

## Assessing the tourism carrying capacity of hiking trails in the Szczeliniec Wielki and Błędne Skały in Stołowe Mts. National Park

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**Abstract.** The objective of this study was to determine the tourism carrying capacity on hiking trails in the Szczeliniec Wielki and Błędne Skały. Those attractions are located in the Stołowe Mts. National Park of the Sudetes in the South-Western part of Poland along the border with the Czech Republic. The total area of the Stołowe Mts. NP is 6,340 ha and it contains around 100 km of marked hiking trails. Tourist traffic in the Szczeliniec Wielki and Błędne Skały has its peaks during weekends and holiday periods reaching mass tourism scales. For this reason it is important to establish a clear tourism carrying capacity and to ensure this capacity is not exceeded. In this study, tourism carrying capacity was estimated based on trail width measurements and observations on the visitors' behavior on trails. As a result an optimal distance between the visitors on a hiking trail was determined to be 4 meters of trail length per person. Whether the tourist carrying capacity was exceeded, was determined by calculating an index based on visitor data collected through the Monitoring System of tourist traffic (MStt). The MStt system consists of 38 infrared traffic counters (pyro-electric sensors) installed at the tourist trail entrances within the Stołowe Mts. National Park borders. Visitor data were aggregated into daily, monthly and annual reports, taking into account the direction of the visitors traffic on the studied hiking trails, i.e., entries only (IN), exits only (OUT) and total passings (IN+OUT). The tourist flow in Stołowe Mts. NP was characterized by its strong fluctuations over time with the carrying capacity index being exceeded only during long weekends and holiday periods. Additionally, the peak in traffic occurred around midday in spring and summer months. During those periods, the average traffic exceeded the hourly tourism carrying capacity by ca. 30%. Significant differences in tourist traffic were due the variability in visitor numbers, time of peak traffic and the dynamics of visitor numbers.

**Keywords:** nature conservation, Tourism carrying capacity, tourist trails, tourist flows, pyro-electric sensors, Stołowe Mts. National Park

### 1. Introduction

Mountain National Parks in Poland are visited every year by more and more tourists what finds confirmation in data from statistical yearbook (Central Statistical Office 2017). The most popular parks are: Tatra National Park (3.7 million), Karkonosze National Park (2.0 million) and Pieniny National Park (0.9 million) and – according to latest data (Rogawski 2017a) – Stołowe Mts. National Park (0.8 million). For protection and nature conservation needs introduced should be monitoring of tourist traffic which provides

qualitative and quantitative data allowing for space and time characteristics. These data are being used for current tourism management in National Park. At simultaneous definition of limit values of tourist trails' carrying capacity it can allow for proper reaction in situation when those indicators are exceeded. The aim of this study is to present a method of determining indicator and evaluation of tourism carrying capacity of tourist trails in Szczeliniec Wielki and Błędne Skały of Stołowe Mts. National Park.

Research on quantitative monitoring and tourist traffic are realized in many National Parks of Poland with the

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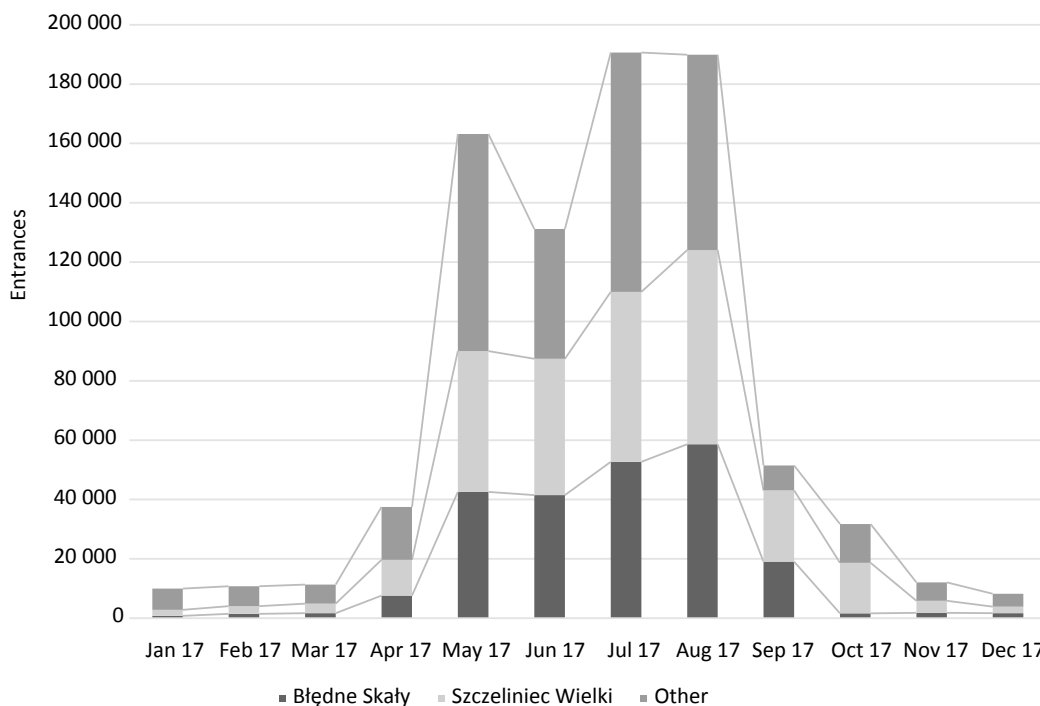
use of different techniques and tools. Most often used are pyro-electric sensors what Spychała and Graja-Zwolińska (2014) confirmed in 14 National Parks. Thanks to those sensors tourist traffic was characterized in detail in following National Parks: Tatra (Fidelus 2010, 2014; Hibner 2014; Taczanowska et al. 2015), Babia Góra (Buchwał, Fidelus 2010), Bieszczady (Prędko 2012), Stołowe Mts. (Rogowski 2017a, 2018a). The greatest advantage of pyro-electric sensors is ease of use, reliability and precision of measurements – within 5% of error indicated by producer, verified to the level of 10% (Rogowski 2018b).

