitants)	Major protected area
Belgium: Gent	306	Agricultural land, semi-urban area, forest	Agriculture, proximity to port of Gent (grains, steel, oil, fertilizers, cars, etc)	5 – 20	Gent (226 000)	Bourgoyen-Ossemeersen Nature Reserve: valley eroded by the river Leie, characterized by floodplains, meadows, and marshes
Netherlands Southern Veluwe	302	Forest, heathland, sand drifts	Tourism	0 – 100	Arnhem (142 250)	Hoge Veluwe & Veluwezoom National Parks: hilly area including woodland, heathland, small natural lakes, and large sand drifts
France: Oisans	278	Forest, mountain pastures, agricultural land	Tourism, agriculture, electronics (Grenoble)	300 – 4 000	Grenoble (153 000)	Écrins National Park: very mountainous area with many peaks over 3 000 m and deep valleys
Austria: Eisenwurzen	281	Forest, mountain pastures, agricultural land	Manufacturing industry, esp. metal and machinery (Linz), tourism, agriculture.	270 – 2 400	Linz (183 140)	Upper Austrian Limestone Alps National Park: mountainous area, largely covered with forests
Hungary: Veszprém-Balaton	300	Lake, wetlands, forest, pastures, agriculture	Tourism, ship manufacturing, wine production	100 – 150	Veszprém (62 000)	Balaton Uplands National Park: landscape characterized by bog and fen meadows, rocky grassland, beech forests, agricultural areas, primarily vineyards
Slovakia: High Tatras	306	High mountains, basin landscape	Tourism, chemical and textile industry, food processing, agriculture	580 – 2 600	Poprad (55 158)	Tatras National Park/Biosphere Reserve: karstic mountain range including many lakes, pastures, and forests
Romania: Islands of Brăila	300	Riverine (Danube), agricultural	Agriculture, food processing, textile, manufacturing, wood processing, large shipyards	4 – 20	Brăila (216 292)	Small Island of Brăila Natural Park: wetland system, including Danube arms, natural lakes, reed beds, riparian forests, and meadows
Scotland: Aberdeenshire	305	Coastal, agricultural, forestry, heather-moorland	Oil and gas, agriculture, tourism	0 – 1 400	Aberdeen (202 370)	Cairngorms National Park: predominantly mountainous area, characterized by pine and birch woodland, heather moorland and moss-sedge heath

- the practical circumstances (how, when, and where) in which respondents had made their observations.

Results

Four main findings emerged from the analysis of the responses according to these criteria. First, respondents' views and concerns about changes in animals and plants at global and local scales differed substantially. Secondly, the picture they drew of changes in their local environment was mixed. Thirdly, the expression of their views was generally associated with embodied experiences. Fourthly, observations of biodiversity changes were more often made in ordinary than in designated places and activities.

Different views at different scales

Across all sites, the vast majority of respondents saw biodiversity as having changed during the last twenty years, both globally and locally (Table 2). The dominant perception of change at global level was clearly one of species loss, with 76% of the sample stating that species numbers had been declining. At local level, this was much more mixed, with 50% seeing a decrease, and 21% stating that there had been a shift in species. Equally, concerns for changes in plants and animals were more prevalent with regard to global (80%) than to local changes (62%).

As expected, respondents who thought species numbers had globally decreased were significantly more likely to be worried about these changes (mean score −1.39, SD = 0.69) than those who thought species were simply shifting (mean score −0.54, SD = 0.73), increasing (−0.20, SD = 1.17) or not changing at all (mean score 0.01, SD = 0.87; ANOVA, $p < 0.001$). A similar relationship also occurred at local level, and could be found in all site samples, although variations in the concern about increase and species shift did exist.

