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# Indicator system of Czech national parks and biosphere reserves: Some developing trends in the Šumava National Park

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**Abstract**
In the Czech Republic, several sociological research studies have been done focusing on the problems of tourism in protected areas. Charles University in Prague has been monitoring this topic since 1997 with a survey focused on key stakeholders – local residents, tourists, and local governments. Quantitative and qualitative data we collected regularly from all Czech National Parks. Now, these 14 years of data enable us to extrapolate some trends to be used for practical management. Therefore, a user-friendly set of indicators was created, describing these trends and present development. Proposed headline indicators describe and analyze trends and mutual relationships of the three pillars – environmental, social, and economic. These indicators could be used for design priorities for the management of environmental protection in national parks. For example, in the case of the Šumava NP visitors, we can observe following trends: A statistically significant increase in the total number of both hikers and cyclists was detected in this period and the proportion of hikers:cyclists was also changed. Significant changes were in perception of the perceived numbers of visitors in centres and on hiking tracks. The demographic characteristic of visitors was also changed during observed period. Both the results of monitoring and selected indicators are available on www.management-chu.cz.

*Key words:* sustainable development, tourism and management, environmental indicators, monitoring

## Introduction

Sustainable tourism in protected areas has increasingly been researched and analysed worldwide (Mcintosh et al. 1995). This research allows for better controls on tourism activities and the development of these activities for the benefit of visitors, local people and other stakeholders. Relationship between the interests of three key players, nature conservation, local residents and tourists, is very important for the effective management of protected areas, e.g., national parks (NPs). Actual management of these areas needs research into the requirements and attitudes of visitors and local people. Monitoring this socio-environmental data and mapping the sociological environment are necessary for the environmental management and development options in these areas (Ceballos-Lascurain 1996). Data from this monitoring should be easily accessible, not only to protected area administrations but also to visitors, residents, local policymakers, and other groups of interested people (Williams & Shaw 1996).

Charles University in Prague (Institute for Environmental Studies) has been monitoring sociological data in all four Czech national parks since 1997 (Čihař et al. 2002, Čihař &

Třebický 2010). This research represents the only systematic and periodical monitoring of tourism in Czech NPs. Data about visitors (both qualitative – questionnaires – and quantitative – physical counting) is gained annually from the Šumava NP and Krkonoše NP and research about local people is carried out every five years in these two protected areas. In the other Czech NPs (Podyjí NP and České Švýcarsko NP), monitoring took place in 2000 and 2010.

The mentioned data (particular items of questionnaires, amount of visitors) are converted into indicators of sustainable tourism in these protected areas. Each indicator should be easy to identify and measure, relatively sedentary, quick to respond, and low in ambiguity (Hughes 2002). Such indicators represent very important tools for assessing the management effectiveness of protected areas (Hockings et al. 2006). Relevant international organizations, e.g., the International Union for Conservation of Nature (IUCN), the World Tourism Organization (WTO), recommend employing indicators in tourism management of protected areas. The WTO defines sustainable tourism indicators as "the set of measures that provide the necessary information to better understand the links and the impact of tourism on the cultural and natural setting in which this takes place and on which it is strongly dependent" (Manning et al. 1997). Two methodological approaches are used to define analytical sustainability measures (Blancas et al. 2010). The first is the non-aggregative approach, which includes studies whose final aim is to develop an indicator system as a measurement tool, and the second is the aggregative approach, which proposes the construction of a general synthetic indicator based on a set of initial indicators as an assessment tool. The first approach is used in this study.

Indicators can provide crucial guidance for decision-making in a variety of ways. They can translate physical and social science knowledge into manageable units of information that can facilitate the decision-making process. Suitable indicators describe and analyse trends and mutual relationships of the three pillars of sustainable development – environmental, social and economic (Parris & Kates 2003). They allow users/target groups (protected area administrators, civil servants, academics, or the general public) to measure and assess the quality of life of local communities and, at the same time, assess the quality of local ecosystems and the environment.

## Materials and methods

### Monitoring of visitors

The monitoring of visitors in the Šumava NP was divided into two separate thematic fields. The first one focused on the physical counting of visitors (hikers, cyclists, motor vehicles, dogs, others) passing through pre-selected monitoring points – tourist crossings. The monitoring points were selected in cooperation with the Administration of the Šumava NP. Five important tourist crossings in the central part of NP were used – Kvilda, Horská Kvilda, Antýgl, Modrava and Březník, although this locality was not occupied regularly. Not only the type of visitor but also the direction of their movement was recorded. Each person was recorded twice at each monitoring point: first, when arriving at the point; second, when leaving the point.