Moreover, primary sources presents rich collection of research regarding theoretical assumptions for determining indicator of tourist carrying capacity of trails (Kołodziejczyk 2015). Particularly significant for this study was elaboration regarding capacity of tourist trails in following mountain national parks: Tatra (Barančokova, Barančok 2007), Pieniny (Bolland 1982), Bieszczady (Jagusiewicz 1982), Karkonosze (Michalski et al. 1979, Swatowska 1996, 1998), Babia Góra (Mielnicka, Warkowska 1979) or Rocky Mountains National Park in USA (Cole 1978). A large contribution in development of theoretical assumptions of designating mentioned above indicators had Sewerniak (1979, 1980a, 1980b, 1982). Presently, such type of research is not often undertaken. That is why Borejszo (2004) elaboration should

be mentioned, who presented indicators for tourist trails in Wigry National Park (tab.1), or Janeczko and Gucma (2015) for Roztocze National Park.

Creating in 2016 Monitoring System of tourist traffic (SMTT) in Stołowe Mts. National Park (Rogowski, Małek 2016) allows for current collection of many quantitative data from pyro-electric sensors and qualitative data from surveys. That allows for space and time characteristic of tourist traffic (Rogowski 2017a) with inclusion of entries only (IN) and exits only (OUT) and passings (IN+OUT) of tourists which is also treated as a load of tourist trails. In 2017 Stołowe Mts. National Park was visited by 847.5 thousand tourists, of which 283 thousand visited Szczeliniec Wielki and 231 thousand Błędnę Skały. The most popular months of this year were: July (19.6 thousand), August (189.9 thousand), and May (163.2 thousand) and the least popular – December (8.1 thousand) (fig. 1). The number of passings (IN+OUT) in both locations reaches respectively 292 and 246 thousand, what on average gave respectively 840 and 660 persons.

Analysis of monitoring data showed increase in number of visitors to Szczeliniec Wielki and Błędnę Skały. Field observations were made in periods of maximum tourist traffic, during Labour Day weekend of 2017. Observation have shown, that around noon formed were queues of tourists



**Figure 1.** Monthly frequency of entrances (IN) the Table Mountains National Park in 2017, with its main attractions

Source: Own elaboration on the base of data from Ecovisio

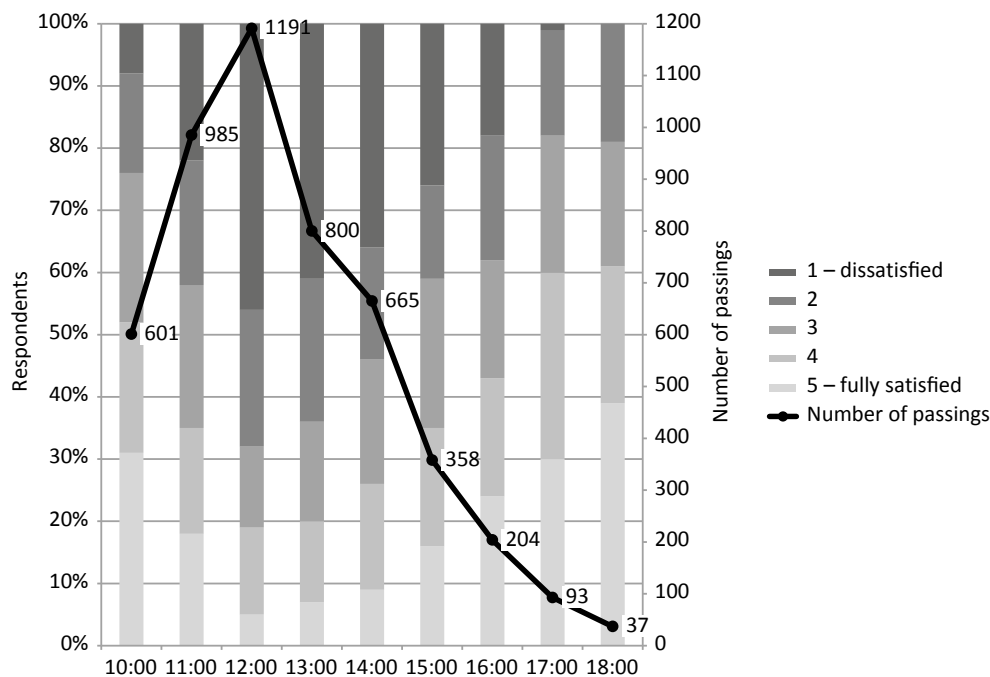
waiting for entrance even for 30 minutes. On trail tourists were moving slowly in crowd one after another, expressing their dissatisfaction. This situation was reflected in high load of tourist trails, problems with current service at entrance ticket offices and negative feedback from tourists. This led to precise recognition of level of tourists' satisfaction in dependence on tourist traffic intensity. To research form, used in 2015, regarding motives and preferences of tourists visiting Stołowe Mts. National Park, added was question diagnosing degree of tourists' satisfaction during visit to Szczeliniec Wielki. Their level of satisfaction was defined with the use of semantic scale: from 1 (unsatisfied) to 5 (fully satisfied). Examination was made between 10 a.m. and 6 p.m. on Labour Day 2017. Obtained was 320 answers (40 answers in each hour). Results of conducted survey regarding motives and preferences of tourists was presented in separate studies (Rogowski, Małek 2016; Rogowski 2017b; Rogowski, Żyto 2018). Below characterized was only measurement of tourists' satisfaction in defined hour intervals (Fig. 2).

