Visitor attitudes towards natural disturbance: the case of the bark beetle in Bavarian Forest National Park, Germany

Martin Müller, Marius Mayer, Manuel Woltering and Hubert Job

Abstract — Management authorities of protected areas have recently been faced with a considerable rise of natural disturbance such as fire or insect pests in ecosystems. Incorporating visitor experience of natural disturbance into management strategies is a crucial task. The present study uses multivariate statistical analysis to examine visitors' attitudes towards large-scale bark beetle infestation in the case of Bavarian Forest National Park, Germany. Findings indicate that visitors have a neutral attitude towards the bark beetle and slightly reject controlling the bark beetle in the national park. Expectations of a successful recovery of the affected areas (green-up) and low personal issue salience are the two strongest predictors for support of not controlling the bark beetle. Our findings suggest that it is well possible to position protected areas as refuges where nature is supposed to follow its course without intervention rather than as landscaped representations of cultural ideal types. In order to communicate this idea of wilderness to visitors, park management authorities should design educational measures to raise visitors' awareness of the ecological mandate of protected areas and of the role of disturbance agents in ecosystems.

Index Terms — perception, attitudes, natural disturbance, protected areas, tourism, bark beetles

1 Introduction

Protected areas managed according to category II of the classification scheme of the World Conservation Union (IUCN) are mandated to protect ecosystems from human interference and make them accessible for recreational activities to a limited degree [1]. In Bavarian Forest National Park (Germany) the designation of areas as core zones (Naturzone) prohibits any management intervention in natural forest dynamics. This also applies to the management of the spruce bark beetle (mainly *Ips typographus*).

Bavarian Forest National Park was established in 1970 as the first German national park (see Fig. 1). It covers an area of 24,250 ha which is dominated by forest ecosystems of Norway Spruce (*Picea abies*) and European Beech (*Fagus sylvatica*). Since the beginning of the 1990s, the mature spruce stands of the mountain spruce forest above 1,100 m have suffered from severe bark beetle attacks [2]. As of 2007, total tree mortality across all forest communities amounted to 5,500 ha or 22 % of the park area.

Being a popular tourist destination, Bavarian Forest National Park receives more than 750,000 visitors annually [3]. It is especially on hiking tours in the back country of the national park that visitors are directly exposed to areas with dead wood. The visual transformation effected by the bark beetle confronts visitors with a new, unfamiliar type of forest image: instead of the usual dark green of commercially-managed forests the visual field is dominated by the grey of standing or lying dead trees (see Fig. 3). Visitors respond in completely different ways to this view. Reactions range from surprise, shock or anger to fascination and marvel.

The radical transformation of the visual forest imagery by the bark beetle prompted concerns within the local population about negative impacts on tourism. Some residents argue that visitors could be deterred by the unaesthetic visuality of the vast dead wood areas and are not able to enjoy their stay. The present survey therefore seeks to answer twoquestions:

- What are visitors' attitudes towards bark beetle infestation and management in Bavarian Forest National Park?
- What are implications for beetle management strategies?

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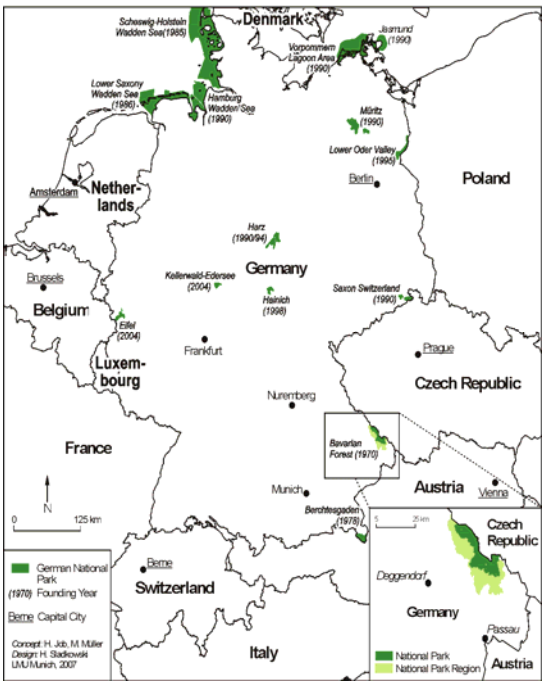


Fig. 1: German national parks and location of Bavarian Forest National Park

2 RESEARCH DESIGN

Research design was chosen to enhance cross-study comparability with existing literature on the perception of bark beetles. Relevant previous studies were conducted in Bavarian Forest National Park in 1997 and 2001 [4], [5] and in several locations inside and outside of protected areas in North America (especially [6], [7] but also [8], [9]). Face-to-face on-site interviews were carried out in the summer of 2007 during weekdays and weekends. Of a total of 783 contacts 617 questionnaires were completed by the interview team of which 608 were valid (N = 608, rejection rate 21.2 %).

