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PILOT USE OF COUNTER FOR MONITORING OF VISITORS IN MENGUSOVSKÁ DOLINA VALLEY

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Abstract

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The area of the Tatranský národný park (Tatra National Park) lacks for continual yearlong monitoring system of visit rate, which would provide basic information about visit rate of the most loaded areas of the national park. The aim of the paper is to bring greater range of data and show possible forms of application and implications for management of visitors in Mengusovská dolina valley. We have selected direct method for monitoring the number of visitors. The counting mechanism with pyroelectric detector the Eco Twin registered in the period from May 31, 2008 to November 20, 2008 exact numbers of tourists who entered the sector of the red tourist path no. 0933 which leads from the cross-road by Žabí potok creek to Rysy Mt. During the total monitored period, the system registered 96.366 traverses. Based on measurement we discovered average daily visit rate and total visit rate of the path during particular days; visit rate dynamics during particular days and hours in period from June to October; respecting with seasonal closing; comparing current visit rate with specified carrying capacity of the path and impact of weather on the number of visitors. For the next period, we propose other research methods for the area (complement and installation of other counters, installation of other equipment (video camera), realization of a questionnaire). Extension of research in this area is urgent because the amount and dynamics of visit rate has apparently changed during the recent years in the Tatry Mts. This might have an impact on the environment of the national park and biosphere reserve. Therefore the management will have to conform to the visit rate.

Key words: monitoring of visitors, counter, management, recreation ecology, Tatra National Park, Biosphere Reserve Tatry

Introduction

Under the new paradigm for protected areas, visitation is expected to continue increasing into the future thus deepening the conflict, which inevitably raises the requirements for visitor management in protected areas (Sheppard, 2006). Similarly Eagles (2004) in his contribution discusses 16 important trends that in the medium-term will fundamentally af-

fect the planning and management of parks and other protected areas. Some authors (e.g. Haider, 2006) describe the ecology of recreation (recreation ecology) as a new scientific paradigm with a clearly defined direction for future development. The aim of the present contribution is to provide a general overview of the issue of monitoring and management of visitors in protected areas.

The most frequent areas of research include methods for monitoring visitors, visitor surveys, data management and visitor modeling, simulation, visitor planning, conflict and behavioral studies, visitor management and information, environmental sustainability, policy and management methods in recreational and protected areas, economic and social impacts of recreation and tourism. Four international conferences devoted to monitoring and management of visitors in recreational and protected areas have already been held at the World Forum (Austria 2002, Finland 2004, Switzerland 2006, Italy 2008). On the Internet there are quite a lot of links not only to individual subjects but also to a further list of sources (e.g. http://www4.ncsu.edu/~leung/recres2.html).

Methods for monitoring visitors in recreational and protected areas were described by Muhar et al. (2002) in his presentation made. In addition to defining the objectives of monitoring, it is necessary to determine the subject for monitoring (the number of visitors, load, density, activity). In principle there are two basic groups of methods: direct (interviews, observation, counting equipment, self registration) and indirect (mapping of footprints or impacts). Cessford et al. (2002) states the advantages and disadvantages of calculating devices. Melville and Ruohonen (2004) similarly state the reasons why we should count visitors, the methods used, examples of the use of collected data and difficulties in their acquisition and processing. Several authors mention a number of practical studies in protected areas in Austria, Czech Republic, Finland, Poland, Germany, USA, Canada, Japan and Australia (Arnberger, Brandenburg, 2002; Cihar et al., 2002). These authors observed besides quantitative and space-time distribution of traffic also other traffic parameters, e.g. reason for the visit, the categories of visitors, the effects of the high number of visitors in the territories etc. Erkonnen and Sievänen, 2002 in their presentation enter into details the most important factors in research visitors (visitor profile, activities, spatial distribution, duration of visit, expenditure, satisfaction and motives, temporal distribution and special issues). The sustainable capacity of American national parks and other protected areas is addressed by Manning (2002). The influence of man-made changes (quantity, type, time and place) is observed in particular, as well as the resistance and restoration capability of the environment (how much impact is acceptable in the territory), the relationship (correlation) between the pressure to develop the land and the use of sports equipment, a model of primary factors which affect the magnitude of pressure from sports use (intensity and extent of pressure) followed by limiting use (how much is too much? – not only ecological but also social sustainability).