Noticeable was dependence between degree of tourists' satisfaction at certain hour and number of passings (IN+OUT) of trail in Szczeliniec Wielki. At 10 a.m. noted were 601 passings, and every second respondent expressed their satisfaction (evaluating passing for 5 or 4). Dissatisfaction was expressed only by every fourth respondent. It can be assumed, that tourists visiting Szczeliniec Wielki

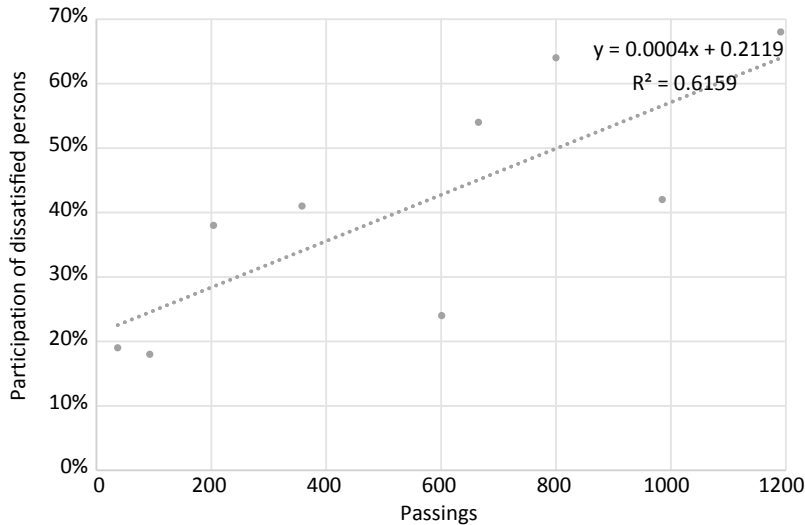
in the morning were more tolerant of increased number of visitors. Possible also is, that those tourists were more aware of values of visited site. Later situation changed: at 11 a.m. noted were 985 passings and satisfaction was expressed by every third respondent, whereas dissatisfaction by 42%. At 12 a.m., when noted were maximum passings (1191), satisfied was every fifth tourist, when those unsatisfied were 70%. In following hours, when number of passings decreased, the relation of satisfied to unsatisfied visitors changed. At 1 p.m. (800 passings) dissatisfaction was expressed by 2/3 of respondents and satisfaction by every fifth, whereas at 2 p.m. (665 passings) the amount of unsatisfied people was 54% and satisfied 26%. Further changes had similar character leading to point where at 6 p.m. dissatisfaction was expressed only by every fifth tourist and satisfaction by 2/3 of them. Above results are shown in Figure 3. Most often respondents expressed their dissatisfaction in hours of the highest number of passings i.e. between 12 and 2 p.m. It is also confirmed by linear regression diagram (Fig.4) with  $R^2$  determination coefficient.

## 2. Materials and methods

In reference to variability of tourist satisfaction, dependent on tourist traffic, prepared was method for development of tourism carrying capacity indicators of tourist trails in Szczeliniec



**Figure 2.** The relationship between the number of passings (IN+OUT) of the trail in Szczeliniec Wielki and the degree of tourist satisfaction  
Source: Own elaboration on the base of data from survey form



**Figure 3.** Linear regression between passings (IN+OUT) of the trail in Szczeliniec Wielki and tourists dissatisfied

Wielki and Błędne Skały. It includes not only natural absorption – protective aspects of values of animate and inanimate nature – but also level of so called Social Carrying Capacity of tourists (SCC, por. Scheryer, Roggenbuck 2009). Indicators of tourism carrying capacity (TCC; por. McCool, Lime 2009) present, according to Kowalczyk and Derek (2010) maximum serviceability of area developed in terms of tourism. In case of second definition – maximum number of people able to use the same values in conditions of optimum perception of impressions and freedom of movement in defined time unit, without compromising quality of infrastructure functioning.

For proper definition of tourism carrying capacity of analyzed tourist trails included should be specificity of field conditions, plant habitats and satisfaction of tourists, detailed below:

- inanimate natural factor – unique character of terrain forms shaped in narrow and winding rock mazes, determining course, tortuosity and width of tourist trail, limiting range of visibility,
- animate natural factor – diverse and valuable plant cover, composed, according to Kącki et al. (2018) out of natural conifer forests and subalpine spruce forests of high-mountain coniferous forest type,
- technical factor – limitations regarding width of wooden structural walkways inside of rock maze and railings easing tourist traffic and determining the direction of march,
- social factor – level of satisfaction resulting from visiting given attraction in given time, defined by tourists.

Designated limits were aggregated with data from pyro-electric sensors from tourist trails in Szczeliniec Wielki and Błędne Skały from Labour Day 2017 and presented were time intervals, where they were exceeded.

As a result of measuring trail width every 3–4 meters obtained was width specification with range from 0.4 to 2 m and average width of 1m. This width allows for free march of people walking one by one. On the base of tourist behavior observation, assumed was that optimum distance between them should amount 4 meters, as it allows for free march, without the necessity of leaving the route (not interfering in trails' closest surroundings) and giving at the same time satisfaction of communing with landscape.

As for degradation of natural environment and impact of tourist traffic on infrastructure condition, above distance includes natural absorption and tourism carrying capacity. Resistance of substratum, rock surroundings and wooden walkways on tourist trail are high enough to bear tourist traffic, at average distance amounting 4m, so it does not influence significantly on environment causing its degradation and destroying touristic infrastructure.

### 3. Results

#### 3.1. Tourism carrying capacity of tourist trails

Indicator of trail's capacity was defined as quotient of trails' length and distance between tourists.

Tourist trail in Szczeliniec Wielki which amounts 1200 meters had indicator amounting 300 people and tourist trail in Błędne Skały which is 600 meters long – 150 people.