The second level of monitoring was the qualitative aspect of tourism. A questionnaire inquiry was carried out by personal interview using a random selection of tourists. Annual surveys were carried out in the high summer season over a nine-day period (two weekends with one working week between them), at the same monitoring points where quantitative monitoring took place. Items in the questionnaires were almost the same every year and

differed slightly in accordance with actual problems and trends in the national park. Over fourteen years of monitoring, 11850 completed questionnaires have been collected. The outputs of this type of research are the main topic of this article.

### Monitoring of local people

Since 1998, surveys of local people and representatives of the local public administration have been carried out every five years in the Šumava NP. Investigations were carried out by means of a questionnaire survey, administered by personal interviews in randomly selected households. Every second to fifth household was approached, according to the size of the village. The research took place in the following municipalities: Borová Lada, Horská Kvilda, Kvilda, Modrava, Prášily, and Srní. Identical questionnaires, containing around thirty questions were used, only slightly modified on some topical issues. The views and attitudes of local people regarding conservation and environmental management activities were analysed in the same way as the data about visitors.

### Indicators and indicator system

The primary data from all questionnaires were entered into an MS Access database and processed statistically by the statistical programs NCSS Program or Statgraphic Plus. The subsequent results were, consequently, aggregated into indicators. Indicators were any numerical facts (variables, indices, and other derived quantitative characteristics) that were related to the quality of any aspect of the environment, human life, and sustainable development of the area (Mederly et al. 2004). A methodical letter for each indicator was also created. It included the name of the indicator, a detailed definition, its efficiency, validity and connectivity with other indicators, the frequency of monitoring, and a description of data processing. Indicators for this research were chosen in coordination with the NP Administration. Forty indicators about visitors are divided into eight sections: a socio-demographic section; itineraries; means of transport and types of accommodation; purpose of visit and role of the national park; environmental awareness of visitors; evaluation of conservation and tourism management in the national park; carrying capacity of the park and tourist activities; and spending in the national park. Most of them are available through an online indicator system (www.management-chu.cz). It is possible to see or download graphs, tables and factsheets for every indicator on this website. All these results are available only in Czech language.

## Results and discussion

At the moment, the online indicator system contains thirty qualitative indicators that describe national parks visitors, and more than forty indicators relating to local people. Moreover, indicators dealing with the amount of visitors in the observed period are located in the indicator system too. There is information about the average numbers of visitors for each monitored tourist crossing. Weekly dynamics of tourists at particular monitoring points (Fig. 1) is also accessible. This article focuses on the quantitative and qualitative characteristics of the Šumava NP visitors during the whole monitoring period (1997–2010).

### Visitors: Their characteristic and attitudes

The first group of indicators consists of socio-demographic data about visitors. Most of the important characteristics remain almost identical over the 14-year monitoring period. Visitors are predominantly Czech. Germans are the most common foreigners who visit this area (4% on average). Other more frequent foreign visitors to the Šumava NP are Dutch, Slova-

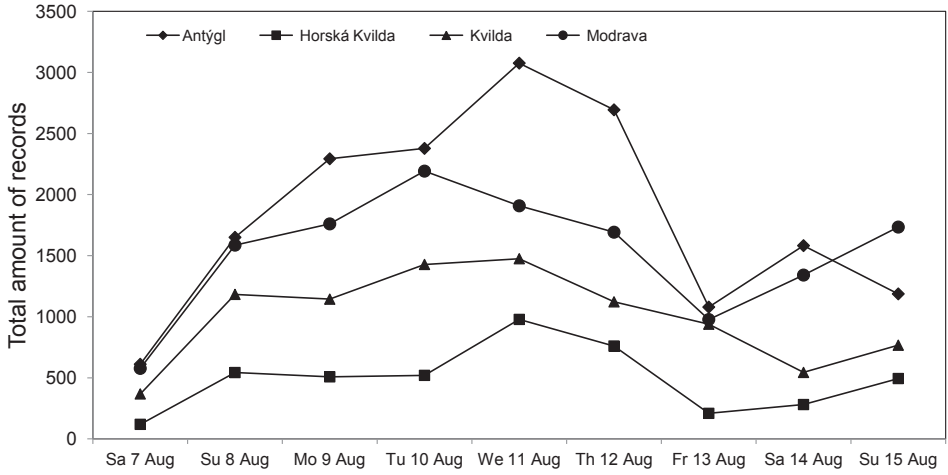


**Fig. 1.** Weekly dynamics of hikers in particular monitoring points in the year 2010 (each person is recorded twice: first, when arriving at the point; second, when leaving the point).