Types of conflicts between recreational use and nature conservation in national parks and biosphere reserves were listed by Ziener (2002). These may also include conflicts between different groups of visitors (cyclists, pedestrian tourists, climbers, skiers, dogs, horseback riders, etc.). Sterl et al. (2002) and Lukač (2002) evaluated the impact of visitors and recreational activities on the birdlife of national parks. One of the practical uses for monitoring

downstream traffic is visitor management and marketing (Gätje et al., 2002). The outputs can be practical measures in protected area visitor management (limiting the number of visitors, the introduction of entrance fees, closed areas, restrictions of time, etc.). It is also possible to evaluate the appropriateness and effectiveness of individual measures. Studies which simulate or predict the magnitude of visitation as well as the occurrence of specific groups of visitors (Brandenburg, Ploner, 2002) are also pertinent. Fredman (2004) in his contribution compares how the declaration of a protected area changes visitation and the impact of tourism. Similarly, Fredman (2006) models the expenditure of visitors during visits to a national park which has an economic effect. The effect of mountaineering on the relief and vegetation of the Tatra National Park (PL) has been described by Jodlowski et al. (2008). Several authors discuss the impact of global climate change on skiing (Luthe, Roth, 2008; Raschi et al., 2008). The development of systems for better management of traffic during sporting events is also interesting (Clivaz, Favre, 2008). In Europe, many initiatives to promote sustainable tourism in protected areas have been created (e.g. The Protected Area Network Parks - http://www.panparks.org, The European Charter for Sustainable Tourism - http://www.european-charter.org). Results from 58 reporting areas of a survey about visitor risk management in core zones of protected areas were presented by Ghelichipour and Muhar (2008). Research on visitor attitudes towards natural disasters, for example the issue of barkbeetle outbreaks (Muller et al., 2008), is also pertinent to central European conditions. In American countries many authors (e.g. Tempel et al., 2008) study increasing levels of recreational use in wilderness, backcountry, and roadless areas which has the potential to impact wildlife species, including those that depend on these protected areas on survival.

In Slovakia, despite the relevance of this issue at present, there has been no systematic and long-term research in this field. We can mention studies from the Tatra National Park in particular. They have repeatedly found that current land use exceeds the carrying capacity (Vološčuk et al., 1992). The importance of visitor monitoring in the High Tatras is also shown by the fact that since the inception of the national park annual visitor numbers have increased almost 100-fold. This statement shows evidence of importance of visitor monitoring in the Tatry Mts. The methodology for regular monitoring of visitors in the Tatra Mts environment was explained in detail by Šturcel (1990). Visitation of the Tatra Mts environment as well as congestion in the city of Starý Smokovec, together with exploratory surveys and monitoring application for nature protection in the Tatras, is reported by Ladygin and Chovancová (2005). Recent papers also include visitor monitoring (Švajda, 2003, 2006, 2008) and evaluation of the tourist path carrying capacity (Barančok, Barančoková, 2008). Some of the problems of tourism in the Polish Tatras were presented by Blazejczyk (2002) in his contribution. Several authors have noted the growing visitation to the High Tatras area (the national park and biosphere reserve) since the declaration of the national park (Harvan, 1970; Harvan et al., 1972). The negative impact of visitors, described among others in the contributions of Chudíková and Chudík (1978) as well as Danko and Garaj (1983), was the reason for proposing measures for its regulation (Strnka, Petro, 1983). Most authors evaluate the bearing capacity of vegetation (Šoltés, 1985; Šoltés, Šoltésová, 1989; Šomšák et al., 1990), eventually geo-ecological bearing visitation (Drdoš, 1989; Midriak, 1989).

The summer monitoring of visit rate has been performed in high-elevation environment of the Tatra National Park at least once a day during the peak of summer season since 1972. The area of the national park lacks for continual yearlong monitoring system of visit rate, which would provide basic information about visit rate of the most loaded areas of the national park. The aim of the operation is to bring greater range of data and show possible forms of application and implications for management in Mengusovská dolina valley.