Respondents who had personally noticed changes were significantly more likely to see species locally as decreasing or increasing, whereas those who had not noticed any changes themselves tended to state that they did not believe that there were any changes, or, to a lesser degree, that a shift of species had taken place (Chi-square test, $p < 0.001$, df = 3). Respondents who had noticed changes themselves were also more likely to be worried about local changes (mean score −1.0, SD = 0.98) than those who had not noticed any changes themselves (mean score −0.4, SD = 1.0, T-test, $p < 0.001$). This difference was also significant when looking at each site sample individually. Interestingly, the same held for changes at global level: those who had noticed changes themselves locally tended to be more worried (mean score −1.3, SD = 0.82) than those who had not (mean score −1.0, SD = 0.88, T-test, $p < 0.001$). Again, this applied to all site samples except the French and Dutch ones. It thus seems that local observations can also affect opinions on a global scale – or, that concern about global change could make respondents more sensitive to changes in the own local environment.

Table 2 – Responses to three questions (a) What kinds of changes have taken place?, (b) How do you feel about this? and (c) Have you personally noticed any changes in animal and plant numbers in your local environment? Total respondents across sites; n = 2 378. "Species numbers have changed" includes overall increase, decrease, and move of species, whereas "species numbers have decreased" is a subset of this. "Worried about changes" includes ratings for "somewhat worried" and "very worried" about the change described in the previous question. All percentages are for valid responses.

	Species numbers have changed (%)		Species numbers have decreased (%)		Worried about change (%)		Noticed changes locally (%)
	globally	locally	globally	locally	globally	locally	
Total sample	**94**	**78**	**76**	**50**	**80**	**62**	**52**
Netherlands	96	72	70	35	77	47	55
France	97	72	76	42	92	70	57
Austria	97	82	82	52	87	67	56
Hungary	96	70	85	43	90	57	39
Slovakia	88	76	71	54	60	56	52
Romania	89	89	71	72	70	73	34
Scotland	97	85	84	49	82	61	57
Belgium	95	76	72	46	87	63	66

Local changes in animals and plants: a mixed picture

Responses about decreases in animals and plants – both as an ongoing trend and as a current state – were very common. Although certain changes were reported repeatedly in some study sites (e.g., a decrease in flowers in alpine meadows in Austria), similarities across the sites were striking: small animals and, above all, small songbirds were most commonly seen as declining, followed by flowers.

However, many responses pointed to other types of trends and states, which is consistent with the findings from the closed questions. In all study sites, certain animals and plants were said to be increasing or even proliferating and, in some cases, returning. Again, in some sites certain observations recurred, for example an increase in wild boar in the Dutch Veluwe, and in large carnivores in the Slovak High Tatras and in the French Oisans. Observations of increase related to large predatory animals, including birds, such as buzzards and corvids, were very often found here. Many responses also stated that some plants and/or animals were increasing while others were decreasing: "Fewer squirrels and sparrows. Number of swans increased on Lake Balaton. Sometimes I see great white egrets" (Hungary), a typical response here being "more crows, fewer sparrows". Thus, the complexity of the responses did not only appear when the results were looked at overall: it was also very evident on an individual scale. Some respondents also mentioned shifts in life cycles and/or spatial distribution. For example, they noted that plants flowered earlier, that animals went into hibernation later than previously, and that some species were found at higher altitudes or latitudes: "Sorts of animals (such as butterflies), which were present in the South of France, are found here in the mountain" (France). Occasionally, these shifts were explicitly attributed to climate change: "Flowers bloom longer due to warmer autumns" (Belgium).

While in most statements feelings and evaluations were not clearly expressed and changes were described in a rather neutral way, such as "No more frogs in the ditch" (Belgium) or "rather shy wild animals come foraging even into the garden (roe deer)" (Austria), others commented on changes in a more evaluative fashion, stating, for example "spreading of invasive plants and pests" (Hungary), "there are far too many seagulls" (Scotland), or "jackdaws are all around, to the point of weariness" (Belgium). It seemed that many species perceived as increasing were also perceived to be out of place, the wrong species in the wrong place, or simply too dominant. Some of the observations clearly referred to the non-nativeness of incoming species: "appearance of newcomers and invading species (tree of heaven, ragweed, wild hemp) degrade the habitat of native species" (Hungary). Many other respondents simply stressed that the increasing species were becoming too dominant and were suppressing others, without mentioning whether they were native or not.