Because appreciation of the national park potentially influences visitors' attitude towards the bark beetle, we introduced a distinction between two types of visitors to test for this hypothesis: national park tourists and traditional tourists [10]. National park tourists rate the importance of the national park for their trip as high and very high and state that they would not or maybe not have come here if it did not exist (n = 173). Traditional tourists, on the opposite, rate the importance of the national park for their trip as low and very low and state that they would have come here, even if the national park did not exist (n = 246).

3 RESULTS

3.1 Visitor attitudes towards the bark beetle

To evaluate the attitudes towards the bark beetle the arithmetic mean of eight attitudinal items was calculated (Fig. 2). On a Likert scale from -2 to +2 the most negative attitude is -2, a neutral attitude 0 and +2 the most positive attitude. On average, visitors had a neutral attitude towards the bark beetle in Bavarian Forest National Park (arithmetic mean $M = 0.0$, standard deviation $\sigma = 0.9$), yet evaluations vary for different statements. 29 % of respondents each show a firmly negative and firmly positive attitude ($M < -0.5$ resp. $M > +0.5$), whereas 41 % of respondents have a balanced attitude towards the bark beetle ($-0.5 < M < +0.5$).

National park tourists have a significantly more positive attitude towards the bark beetle than traditional tourists for all items except for their evaluation of the beetle's impact on tourism (Fig. 2). They regard the bark beetle as less detrimental to forest rejuvenation and tend to concede a right to exist for the insect within the boundaries of the national park. Traditional tourists see the bark beetle as a threat to the health of forests and rate it as detrimental to the forest in the national park. It is probably for this reason that traditional tourists tend to somewhat support controlling the bark beetle ($M = -0.1$, $\sigma = 1.4$), whereas national park tourists clearly reject such a measure ($M = 0.6$, $\sigma = 1.3$).

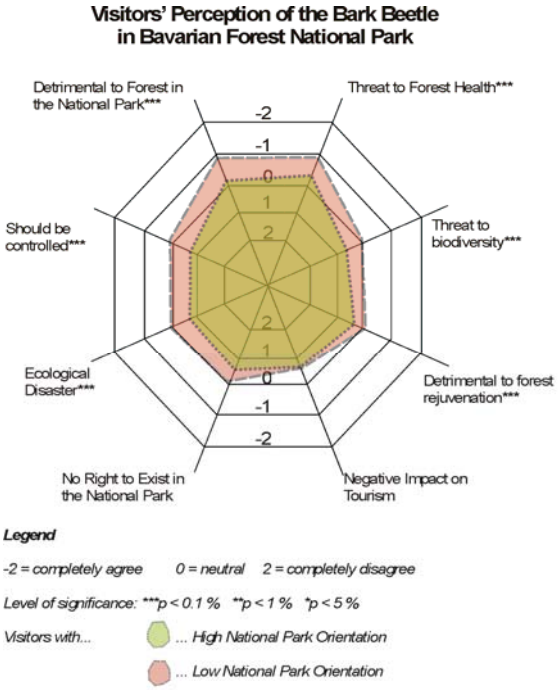


Fig. 2: Differences in the perception of the bark beetle in Bavarian Forest National Park by visitor type (positive statements inverted).

3.2 Visitor attitudes towards controlling the bark beetle

Attitude towards controlling the bark beetle shows a relatively even distribution across the five answer categories. On average there exists a slight preference for non-intervention (M = 0.2, σ = 1.4). But what factors drive support of non-intervention? Table 1 shows the results of a statistical model with potential factors of influence. Model 1 includes the attitude towards the bark beetle as an explanatory variable for the attitude towards controlling the bark beetle. As expected, the correlation between the attitude towards the bark beetle and the attitude towards control are highly correlated: the more positively visitors assess the bark beetle, the weaker is their support for controlling it. The only other significant variables in this regression model are expectation of recovery and personal issue salience: if respondents expect a rejuvenation of the infested forest patches and if the outbreaks are of a low importance to them, they tend to reject beetle management.