Part of the integrated management of protected areas is the management of visitors and infrastructure (http://www.ipam.info). The starting point for quality management should be recreation ecology. The aim of such management is to offer maximum entertainment for visitors with a minimum of negative impacts, control of entry and establishment of respectable limits, the establishment of optimal learning methods for visitors (e.g. nature trails), and inviting and providing rules for visitors. Management of visitor services and infrastructure must be systematically identified, analyzed and controlled using a wide spectrum of measures. The regulation of entry, available services, transportation options, information on the behavior of visitors, risks and potential hazards are key issues. The various categories of protected areas and specific local conditions require sophisticated management of visitors and locally-based methods of meeting the needs of visitors and the local population. Control of visitors must be made with respect to the infrastructure needs of tourists and legislation.

Study area

Study area (Fig. 1) is located in Vysoké Tatry Mts. Mengusovská dolina valley is a national nature reserve in size of 1.612,96 ha. It is in shape of irregular triangle fastigiated in the south. It is a valuable area of the Východné Tatry Mts with presence of crystalline schist in granodiorite massif, well-preserved reef ridge relief and surface modeled by glacier. The valley is full of complex ecosystems (valuable phyto- and zoocoenosis), which are typical for the Karpaty Mts, with numerous tarns (the largest and deepest tarn on the Slovak side of the Tatry Mts is Veľké Hincovo pleso tarn). There is exuberant presence of endemic, critically endangered and precious species of vertebrates and invertebrates. The high-elevation region is preserved with functioning self-regulated mechanisms. However it is influenced by tourism very negatively in many locations (Popradské pleso tarn, Ostrva, Hincovo pleso tarn, Rysy Mt.). The area is part of biocenter of transregional significance, part of the Biosphere Reserve Tatry and part of bilateral national park. Mengusovská dolina valley is considered one of the most beautiful valleys of the Tatry Mts. Along with the symbolic cemetery for the victims of the Tatry Mts, the uppermost situated hut in the Tatry Mts - the hut under the Rysy is located in the valley. The area is adjacent to other reserves with the highest degree of protection. The state of protection as a summary of all impacts affecting the ecosystems is influenced partly negatively by tourist utilization.

Methods

We have selected the direct method (Muhar et al., 2002) for monitoring the number of visitors. The counting mechanism with pyroelectric detector the Eco Twin registered in the period from May 31, 2008 to November 20, 2008 exact numbers of tourists who entered the sector of the red tourist path no. 0933 which leads from the cross-road by Žabí potok creek to the Rysy Mt. in Mengusovská dolina valley (Fig. 1) in elevation 1.596 m above sea level. Cessford et al. (2002) states advantages and disadvantages of counting mechanisms. In this case, we