kian and British (Fig. 2). This indicator shows no significant trend; only a decrease in the number of German visitors during the last three years could be remarkable. Czech tourists come to the NP mainly from the capital, Prague, and from the Šumava NP neighbouring districts (Klatovy, Strakonice, and Prachatice; more than 50% of the visitors). Males slightly outweigh females but the difference is small (57% vs. 43% in 1997, and 52% vs. 48% in 2010). As regards the social make-up of tourists, the predominant group consists of white-collar workers (>40% of the respondents). The majority of all visitors had completed secondary school education (54.6%) and more than one-third of respondents are university graduates (38% on average). It is possible to observe apparent changes in age groups (Fig. 3). The age group ">60 years" is still the most frequent, in contrast to the 40–59-year age group. This trend could be caused by the ageing of the sort of people who visit the Šumava NP re-

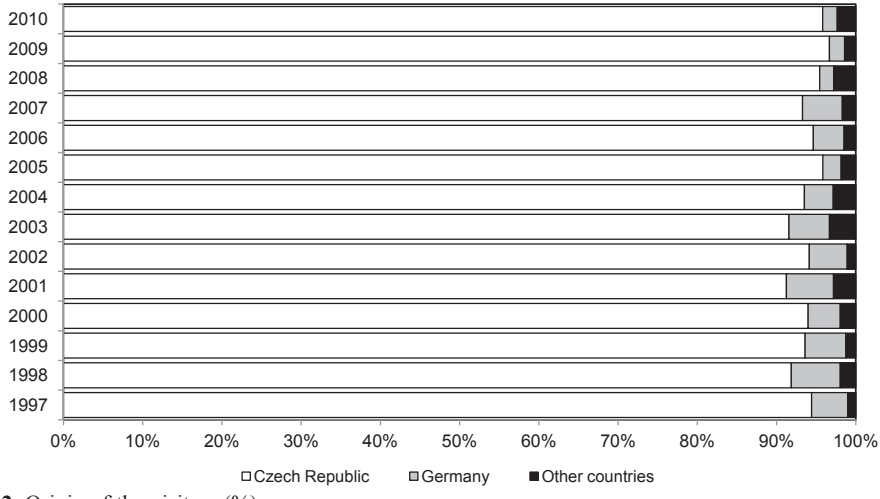


**Fig. 2.** Origin of the visitors (%).

peatedly and nowadays they are included in the higher age group. Other age groups have an almost identical proportion between 1997 and 2010. In comparison, in the Krkonoše NP, the 40–59-year age group has also gradually decreased, but at the expense of younger people, namely the 20–39-year age group.

Other indicators deal with accommodation and transport. The most significant changes appear in the type of accommodation (Fig. 4). More and more people stay in bed and breakfasts. On the other hand, staying in company property has decreased because this type of accommodation as a typical phenomenon of the communist period is decreasing. Between 15 and 20% of visitors state "other" as the category of accommodation. In the last four years, in particular, this term represents staying with relatives and friends, or – and that is important – outdoors, which is prohibited in the territory of the Šumava NP (except camping sites). Staying or sleeping outdoors (in nature) has a very strong tradition in the Czech Republic; especially young people are keen on sleeping outdoors. These people have a high regard for the temporary overnight campsites that were recently established for tourists, who travel through the Šumava NP on the red marked trail, leading alongside the national border from Nová Pec all the way to Železná Ruda. Apart from company properties, camps have not disappeared but people prefer more comfortable accommodation. Evidently for this reason, less than 13% of visitors stayed in camps in 2010 compared to 20% in 1997. However, camping still plays an important role in visitor accommodation in the Czech Republic. For example, only 1.5% of visitors in the neighbouring Bavarian Forest NP spent their time in this type of accommodation (Mayer et al. 2010). The drop in camp visitors could be traced not only in the Šumava NP but also in other Czech NP (Krkonoše NP: 3.9% in 1997 vs. 2.3% in 2010; České Švýcarsko NP: 21.3% in 2000 vs. 14.2% in 2010). The Czech Statistical Office also notes the annual decline of accommodation in camps in the whole Czech Republic, in its Statistical Yearbooks of the Czech Republic (accessible from www.czso.cz). This trend is also closely connected with above mentioned changes in age groups. The rate of camping starts to decline as people enter their forties, as it is more likely for younger people to prefer this type of accommodation. Moreover, young people are still using the above-mentioned temporary overnight campsites more, at the expense of these camps. The noticeable decline in 2002 was caused by extremely bad weather; there was long-lasting rain, which caused