Negative changes were often attributed to urban sprawl and economic development, climate change, farming practices or general mismanagement of the natural environment. Institutionalized conservation was also frequently mentioned. Conservation was in some cases seen as a cause of positive change: "lynx and bear are back, animal and plant conservation in national parks have put things in order again" (Austria), "new release of red kites brilliant for the area" (Scotland). However, it was also held responsible for increases in species that were perceived as undesirable, either with regard to species-specific conservation ("increase of "protected" black crows, which can be very aggressive," Belgium), or, more frequently, with regard to protected areas. Examples mentioned here included the effects of conservation on large carnivores, the reintroduction of or increase in wild boar and the frequently mentioned "over-protection" of brown bears in the Tatras. Some respondents explicitly linked the increase in these species to management of designated areas: "I do not want to be afraid of bears, lynx or suchlike wild animals, which are flown into the national park for lots of money" (Austria), "The number

of wild boar has tremendously increased, especially in protected areas. They are damaging vineyards and sometimes even endanger tourists" (Hungary).
Overall, respondents' observations painted a complex picture of shifts in animal and plant populations, associated with positive and negative feelings which were seen to be caused by a variety of factors. While conservation efforts were often seen to be effective, these effects were not always considered positive.

Embodied experiences of changes in the living environment

A key aspect of the study was gaining an in-depth understanding of how respondents constructed their knowledge about changes in plants and animals. As such, a large part of the analysis focused on the terms used to describe these.
The verbs used by respondents were found to emphasize strongly the importance of senses. Unsurprisingly, respondents often pointed to changes in what they saw: "I saw magpies at 2 100 m this year 2007, which I had never seen during the thirty years I've been working in the ski resort" (France). Colourful flowers, notably poppies and bluebells, appeared in many responses and were mainly seen as decreasing. But respondents also relied on what they could hear: we found many observations about changes in songbirds and some about changes in owls: "I have not heard the eagle owl for two years around here" (Austria). References to smell and taste were also present. One respondent noticed that "hay is less fragrant" (France). Others felt that meat (Hungary), fruit and vegetables (France) were blander. One respondent wrote he could "now feel mosquito bites in November" (Belgium). These examples clearly show that respondents paid close attention to animals and plants and exhibited a sensory engagement with nature which was not only visual but also auditory, olfactory, gustatory and even tactile.

Experiencing change: immediate surroundings vs protected areas

Another finding relates to the importance of particular places referred to by respondents when they described changes in nature. We expected the protected areas in the vicinity of the research sites (Table 1) to be particularly well represented in our respondents' accounts of biodiversity changes, and designation categories as such were widely known among our sample: about 90 % of the entire sample stated in response to a set of closed questions that they felt familiar with the terms "nature reserve" and "national park" – a consistent finding across all sites, except the Brăila islands, where these terms were known by only about 50 % of the respondents.
However, our analysis of these observations revealed a different picture. Protected areas were mentioned occasionally, especially by respondents living in rural areas within or adjacent to these reserves (see also the section "Local changes in animals and plants: a mixed picture"). But even within these groups, they were mentioned far less often than 'ordinary' places close to the respondents. "In the / our garden" was the place most often referred to, and respondents sometimes specified locations further, for example, "at garden feeders", "in the nesting box". Some observations were even made indoors: "During the last 5 years, I noticed a species of mosquito-fly in summer […] in the kitchen" (Flanders). Beyond the garden and the home, public parks and "the neighbourhood" also appeared to be important places for observations and experiences of nature.
The activities mentioned had similar characteristics. Most often, participants referred to ordinary daily activities rather than practices specifically targeted at observing nature. Some of these activities involved direct engagement with nature, e.g. feeding birds or gardening, but not all of them: for example, respondents also made observations when walking their dog – "In the local woods where I walk my dog there are fewer deer, rabbits and squirrels and less plant life than in previous years" (Scotland) – or driving a car – "fewer hedgehogs dead on road" (Scotland). Thus, it seems that observations of biodiversity change were made much more often in everyday places and activities. Designated sites and specific activities targeted at the observation of nature played a much less pronounced role.