At later stage tourism carrying capacity was defined as product of trails' capacity and time of passing, that is why calculated was hourly tourism carrying capacity.

Tourist trail in Szczeliniec Wielki is covered on average in 45 minutes, what defines its capacity for 400 people per hour, approximately 7 people per minute. Touristic trail in

Błędné Skały is covered on average in 30 minutes, what defines its capacity for 300 people per hour, approximately 5 people per minute.

Additionally, when taken into consideration is time of access to trails in Szczeliniec Wielki and Błędné Skały defined in Regulation of Director of Stołowe Mts. National Park number 3/2018 (Regulation 2018), indicated can be daily capacity of trails in given moment of the year. All of mentioned above limits were shown in Table 1.

### 3.2. Hourly tourism carrying capacity of tourist trails

Comparison of tourism carrying capacity indicator with data from pyro-electric sensors in hourly intervals show periods in which designated indicator were exceeded. Data from sensors defying tourist traffic intensity include entries only (IN) and exits only (OUT) from the trail. This intensity in case of Szczeliniec Wielki trail is the highest in morning and early-morning hours (9 a.m.–2 p.m.), exceeding tourism carrying capacity for five hours (Fig. 4).

Only during three hours with the most intensive tourist traffic (10 a.m.–1 p.m.) noted was 58% of daily passings (IN+OUT), and for five hours (9 a.m.–2 p.m.) almost 83%. Dynamic increase in intensity of tourist traffic, amounting 550% (from 108 to 601 passings), was visible in particular after 9 a.m. In the next hour this increase achieved value over 160% and in the next one – 121%. Accumulation of intensity occurred between 11 and 12 a.m. where the capacity indicator was exceeded by almost 198% (by 791 passings), noting 1191 passings. It can be defined as 20 passings per minute, what constitutes on average one passing every 3 seconds. In remaining forenoon and early afternoon hours indicator was exceeded by below values:

- hours 9 a.m.–10 p.m. by 50% (by 201 passings),
- hours 10 a.m.–11 a.m. by 146% (by 585 passings),
- hours 12 a.m.–1 p.m. by 100% (by 400 passings),
- hours 1 p.m.–2 p.m. by 66% (by 265 passings).

After 2 p.m. the intensity of tourist traffic visibly decreased, reaching the limit of indicator. Its drop oscillated initially in range of 50–60% per hour, reaching 93 passings between 4 and 5 p.m. Between 8 p.m.–10 p.m. tourist traffic subsided, and then in last two hours of day single passings took place. During that time noted were 18 passings, including 6 entries only (IN) and 12 exits only (OUT), generated probably by refuge “Na Szczelińcu”. Indicator of daily trail capacity in Szczeliniec Wielki on Labour Day, amounted 400 people (400 people per hour x 10 hours of official opening of the trail), and noted was 5115 passings what constituted 127% of indicator value.

From data analysis of all hours in 2017 indicated, that in case of 3923 (45%) measurements noted was tourist traffic

**Table 1.** Tourism carrying capacity (TCC) of Szczeliniec Wielki and Błędné Skały in various period

Characteristic	Szczeliniec Wielki	Błędné Skały
Average width of trail	1 meter	
The optimal distance between tourists	4 metres	
Tourism carrying capacity (TCC)	300 persons	150 meters
Passing time	45 minutes	30 minutes
Hourly tourism carrying capacity (HTCC)	400 persons	300 persons
Minute tourism carrying capacity (MTCC)	7 persons	5 persons
Daily tourism carrying capacity (DTCC) between 1 May and 16 June	4,000 persons	3,000 persons
Daily tourism carrying capacity (DTCC) between 15 June nad 30 June	5,200 persons	3,900 persons
Daily tourism carrying capacity (DTCC) between 1 July and 30 September	4,000 persons	3,000 persons
Daily tourism carrying capacity (DTCC) between 1 October and 31 October	2,800 persons	2,100 persons
Annular tourism carrying capacity (ATCC)	712,800 persons	534,600 persons

that amounted on average 78 passings per hour (76 entries and 2 exits). For 157 hours in analyzed period noted was exceeding the indicator of tourist carrying capacity which amounted on average 34%. Values exceeding the limit were noted most frequently between 11 and 12 a.m. for 59 days and between 10 and 11 a.m. for 45 days. Mentioned hourly interval (10–12 a.m.) should be included into daily peak of tourist traffic on trail, which in 2/3 of cases lasted until 1 p.m. Occasionally cases of exceeding the factor occurred already after 10 a.m. (for 8 days) and after 1 p.m. (for 12 days) and even after 2 p.m. (for 4 days). Average time of exceeding the indicator amounted 2 hours and 30 minutes during 69 days, whereas 5-hour maximum was noted exclusively on May 1, 2017. Tourism carrying capacity indicator was exceeded

most often in July and August and in single days in May and June and in single days of September, October and April.

As shown in Figure 5, tourism carrying capacity on trail in Błędne Skały was also the highest in forenoon and early afternoon hours, exceeding capacity indicator during 6-hour period.