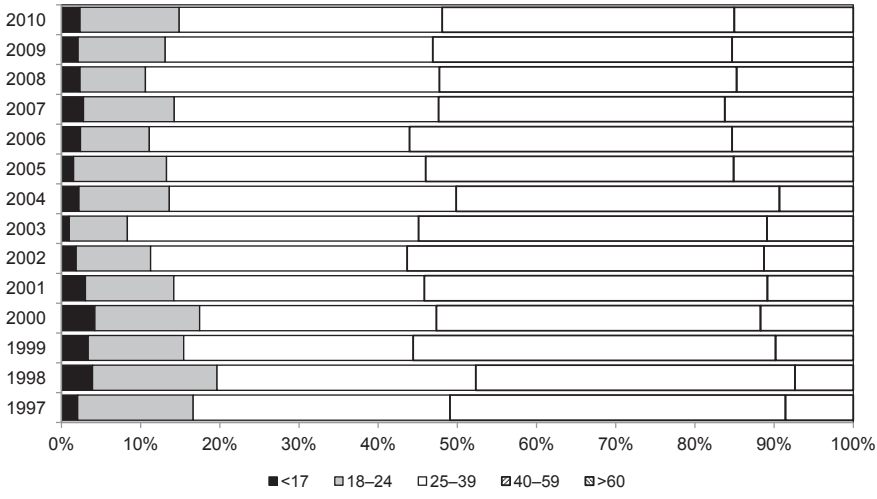


**Fig. 3.** Age groups of visitors (%).

catastrophic flooding in the lower part of the Czech Republic at that time.

One very useful indicator for the conservation of nature is the means of transport used by visitors. Car dependence for travelling to and within the park increased over the monitoring period. In 1997, 78.4% of visitors travelled to the Šumava NP by car. In 2010, almost 87% of respondents used this type of transport. On the other hand, public transport as a means of transport to the Šumava NP is still less popular. It is possible to trace the annual decrease of using the train (6.2% in 1997 and 2.9% in 2010) and the bus (10.8% in 1997 and 8.8% in 2010). This car dependency shows an increasing preference for more consuming forms of tourism.

Considerable change is also reported in the expected length of stay (Fig. 5). The most frequent period of stay remains one week (approximately a half of all respondents). However, it is possible to observe a gradual increase in the number of shorter visits, between two and six days, in comparison with the beginning of this monitoring. Apart from this, longer