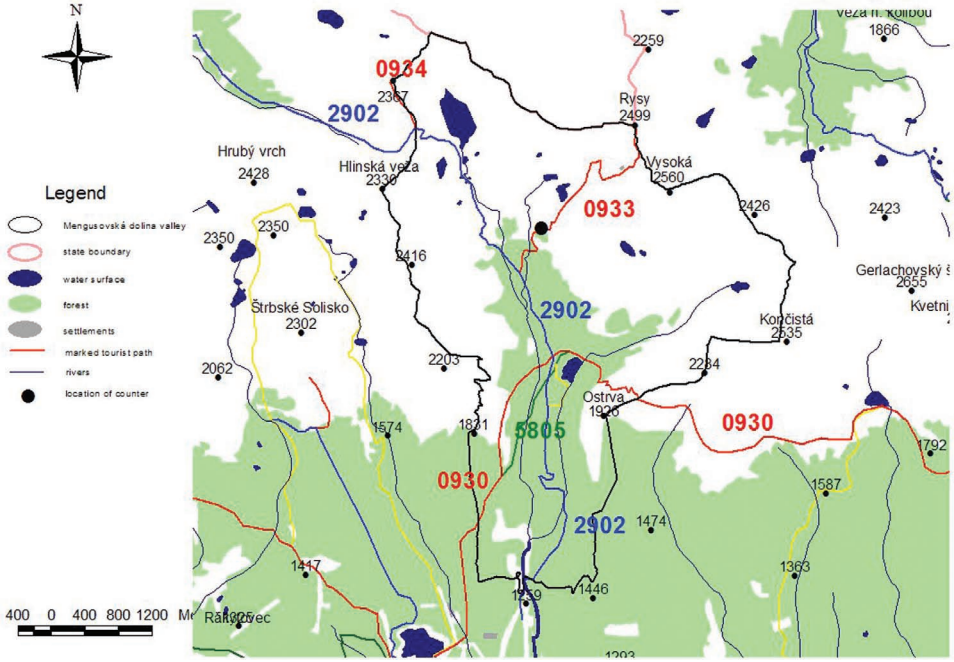

Fig. 1. Mengusovská dolina valley (forest area, water surface and rivers, marked tourist pathes with numbers, state border line, location of Ecocounter).

used pyroelectric detector for walkers which stores the data in the Eco Logger. Palmtop Tungsten E2 and Eco-PC software was used for capture, visualization and analysis of data. Melville and Ruohonen (2004) state the reasons why to count visitors, what methods should be used, examples of data assimilation, and problems regarding data capture and processing. Our goal was to discover:

- average daily visit rate and total visit rate of the path during particular days;
- visit rate dynamics during particular days and hours in period from June to October;
- respecting with seasonal closing;
- comparing current visit rate with specified carrying capacity of the path impact of weather (data from the Slovak Hydrometeorological Institute Štrbské Pleso) on the number of visitors.

Results

During the total monitored period (174 days), the system registered 96.366 traverses (there 50.292, back 46.074). Higher number of traverses facing into the valley may be explained by continuing of visitors to the Polish side after reaching the peak of the Rysy Mt. The average daily visit rate in both directions during the monitored period was 553,8 people, the maximum visit rate of the path was registered on Saturday, September 13, 2008 – 2.512 people. The presented graph (Fig. 2) shows higher visit rate on weekends.

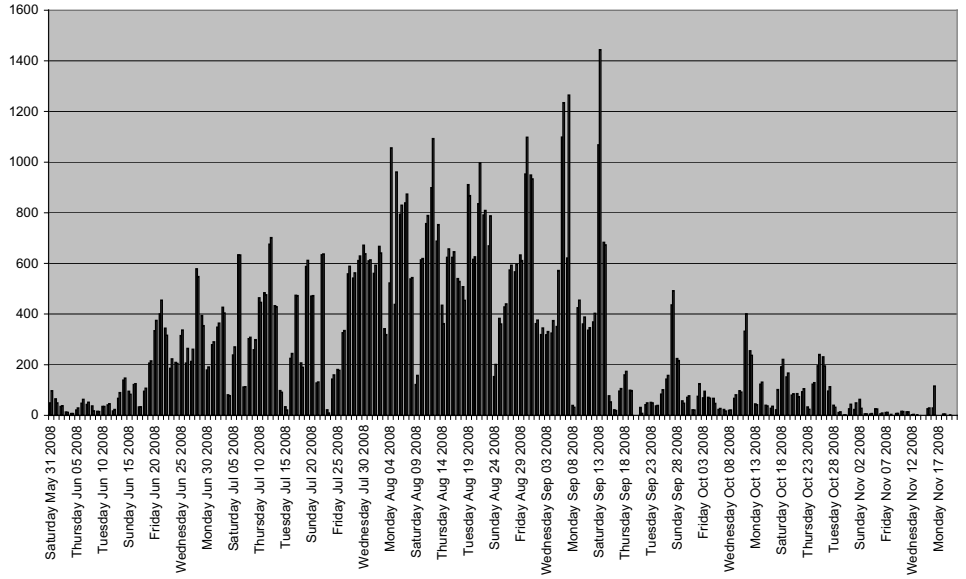

Fig. 2. Seasonal dynamics of visitor rate on monitored tourist path during the period 31.5.2008–20.11.2008.