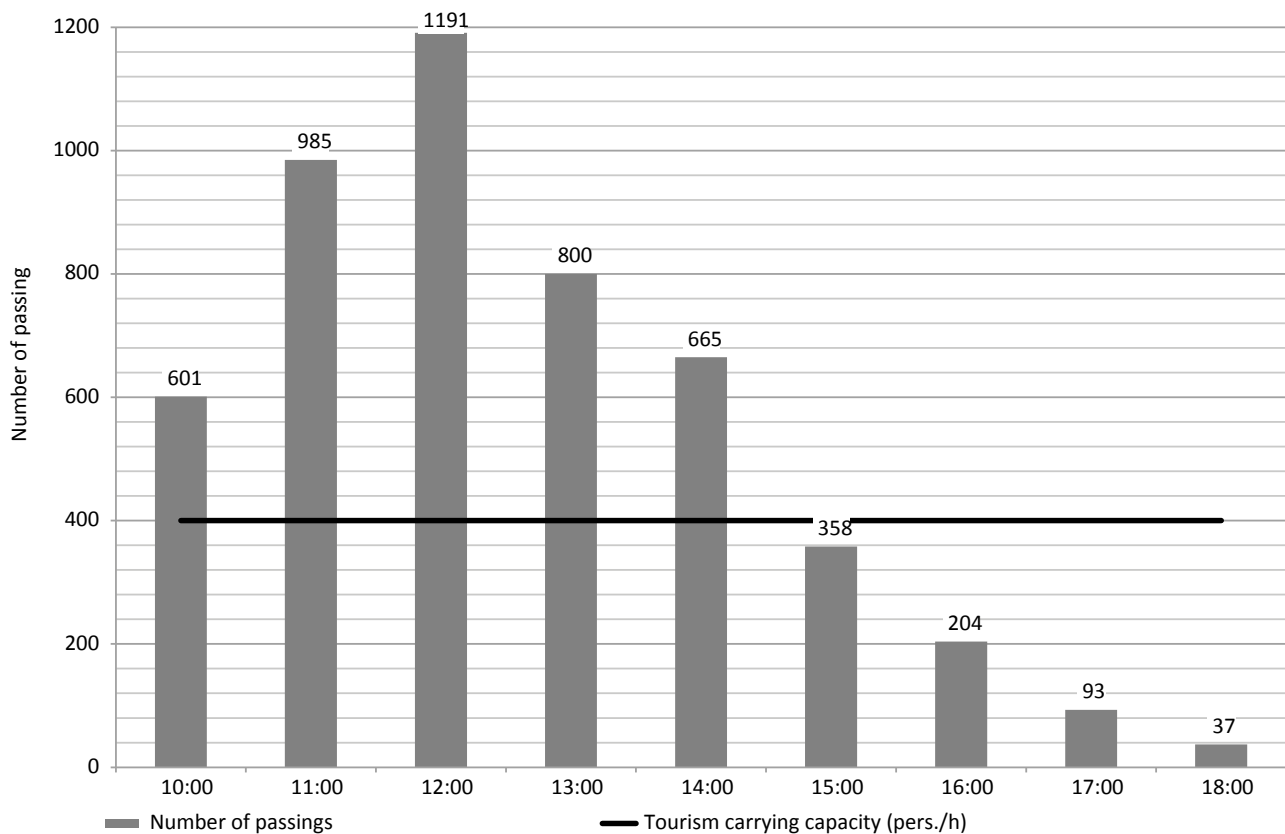
Increased tourist traffic begins after 10 a.m. and lasts until 4 p.m. In Błędne Skały there is no visible culmination in comparison to Szczeliniec Wielki, and maximum number of passings reaches 500–600 during one hour. This fact causes, that during three hours with the highest tourist traffic (12 a.m.–2 p.m.) noted was 45% of daily passings and for five hours (10 a.m.–3 p.m.) 71% of whole traffic. Tourist traffic in Błędne Skały was characterized with smaller time concentration than in case of Szczeliniec Wielki. Dynamic increase of intensity (smaller than in Szczeliniec) was noted between 9 and 10 a.m. and amounted 93%. In following hour it was smaller, i.e. 59%. In next hours noted was slight changes. Cumulation which amounted 601 passings occurred between 1 and 2 p.m., at the time the indicator of tourism carrying capacity was exceeded by 100% (by 301 passings).

At the time noted was on average 10 passings per minute, what gives one passing every 6 seconds. In remaining forenoon and early afternoon hours exceeding the indicator had smaller values:

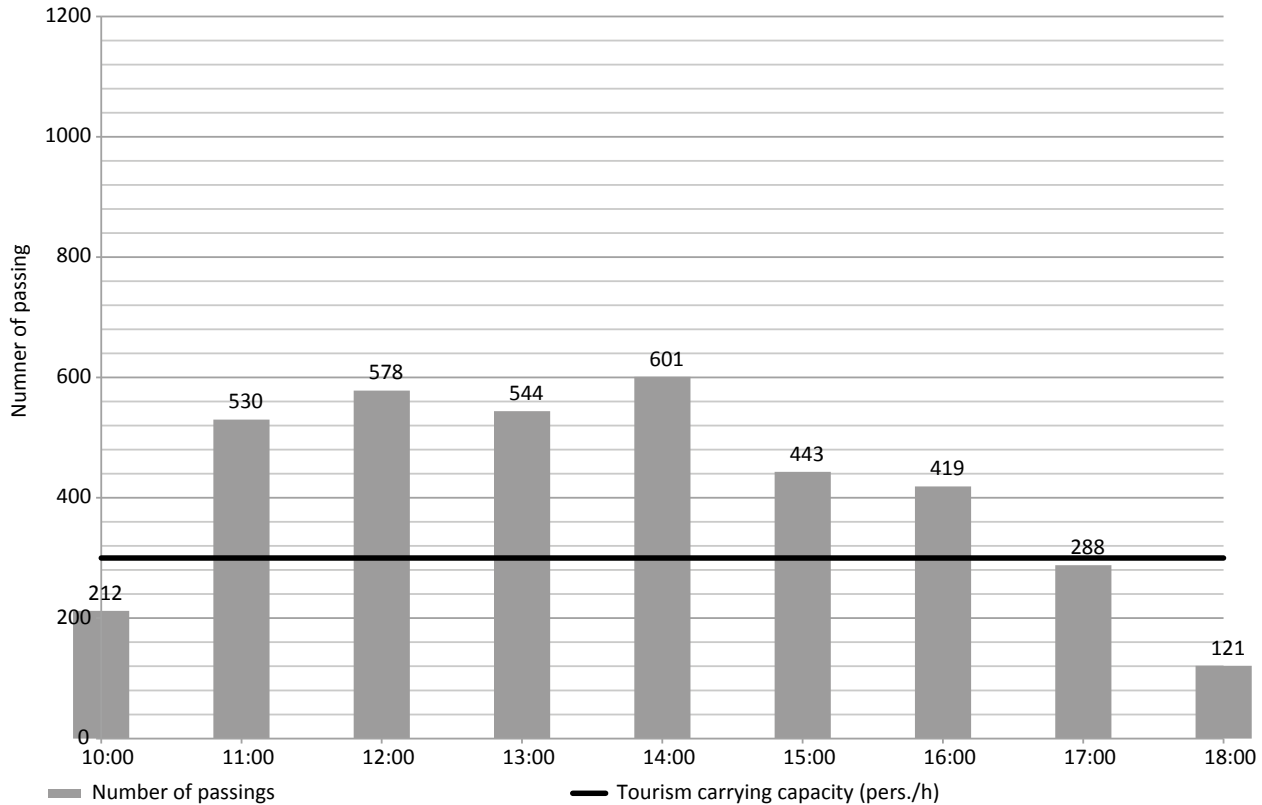
- hours 10–11 a.m. by 77% (by 220 passings),
- hours 11–12 a.m. by 93% (by 268 passings),
- hours 12 a.m.–1 p.m. by 81% (by 244 passings),
- hours 2–3 p.m. by 48% (by 135 passings),
- hours 3–4 p.m. by 40% (by 119 passings).