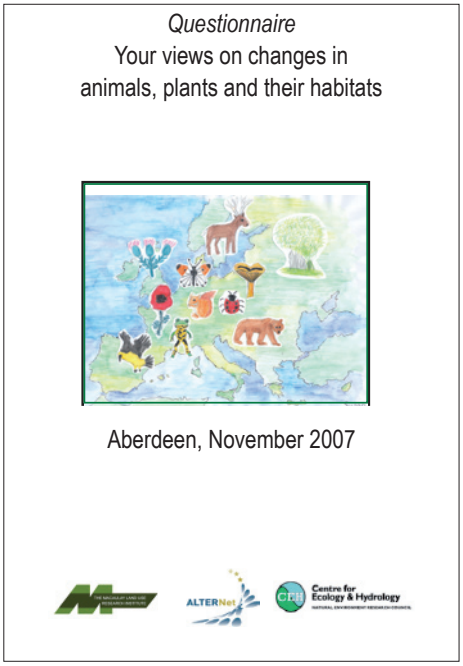

Figure 2 – Cover page of the questionnaire

Discussion: the role of perception in constructing views about biodiversity changes

Global biodiversity loss cannot be perceived in daily life. However, our respondents expressed strong awareness of and concern about it. This shows that the discourse about global biodiversity loss has been successfully conveyed to ordinary citizens and con-

firms Uzzell's claim that an environmental problem can be acknowledged without being perceived (Uzzell 2000). In addition, respondents viewed biodiversity loss as being more important on a global scale than locally: here again our results are in line with Uzzell, who showed the existence of this phenomenon with other environmental problems and coined the term "environmental hyperopia" (Uzzell 2000).

But we do not fully agree with his claim that direct experience of environmental changes is unlikely (Uzzell 2000). While this may be true for some environmental problems he considered (water and atmospheric pollution, effects of acid rain, noise pollution, and holes in the ozone layer), which require sophisticated instrumental techniques to be disclosed (e.g. Jamison 1996), this is not the case for local changes in animals and plants. Indeed, our respondents had clearly perceived shifts in their natural environments, such as missing or new sounds or smells. Respondents also linked changes in animals and plants to other environmental changes, such as climate change: although they could not directly perceive an increase in temperature, they noticed it indirectly, through changes in their living environment. Our results therefore support Ingold's analysis of people as sentient bodies, engaged in an environment that changes over time, and underline the "embodied character" of human experiences of nature (Macnaghten 2003). People who may belong to so-called inactive publics (Hallahan 2000) were certainly active observers of nature.

Respondents did not refer to random animals and plants but to those that had attracted their attention, mattered to them and were part of their life world. A majority of their observations were made in their immediate surroundings, especially gardens, which is in line with Bhatti and Church (2001), and in everyday activities. Changes in their natural environments were perceived in the places they inhabited rather than in 'exceptional' or 'spectacular' places they rarely visited. The need to live in an environment to be able to perceive its changes might explain the rather meagre presence of protected areas in the responses, which initially seemed so surprising.

Finally, our respondents had perceived a large variety of changes in animal and plant numbers: decreases and increases, deemed as positive or negative, depending on the species, their location, behaviour and relative abundance. The discourse about global biodiversity loss allows for some increases in species and does not consider all increases positive, i.e. invasive species are seen as a major cause of biodiversity loss (e.g. Wilson 2006). But perceived increases in or appearance of species, whether seen as positive or negative, were not restricted to invasive species. The changes perceived by ordinary citizens were therefore more complex than those communicated in the discourse about the global biodiversity loss, which could have led them to think that the biodiversity crisis does not really apply to their own environment.

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