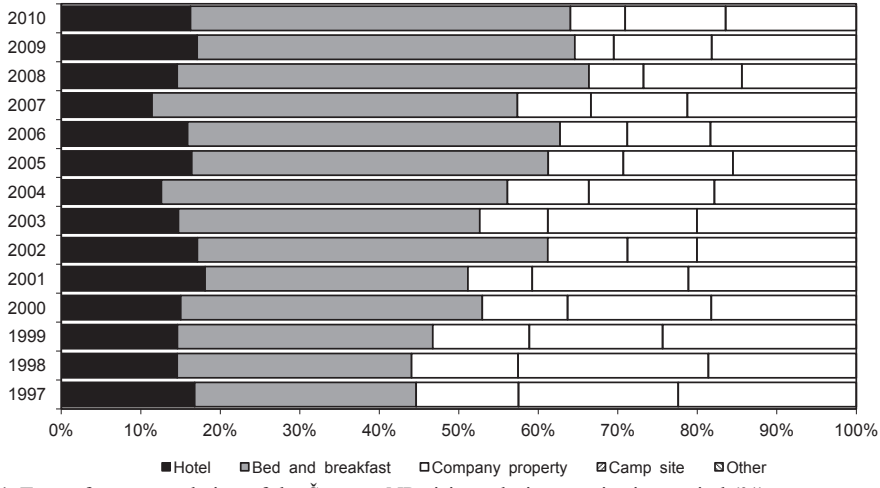


**Fig. 4.** Type of accommodation of the Šumava NP visitors during monitoring period (%).

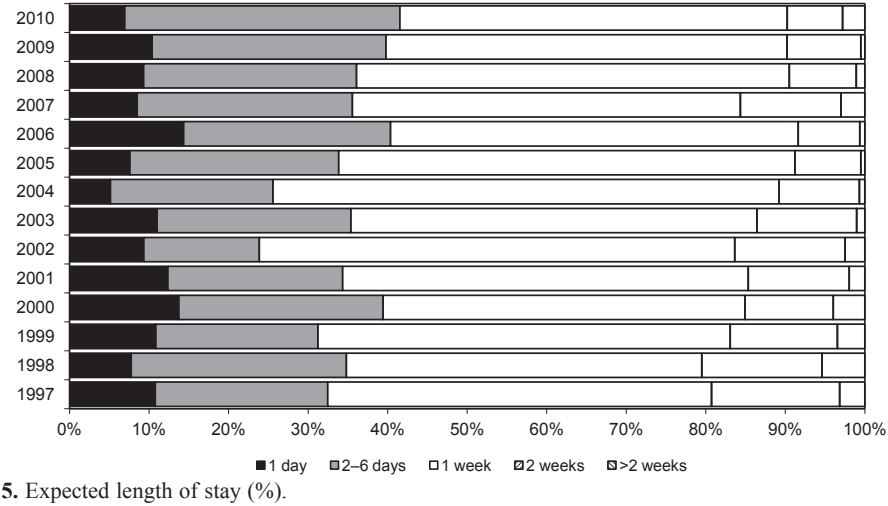


**Fig. 5.** Expected length of stay (%).

stays are less popular among visitors. If we look at a two-week stay, there has been a 9% decrease during the fourteen years of monitoring. It is possible to observe the same trend in the Krkonoše NP, where the changes are more expressive. In 1997, 16.7% of visitors spent two weeks in the Krkonoše NP and 27.2% of tourists spent a shorter time, between two and six days. Longer stays were, annually, less popular and tourists preferred shorter visits, so that in 2010 the following situation occurred: two-week stay – 3.2% of tourists; and visits between two and six days – 47.9% of tourists.

Another group of indicators deals with the perception and attitudes of visitors towards the state of the environment, NP management and tourism. The most expressive trends are registered in the perception of tourism intensity, both in tourist centres and on hiking tracks. More and more visitors perceive the intensity of tourism in centres as high and disturbing (Fig. 6). This was the opinion of more than half of respondents in 2010, compared to 37.9% in 2002, when we started to ask this question. The carrying capacity of visitor numbers in the tourist centres and their vicinity seems to have been nearly reached. A similar situation has occurred in many protected areas worldwide (Gössling 1999). Visitors also evaluate tourism intensity on hiking tracks. There is not such a significant change in this respect (35% in 2002 vs. 45.4% in 2010). This could be caused by the extent of the Šumava NP and the large amount of marked trails. This is also one of the reasons why there is no increasing trend in the perception of conflicts between hikers and cyclists on tracks. Since 2002, approximately 70% of visitors have not seen any conflict between these two groups of tourists. If we look at the Krkonoše NP visitors, there is only a 5–6% increase in perceptions that tourism intensity is high. In 2006, our visitor monitoring was also carried out in the winter season (Čihař & Görner 2010). Compared with the summer, fewer winter tourists evaluated