After 4 p.m. the intensity of tourist traffic decreased reaching the values of the indicator. The decrease of intensity oscillated initially around 30% every hour, and after 6 p.m. the decrease was very visible (on average by 250%), reaching the minimum 7 passings between 7 and 8 p.m. Then tourist traffic subsided. The indicator of daily capacity of trail in Błędne Skały on May 1, amounted 3000 people (300 people per hour x 10 hours of trail opening), and the trail walked 3799 people, indicating that exceeding reached the value of 27%.

Data analysis for all hours in 2017 indicates, that in case of 2655 (30%) noted was tourist traffic which amounted on



**Figure 4.** Hourly passings (IN+OUT) in hiking trail in Szczeliniec Wielki on 1 May 2017 on background of hourly carrying capacity



**Figure 5.** Hourly passings (IN+OUT) in hiking trail in Błędne Skały on 1 May 2017

average 90 passings per hour (89 entries and 1 exit). For 157 hours in analyzed period noted was exceeding the tourism carrying capacity indicator which amounted on average 28%. For 54 days in year noted was exceeding the tourism carrying capacity indicator between 11 and 12 a.m., and for 47 days between 12 a.m. and 1 p.m. This interval should be included into daily peak of tourist traffic in Błędne Skały, though its culmination is not as dominant as in case of Szczeliniec Wielki. Exceeding the limit also took place for 10 days between 10 and 11 a.m., for 33 days between 1 and 2 p.m., and for 16 days between 2 and 3 p.m. and for 6 days between 3 and 4 p.m. Tourism carrying capacity indicator was exceeded most often in July, August, then in May and June and one day of April and September.

### 3.3. Daily capacity of tourist trails

Thanks to summary of daily passings, possible is definition of indicator exceeding of daily carrying capacity, with inclusion of hours accessibility of tourist trails defined in Regulation of Director of Stołowe Mountains National Park number 3/2018. Due to extensiveness of data, period of

analysis was limited to summer season, i.e. from the beginning of May until the end of September, 2017.

As shown in Figure 6, for 120 data corresponding to daily passings of tourist trail in Szczeliniec Wielki in period from May 1, to September 31, 2017, only three of them exceeded set limit, what constituted on average 112% of tourism capacity indicator:

- May 1 (5180 passings; 128% tourism capacity indicator),
- August 14 (4286 passings; 107% tourism capacity indicator),
- August 13 (4013 passings; 101% tourism capacity indicator).

Number of passings in remaining days was within the norm, what finds reflection in average amount of tourist traffic for whole analyzed period on the level of 45% of indicator.

Similar situation occurred on tourist trail in Błędne Skały (Fig.7). For the same number of daily passings in period from May 1 to August 31, 2017, only 4 values exceeded the limit, constituting on average 115% of tourism capacity indicator:

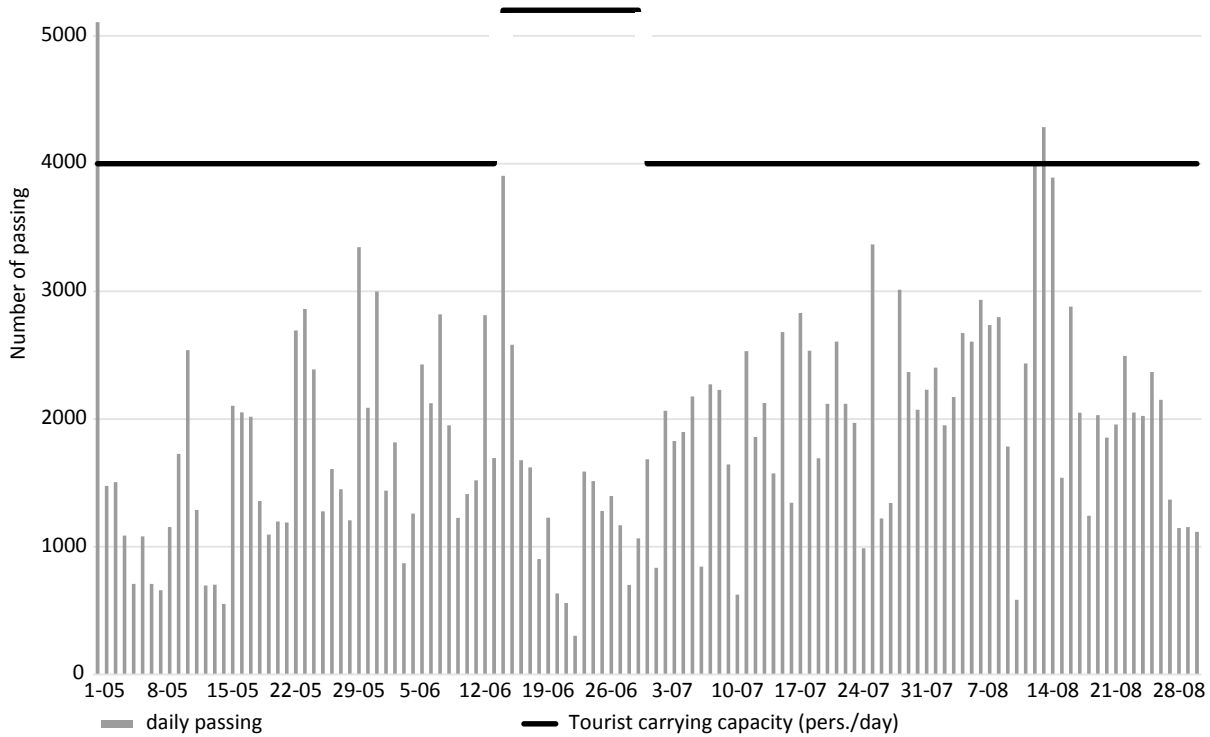


Figure 6. Daily passings (IN+OUT) in hiking trail on Szczeliniec Wielki in the period from 1 May to 31 August 2017

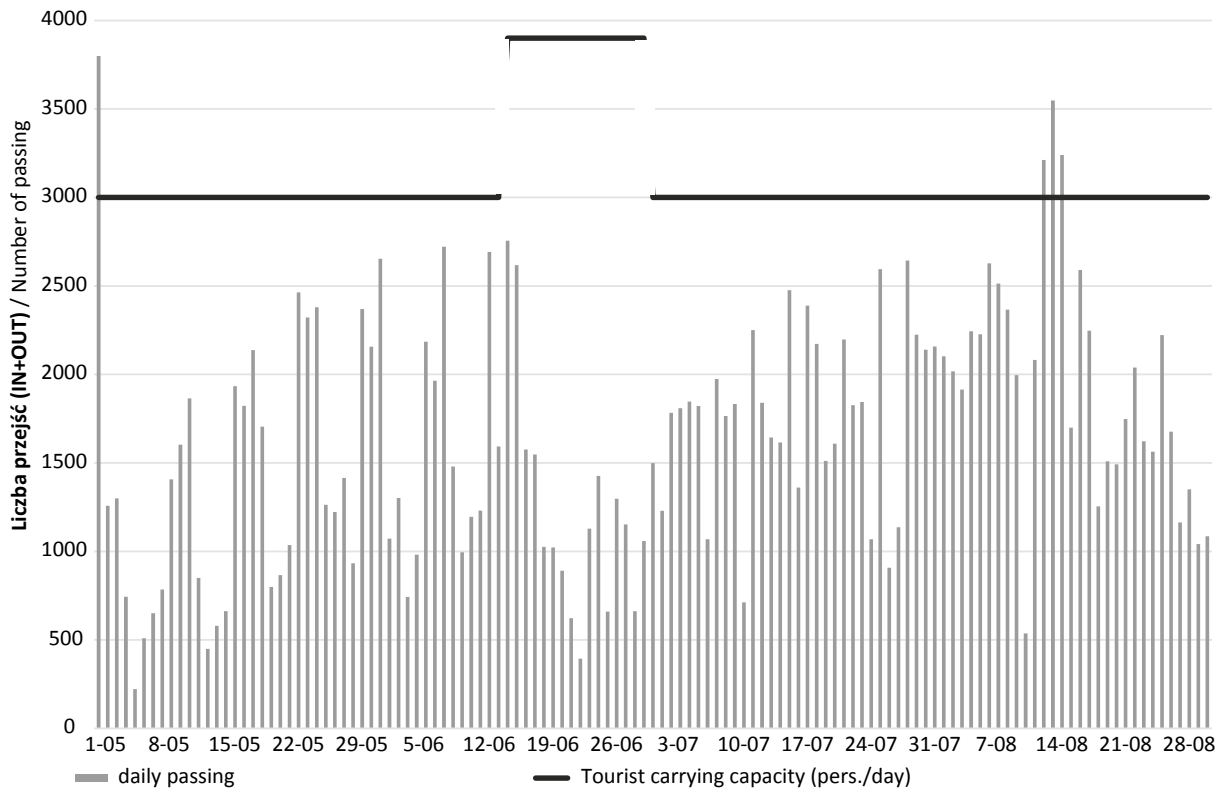


Figure 7. Daily passings (IN+OUT) in hiking trail in Błędne Skały in the period from 1 May to 31 August 2017



- May 1 (3799 passings; 127% tourism capacity indicator),
- August 14 (3548 passings; 118% tourism capacity indicator),
- August 15 (3240 passings; 108% tourism capacity indicator),
- August 13 (3212 passings; 107% tourism capacity indicator).

In remaining days, total number of passings was lower than set limit, what finds reflection in average amount of tourist traffic for all analyzed period on 54% of indicator. Definition of periods of exceedance of indicator of tourist carrying capacity for trails made possible attempt to limit the number of entries.

#### 4. Summary

The amount of tourist traffic in Stołowe Mts. National Park was estimated till now on the base of sale of enter tickets to tourist trails in Szczeliniec Wielki and Błędné Skały. This estimation wasn't precise since it did not include remaining areas of the Park. The creation of Monitoring system of tourist traffic (SMrt) allowed for precisizing size of tourist traffic, showing that this phenomenon is twice bigger than data obtained so far.