We can observe daily dynamics (Fig. 3) on the example of the day with the highest visit rate. The most people entered the valley before noon about 10 o'clock, and come back in the afternoon at 5 o'clock.

For the demands of practical protection of nature and ranger service, we should emphasize disobedience to seasonal closing of the tourist path (e.g. May 31, 2008 – 146 or November 16, 2008 – 145 traverses registered in both directions). Also in terms of established visiting regulations, we registered night intrusions to the valley (e.g. August 4–5, 2008). These activities might have direct negative impact on the protection of fauna. If we compare current visit rate of the tourist path with the specified carrying capacity of the path we will discover fiftyfold overload of specified limit (average possible number of tourists per one day of summer season – limit of potential carrying capacity considering destruction of its surface – up to 50 people according to Midriak (1989) or more precisely geologically reasoned visit rate – 63 people according to Drdoš (1989)). Šoltés and Šoltésová (1989) state average daily visit rate for stated path 1.990 people in both directions (in the direction toward the Rysy Mt. 994, in the direction from the Rysy Mt. 996). On the basis of respectable capacity, there was a proposal to decrease daily visit rate to 1/5 (on average in both directions about 400 people per day). Stated discoveries confirm continuing tendency of negative impact of overloaded visit rate on the ground cover and flora.

Distribution of visit rate during days in week (generally the lowest visit rate is on Mondays, the highest during weekend) and the impact of weather on number of tourists are possible areas of research. Next graph (Fig. 4) shows the data captured in July 2008 from the

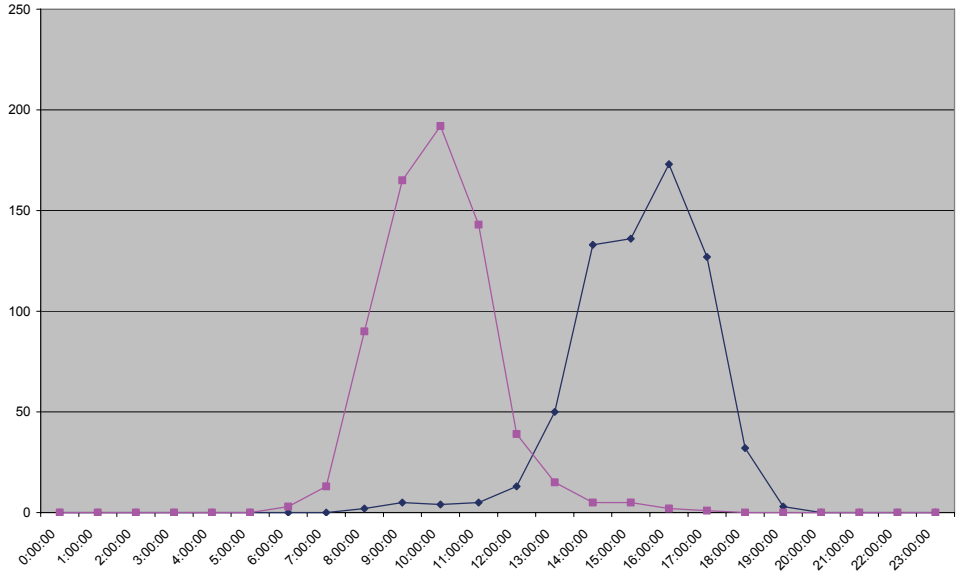

Fig. 3. Daily dynamics of visit rate on monitored tourist path during 13.09.2008.

station Slovak Hydometeorological Institute Štrbské Pleso (the average daily temperature, precipitation amount, cloud amount and wind velocity). Looking at the visit rate in July 2008 we can observe the impact of adverse weather on visit rate (e.g. Wednesday 23 July, 2008). However, visit rate on weekends is generally high despite of adverse weather (e.g. Sunday, July 20, 2008).