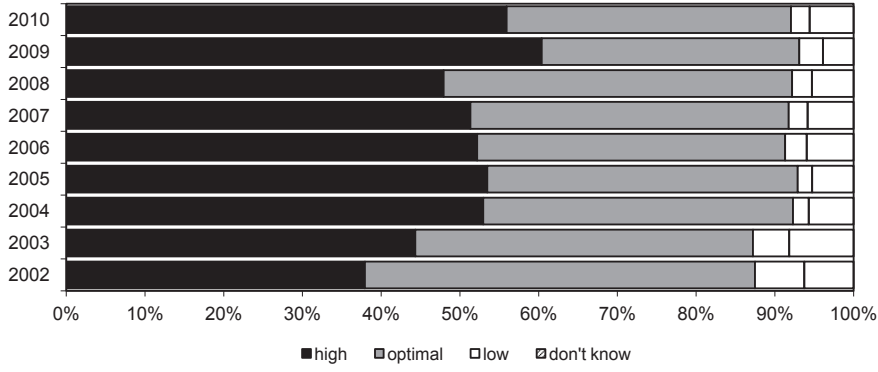


**Fig. 6.** Do you think actual intensity of tourism in the territory of the NP (in the centres and their vicinity) is…

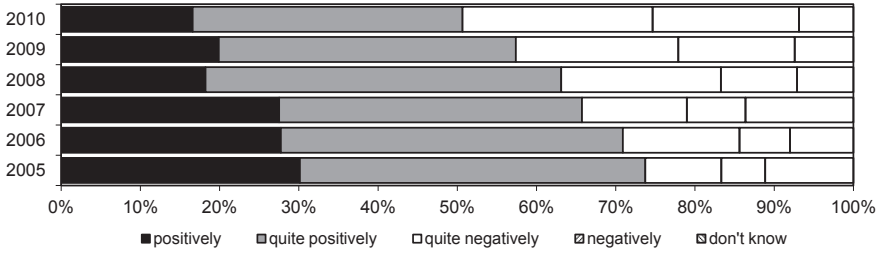


**Fig. 7.** How do you perceive overall appearance and character of newly completed construction?

tourism intensity as high and disturbing (39.1% vs. 52.2% in tourist centres; 21.6% vs. 43.8% on hiking tracks). By contrast, in the Krkonoše NP, the feeling that tourism is too concentrated is more widely held by tourists in the winter season than in the summer (Görner & Čihař 2010).

Since 2005, visitors have also expressed their opinion of construction activity in the Šumava NP in our questionnaire. There is a significant decline in satisfaction with new construction in the central part of the Šumava NP. At the beginning of the monitoring of this topic, 73.7% visitors perceived the overall appearance and character of newly completed construction as positive. We recorded an annual downtrend of about 3–6% and, by 2010, only a half of tourists perceived new buildings as a positive component (Fig. 7). In the last few years, visitors have evaluated not only the appearance of buildings, but also the amount of them, more critically. In the question about how new construction influences the typical character of the scenery, the predominant view of tourists is positive, but there is a similar trend as in the case of the previous query. Positive responses prevailed in 2005 (57.3% of all respondents). Five years later, only 40.7% of replies were positive and negative replies dominated (51.1%).

The indicators dealing with visitor behaviour also show several trends. The decreasing tendency for pedestrians and cyclists to use border crossing points is slightly surprising. Whereas fourteen years earlier, more than 36% of respondents took advantage of the possibility to visit the Bavarian Forest NP on the German side of the border during their stay, only every fifth visitor did so in the last year of monitoring. This decline could be connected with shorter lengths of stay (see above). Visitors have less time and prefer several trips to the most widely known sites in the Šumava NP.

**Visitor numbers**

Fig. 8 summarizes the development of the number of hiking visitors and cyclists over 14 years of monitoring (1997–2010). The number of hikers peaked in 1997 with an average of 2470 persons per day across four monitoring points. If we convert this number into the whole main summer season (62 days in July and August) that equates to approximately 153000 visitors in these two months. Since the beginning of monitoring, the number of hikers has remained almost the same. It is possible to observe a deeper decrease (by 27%) in 2002, which was affected by extreme flooding in the whole country during the monitoring period. A significant increase by 25% occurred in 2009. This year was affected by the implications of the financial crisis and Czech people preferred domestic holidays. The increasing number of domestic visitors was also recorded in the Krkonoše NP in 2009. If we compare particular monitoring points, Antýgl, with an average of 1033 recorded persons per day, is the site most frequently visited during the 14 years of monitoring. It is followed by Modrava (778 persons per day) and Kvilda (447). The least frequently visited crossroad remains Horská Kvilda, with 262 recorded hikers per day.

The number of cyclists reveals a different picture. Cycling, even on hiking trails, is becoming increasingly popular and each year has exceeded the initial number (in 1997) of 1300 recorded cyclists per day across all monitoring sites. This number matches approximately to 80000 cyclists passing through four monitoring points in July and August. So far, cycling peaked in 2003, with a 70% surge. The predominant area for cycling is Modrava (daily average 711 tourists), followed by Kvilda (522), Horská Kvilda (367) and Antýgl with 154 recorded cyclists. The latter is influenced by the ban on cycling between Čeňkova pila and Horská Kvilda, along the Vydra and Hamerský Potok streams.