Tourist traffic in Szczeliniec Wielki and Błędné Skały is characterized by high dynamics of variability and time concentration. In Szczeliniec Wielki during 3 hours with the highest attendance noted was almost 2/3 of passings, and in 5 hours over 80%. In Błędné Skały this concentration was lower. Cumulation of tourist traffic took place around noon (11–1 p.m.), what is especially visible during spring and summer months with intensification during holiday seasons (popularly called “long weekends”). In hours preceding daily cumulation (9–11 a.m.) and in hours following it (1–3 p.m.) noted was the highest variability of tourist traffic intensity. However, the most daily entries was noted during May holidays (turn of April and May), what makes not only spring, but also annually cumulation of tourist traffic. Many entries to the Park was noted also in half of August – summer cumulation. Moreover, noticeable was peak of season of school trips on the turn of May and June.

The most important differences in characteristics of tourist traffic of both analyzed places are related with its size, moment of daily cumulation and hourly diversity. In Szczeliniec Wielki noted is larger tourist traffic, which lasts longer and is characterized by greater variability with moment of culmination in afternoon hours. This fact results in shorter time without any tourist traffic, greater exceeding of limit of tourism carrying capacity both in context of maximum value but also average value, but time

of noted exceedance was shorter. In Błędné Skały, tourist traffic is slightly smaller and lasts shorter than in Szczeliniec Wielki, its variability is smaller but set limits are being exceeded on average and hour longer than in Szczeliniec Wielki. Therefore increases and decreases in tourist traffic in Błędné Skały are smaller, causing that noted amount in each hour is more even. Above differences may be explained by following factors:

- different rise and altitude of both attractions – Szczeliniec Wielki is the highest peak of mountain range, therefore generating more interest,
- different degree of availability – better in case of Szczeliniec Wielki (30-minutes approach the most popular tourist trail); weaker in case of Błędné Skały (shuttle commute or 45-minutes approach the trail), what indirectly limits the numbers of entries and increases in intensity through limited number of parking spaces,
- length and different time of passings of tourist trails – in Szczeliniec Wielki the trail is longer, more varied and has more vantage points,
- presence of “Na Szczelińcu” shelter, which generates tourist trail in evenings, at nights and in the mornings.

Indicators of hourly and daily capacity of tourist trails in Szczeliniec Wielki and Błędné Skały was established on the base of field measurements and observation of tourist behavior, with including protective aspects of forest ecosystems and forms of terrain. Indication of exceedances – in terms of size and time of lasting – was possible thanks to data obtained from System of Monitoring of tourist traffic (SMrt) financed from sources from Forest Fund. Frequency and size of exceedances of indicators are presently slight. It may present “new” phenomenon, which in following seasons may grow stronger. For that reason it should be subject of further monitoring.

#### 6. Conclusions

Procedure of designating tourism carrying capacity of tourist trails in Szczeliniec Wielki and Błędné Skały led to clarification of indicator's values. It should be noticed however, that this refers to exemplary situation, where distance between tourists is equal and permanent, what in practice happens extremely rare. It is difficult to estimate, with that big diversification of tourist traffic intensification, standards matching such extreme and different from each other situations. In comparison to research in field of tourism carrying capacity of tourist trails listed in the review of literature, it should be emphasized that indicators listed above has higher limits what is determined by resistance of tourist values. Terrain forms, rock substratum and wooden walkways (as elements of tourist development) and course of tourist trails

cause, that their resistance to tourists' use is higher. That determines higher tourism carrying capacity.

Above norms are hard to use in case of groups of tourists, however they may define their approximate number within analyzed trails. Assuming, that typical group led by tourist guide amounts 40 people, it can be defined, that on tourist trail in Szczeliniec Wielki, at the same time could be present 7–8 groups, and in Błędne Skały 3–4 groups. Those groups could enter the trail in 5–10 minutes intervals. Therefore, having regard to the speed of movement, comments of tourist guide and security considerations in terms of passing harder and narrower parts of trail, tourists should not disturb each other. This would result in safer, more satisfying touring, and the impact on surrounding nature would be minimalized.

Indicators of tourism carrying capacity of tourist trails may be extremely helpful in current management of tourist trail on the area of National park, especially in its most popular parts. Knowing the size of tourist traffic and its changeability in time, used can be both indicators, allowing individual tourists and groups enter to trails in designated time intervals. Those intervals may serve foremost surrounding nature, but also greater satisfaction from contact with nature, without presence of bystanders. Establishment of such limits is extremely significant in counteracting of development of "overtourism", observed in national parks (Menzione 2018). Properly thought through use of designated limits will be understood by tourists. Those limits can be executed on many ways, for instance, change in price of tickets in dependence on time of day, or current information for tourists on number of entries thanks to data transmission and display, using social participation in making aware decision on entering tourist trails.

Tourist traffic increasing every year in Stołowe Mts. National Park (in 2018 noted was almost 20% increase) presents new challenges for its administration. They are related to clarification of tourist carrying capacity limits of the park, because noticeable will be higher and higher tourist pressure. In present situation not enough will be running extensive education for sustainable and responsible tourism. The message about existing restrictions should be strengthened with the use of different methods and tools for explanation of this situation and limiting tourist traffic development in most burdened places and periods of time. The effect of those actions should be relief for most popular places, distributing in time and space tourist traffic to other areas of park and its closest surrounding, in particular those which are characterized by higher resistance to tourist pressure. This situation should lead to covering with observation negative influence of tourism on natural environment components in terms of its identification, diagnosis and in proper situations limitation.

## Conflict of interest

Author declares lack of potential conflicts

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