

Using trigger trail cameras for visitor monitoring – Applications in Bavaria

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A demand for qualitative data to evaluate visitor management actions

The evaluation of visitor management actions is dependent on profound data about visitor flows and visitor numbers (Clivaz et al. 2013). Stakeholders in the Urban Forest 2050 project were interested in more qualitative data to evaluate their visitor management and offers for specific target groups. Managing authorities were interested to get numbers of joggers, Nordic walkers and dog walkers, as well as prams and wheelchairs. Also user numbers of dog walkers and especially off leash dogs was considered important, since they are a source for potential conflicts with both other user groups and cause interference with wildlife. Finally, also the share of the persons reading information boards had to be assessed. A number of visitor counts and monitoring with camera-based systems have been described (e.g. Janowsky & Becker 2003). Rapid technological development has led to a wide availability of trigger trail cameras for wildlife observation at budget prices, so we opted for these cameras to test options and limitations of such cameras for visitor monitoring. Two urban proximate forests in Freising and the southwestern mountain slope of the Grünten Mountain in the southwest of Bavaria were selected as a study area.

Material and methods

In Germany, strong privacy regulations have to be respected when conducting research with camera-based systems according to § 6b BDSG (Bayerisches Landesamt für Datenschutzaufsicht 2013). To generate camera data according to the privacy regulations, we attached a transparent strip of plastic to the lens. According to privacy regulations and suggestions of Czachs & Brandenburg (2014), cameras were mounted 4 m above ground. The cameras were adjusted so that the trigger range of 20 m covered as much of the trail as possible. To count in well-frequented areas and catch fast moving persons such as bikers, a fast trigger speed and a wide range of the club-shaped zone that activates the camera for taking single pictures is vital to gain good results. We tested three different models, Dörr Snapshot 5.1 with GSM-Mod-

ule, Cuddeback C3 and the Reconyx Hyper Fire. The latter is one of the fastest trigger speed cameras available at the market: We used this camera for monitoring an informal mountain bike trail at the Grünten. Both a simple system evaluating pictures with dual-screen evaluation of pictures and manual counting by listing them into an Excel file and a more elaborated system attributing selected pictures with events fully visible using XnView for later assessment in R statistics was applied.

Results

Compared to other means of visitor counting and monitoring systems such as sensors, although partly blinded, a remarkable depth of information can be achieved with trigger cameras, by the shape of the body, often also gender can be distinguished. In the Grünten study, also the share of mountaineers with inappropriate equipment for rough demanding alpine terrain could be determined.

A model for visitor numbers

Linear relationships between the amount of pictures taken and passing persons could be demonstrated for all cameras based on counts of selected days (see Figure 1). The relationships are different for every site and for each camera model, however. The equations derived from the linear regression models allow to predict visitor numbers from the number of pictures taken. However, on peak days (first sunny weekend in April 2015, warm and sunny holidays in November 2015), the actual number of visitors were underestimated since group sizes tend to be larger on such days. No specific equations could be developed for the different user groups. While

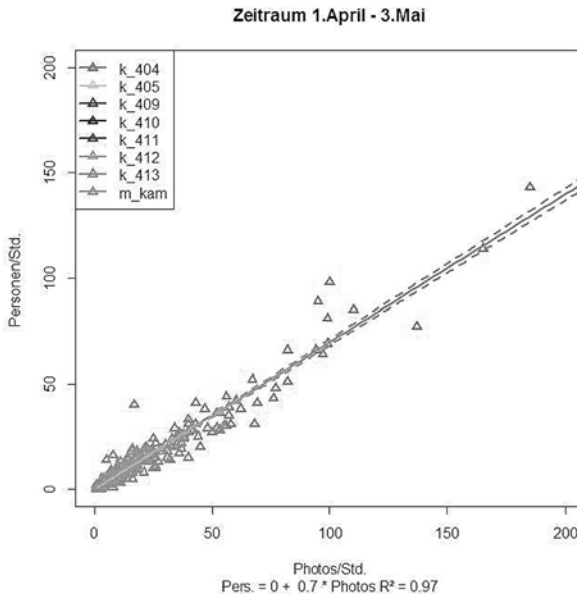


Figure 1. Correlation between passers-by and pictures taken by the trigger camera, Freising

for hikers and strolling persons weaker linear correlations were detected, there is none for groups such as dog walkers or joggers.

Conclusions and implication for practice

Trigger trail cameras provide in depth and very detailed information about outdoor recreation activities and allow assessing various monitoring and evaluation questions. Also ex-post evaluations of data sets are possible. Due to a huge amount of data generated by the cameras, they are best used for short term monitoring questions. Strong correlations can be drawn between pictures taken and passing persons at least in all of our study sites, so numbers of passers-by can be well predicted by looking at the numbers of pictures taken by the camera. To get high accuracy especially for faster moving objects, selected camera should provide very fast trigger speeds and quick recovery. However, privacy regulations have to be respected and the use of cameras is perceived critical at least by the German public. The method therefore has to be well communicated in press and media and needs also strong support by all stakeholders to avoid critical voices from the public.



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