Discussion and conclusion

On the basis of captured data and their comparison with actual results of one-shot counting of tourists in high-elevation environs in previous periods since 1972, we could estimate the yearly visit rate of the Tatry Mts more expertly, consider precision of manual counting and also tendency in visit rate, more precisely exact impact of weather on visit rate. We can also observe spatial arrangement of visit rate in high-elevation environs of the national park. Traditionally, the mostly visited localities are valleys with infrastructure (road, cable car, hut). In some localities we have already observed national composition of tourists. From the captured data, we can determine the dynamics of visit rate and also the amount of tourists who reached the summit during the planned tour.

Although the results are only for half of 2008, they show a clearly dependence between the season, weather, days and weeks. It was the first experiment unique in the territory of

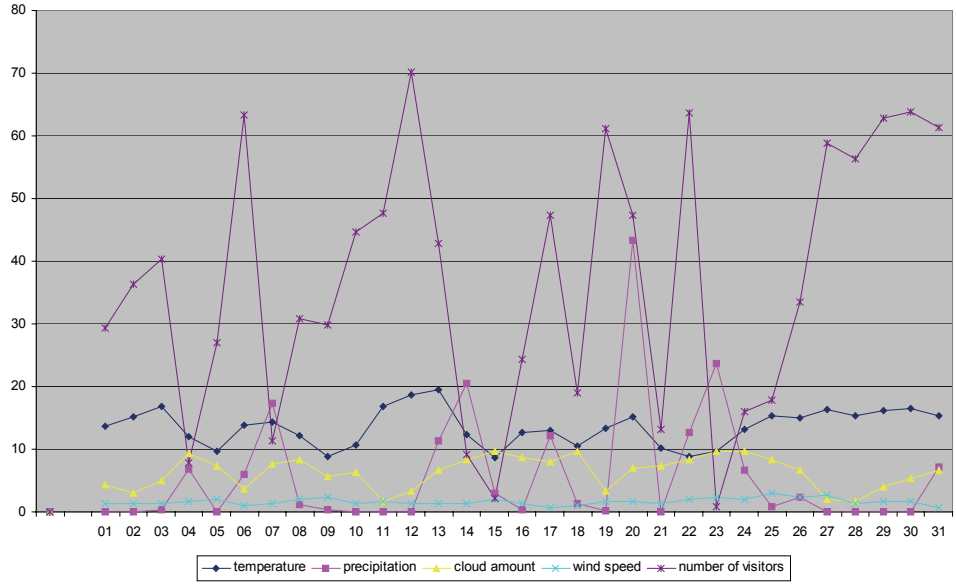

Fig. 4. Impact of weather on visitor rate in area during July 2008 (temperature in °C, precipitation in mm, cloud amount in 1/10, wind speed in m/s, number of visitors x 10).

the Tatra National Park with using of automatic calculating device. Results can be further used as input for variables in assessing the tourist path carrying capacity and evaluation of effects of number of tourists in the devastation of surrounding of trails in different parts of the national park (e.g. Barančok, Barančoková, 2008).

For the next period, we propose other research methods for the area. Complement and installation of other counters in model area can help administration of the national park to obtain complete survey of yearly visit rate of stated paths – places from where the most people come, how many of them reach the circular or the summit, utilization of the passages between Slovakia and Poland etc. Installation of other equipment (video camera) can help to find out the forms of transport of the tourists, more detailed structure of visitors as well as conflicts among them. Realization of a questionaire at the entrances to the studied area can discover motives of visits of the national park, gender, education, age, nationality, permanent address, duration and regularity of visits, reaction of people on high number of tourists – social stability, relationship to the national park, adequate expenditures. Extension of research in this area is urgent because the amount and dynamics of visit rate has apparently changed during the recent years in the Tatry Mts. This might have an impact on the environment of the national park and biosphere reserve. Therefore the management will have to conform to the visit rate.

The contribution as well as other papers stated in the list of literature document another usage of captured data. For example, we can estimate the amount of customers in particular localities, determine the frequency of visits, conform investments needed for service and reparation of paths, prevent the erosion and degradation, comprehend the circulation of

visit rate, quantify attractiveness of localities, dispose terrain workers properly and conform everyday management of locality. Another part of integrated management of protected areas is management of visitors, services and infrastructure. Similar studies should serve as resources for high-quality management.

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