A second model was estimated without the attitude towards the bark beetle as an explanatory variable (Model 2, Table 1). This model has a considerably higher number of significant predictors. Issue salience and recovery still have the strongest correlation with the attitude towards control. Similarly, a higher level of education and better subjective knowledge about the bark beetle correlate positively with the attitude towards control as do a high national park orientation and a pro-environmental worldview. A weak correlation with the number of visits can be found: support for management intervention increases as the number of repeat visits increases. Variables like the age or the sex of respondents, urban residence or the distance of respondents' residence to the national park do not act as significant predictors.

TABLE 1

FACTORS INFLUENCING VISITORS' ATTITUDES TOWARDS CONTROLLING THE BARK BEETLE

Independent Variables	Standardised β-oefficients Controlling the Bark Beetle (N = 572)	
	Model 1 with „attitude“	Model 2 without „attitude“
Age	0.01	-0.01
Sex *(1=male)*	0.02	0.04
Education	0.06	**0.15*** **
Urban Residence	0.04	0.03
Distance	-0.06	-0.09
Duration of Stay	0.01	0.02
Number of Visits	-0.07	**-0.09***
Intensity of Perception	-0.03	-0.04
Environmental Worldview	0.04	**0.10****
National Park Orientation	0.06	**0.13*** **
Issue salience	**-0.09****	**-0.23*** **
Subjective knowledge	0.02	**0.15*** **
Recovery *(1 = rejuvenation)*	**0.09****	**0.25*** **
Correct Cause *(1 = bark beetle)*	0.03	0.04
Attitude towards Bark Beetle	**0.61*** **	—
R^2 (adjusted)	**0.52**	**0.26**
F	**30.1****	**11.0****

Level of significance: *** < 0.1 %. ** < 1 %. * < 5 %
Results of OLS regression with "attitude towards controlling the bark beetle" as dependent variable.

4 DISCUSSION

Survey respondents in Bavarian Forest National Park show a balanced attitude towards the bark beetle and a slight tendency towards rejecting measures to control it. Attitudes towards controlling the bark beetle are mainly driven by the expected development of dead wood areas, the subjective knowledge about the bark beetle and the role of the national park. These factors could be influenced directly by the park management by way of public relations and environmental education. Our results suggest that it is important for visitors to be reassured that bark beetle infestations do not harm nature or inflict irreversible damage on ecosystems. Intensified education of visitors about the role of the bark beetle as a naturally occurring organism in spruce forests can foster acceptance. Expecting or perhaps even experiencing firsthand the rejuvenation of dead wood areas can equally contribute towards an enhanced understanding of the natural processes following bark beetle infestations.

The relatively open-minded attitude towards the bark beetle, especially as compared to similar surveys in other countries [7], is also reflected in respondents' opinion that dead wood areas do not negatively affect tourism. Similarly, previous research in the Swiss National Park [11] indicates visitors are quite able to appreciate the characteristics of a natural-state forest without management. It should be of particular interest to national park management that visitors' affinity to the national park and also to the idea of national parks as refuges of nature crucially influences the attitude towards the bark beetle. Visitors who display a strong orientation towards the national park have a significantly more positive attitudinal profile: they disapprove of controlling the bark beetle and do not regard it as an ecological catastrophe.



Fig. 3: Aerial view of area affected by spruce bark beetle (*Ips typographus*) in Bavarian Forest National Park. Mount Lusen is on the right.

In order to foster visitors' acceptance of the bark beetle it is mandatory to actively position the national park - with its conservation mandate - as an attraction for tourists. The ordinary landscapes of commercially-managed forests, as they are found all over Germany, cannot be the unique selling proposition of a national park. Quite to the contrary, the label "national park" promises something special. If, as social psychology suggests, tourism functions through an experience of contrast and difference, it is only logical to give up the ordinary forest imagery in favour of the rough, rugged landscapes produced by the bark beetle. It is crucial, however, for national park management to communicate to visiotrs this new, dynamic concept of nature and nature conservation - of wilderness [12].

NB: The results presented in this short paper are the outcome of a research project funded by Bavarian Forest National Park. As they have been significantly abridged and are in a preliminary stage, this contribution is not appropriate for citation. If interested in a full analysis, a working paper [13] and the research report [14, in German] can be obtained from the first author upon request.

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