The proportion of hikers to cyclists is also recorded annually. This index continually decreased in favour of cycling from 1997 to 2004: 189 hikers to 100 cyclists in 1997 and 120

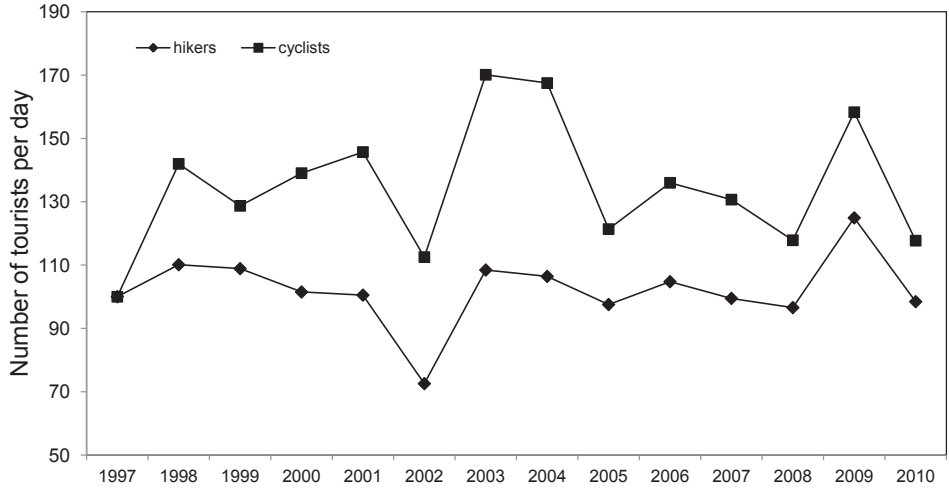


**Fig. 8.** Number of hikers and cyclists. The indicator is based on an average number of tourists (hikers and cyclists) per monitoring day. It sums records from four monitoring points in the NP; the beginning of monitoring (1997) corresponds to 100.

to 100 in 2004. In 2005, this trend was disrupted and the index jumped back to 152 to 100 and has remained fluctuating around 150 to 100 since then.

## Conclusions

This article shows, by means of indicators, the most significant trends in the characteristics and attitudes of the Šumava NP visitors during fourteen years of monitoring. Frameworks of the Šumava NP indicators can be used as a basis for a discussion about the future of the NP and its proper management. It is necessary to know tourists' attitudes and preferences because they are important predictors of tourist satisfaction and future behaviour. Satisfied visitors are more likely to revisit the area. Some general conclusions can be mentioned here. For example, the dominant proportion of domestic visitors is recorded in monitoring profiles. The number of tourists visiting the Šumava NP in the summer season has been stagnant in recent years, yet other indicators show that the social carrying capacity of core areas of the NP was reached. All the efforts aiming at tourism growth in the area should therefore address its sustainability – i.e., qualitative, not quantitative (extensive), development. In such areas, it is not the construction of new buildings, but the improvement of existing facilities that will be appropriate. Secondly, this study shows apparent changes in the age groups of visitors. One possible branch of future research should look into the tourist behaviour of different age groups. Young visitors are more interested in the outdoors and sports, middle-aged tourists like activities that emphasize nature, whereas older tourists would like to see more cultural sites. Knowledge about age-specific tourist facilities would enable managers to address specific age groups.

The Internet database of indicator results forms a basis for an effective environmental policy and decision-making, not only in this NP but also in other protected areas. Indicators are also helpful in harmonizing the typically conflicting interests of nature protection and tourism development. They enable NP managers to respond flexibly to changes in visitors' attitudes and requirements. Finally, they can be connected with international activities, as-

sessment and membership of NPs and wilderness areas, e.g., the Europarc or PAN Parks. We found that the indicator results, presented in a proper way, enable different stakeholder groups in national parks to communicate and cooperate. As Eagles et al. (2000) claim, it is politically dangerous not to have some monitoring (indicator) system: "senior politicians, government policymakers, and business planners make decisions based upon the available information. Those sectors with weak or incomplete information risk being undervalued when policy, planning, and management decisions are made."

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