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The coronavirus disease 2019 (COVID-19) pandemic changed recreation patterns worldwide. Increases in protected areas' visitor numbers were reported along with associated challenges. Changes in visitor numbers, composition, and motivation remain mostly unrecorded due to a lack of baseline records for comparison. We aimed to fill this gap with a study in the Swiss National Park (SNP), an International Union for Conservation of Nature (IUCN) strict nature reserve in the European Alps, where visitor numbers strongly increased in 2020 and 2021 compared to previous years. In summer 2020, we repeated a visitor survey previously conducted in 2006 and 2012, complemented by assessments of COVID-19-related motivations. To deepen our understanding of the COVID-19 context, we conducted semistructured interviews with SNP visitors. In general, COVID-19-related factors were a strong driver of increased visitor numbers. A fifth of survey respondents indicated that they would not have visited the SNP but for the pandemic, with most of them being first-time or infrequent visitors. Furthermore, our data showed that more young, domestic, and less experienced visitors came to the park. We discuss impacts and implications for practitioners and researchers (ie the need to better sensitize newcomers to environmental issues) and argue that our study holds insights for park managers worldwide.

Keywords: nature conservation; Swiss National Park; COVID-19; visitors; survey; visitor experience; travel restrictions; wilderness area.

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Introduction

The coronavirus disease 2019 (COVID-19) pandemic had strong effects on people's mobility and recreation patterns (Ritchie 2020). One striking change was that visits to green spaces, parks, and protected areas strongly increased during and after the first wave of the pandemic (Day 2020; Beery et al 2021; Moore and Hopkins 2021; Rice and Pan 2021; Venter et al 2021). Particularly during shutdowns or lockdowns, the use of green space within or close to urban areas increased where not restricted (Derks et al 2020; Venter et al 2020; Geng et al 2021; Lu et al 2021). Once movement restrictions were lifted, uncertainty related to international travel led to people spending their vacation in their countries of residence and exploring more remote, rural, and often mountainous areas (Derks et al 2020; Morse et al 2020; Seraphin and Dosquet 2020). As a consequence, protected areas experienced a major increase in visitors over the summers of 2020 and 2021, particularly in more densely populated areas of Europe (Spenceley et al 2021; Stiftung Wildnispark Zürich 2021). Whereas this trend entailed management issues such as overcrowding, lack of social distancing, parking and traffic problems, and inadequate behavior with respect to protection goals (McGinlay et al 2020; Jenkins et al 2021), it also offered new potential for tourism and human–nature interactions (Jacobs et al 2020).

Although observational and anecdotal experiences (as described by Jacobs et al 2020; McGinlay et al 2020; Jenkins et al 2021; Jones et al 2021) suggest that COVID-19 caused shifts not only in the number, but also in the composition, behavior, and motivation of park visitors, to date there is still a gap regarding evidence-based analyses of such shifts and their relation to COVID-19 regulations. To fill this gap, we present findings from a 14-year time series of visitor numbers, 3 visitor surveys at similar time intervals (2006, 2012, and 2020, the latest of which included questions covering aspects of the pandemic), and qualitative interviews conducted in 2020. In this mixed-methods resurvey study, we explored effects of COVID-19 regulations on various aspects of park visitation. In particular, we analyzed how numbers of visitors, demographic composition, and their perceptions, activities, opinions, and motivations changed compared to previous surveys, and how these changes were related to the COVID-19 pandemic.

By analyzing how the pandemic's circumstances affected visitor composition and attitudes, we aimed to understand the consequences for a protected area and its management. From our results, we drew conclusions and provide

recommendations for park managers in Switzerland and beyond, and we identified further research needs with the aim of indicating how protected areas can be better prepared for comparable situations in the future.

Methods

Study site

The Swiss National Park (SNP; 46°40′N; 10°12′E) covers 170.3 km^2 of mountainous terrain in SE Switzerland in the Central European Alps. It ranges from 1380 to 3173 m above sea level in elevation. Founded in 1914 as the first national park in the Alps, the SNP is the only national park in Switzerland, and it is protected under the Swiss National Park Act (Federal Assembly of the Swiss Confederation 1980). It has been classified as an International Union for Conservation of Nature (IUCN) strict nature reserve (category Ia, IUCN 2021). Apart from one road cutting through the park, the only human activity allowed is hiking on a trail network of 100 km, which is open during the snow-free season (approximately June to October). Accordingly, hiking, observing wildlife, and experiencing pristine mountain scenery were indicated as the main motivations for visiting the SNP in past visitor surveys (Campell et al 2010; Backhaus and Rupf 2014). All trails—from easy mountain trails to difficult alpine routes—are accessible from different trailheads without permit or entrance fee. Strict regulations are in place: Visitors are prohibited from leaving the trails, bringing pets into the park, biking, disturbing wildlife (eg by flying drones), camping and lighting fires, and collecting plants, animals, or rocks. At each trailhead, park regulations are displayed on large boards, along with a map of the hiking trails.

Together with the regional nature park Biosfera Val Müstair (BVM) and further adjacent areas, the SNP forms the United Nations Educational, Scientific and Cultural Organization (UNESCO) Biosphere Reserve Engiadina Val Müstair (UBEVM). The SNP region can be reached from larger Swiss and Italian agglomerations by public or private transportation within a few hours and mainly attracts overnight visitors.

Visitor census data

Due to the strict regulations, visiting the park perimeter is only allowed on foot by using the official trails. Therefore, visitors are defined as people who enter the SNP and hike on its trails. Total annual visitor numbers are estimated based on the number of hikers that cross pedestrian counting stations between 1 June and 31 October, when the majority of trails are open. The counting systems consist of slab sensors (Eco Counter, Lannion, France) buried below footpaths on 11 trail sections (Rupf et al 2006; Millhäusler et al 2016). Counts per trail section are extrapolated to the total trail system of the park by multiplying each count with a station-specific weighting factor, and by accounting for trail sections lacking a counting station. Weighting factors were determined by manual validation counts at relevant sites and backed up by expert knowledge from park rangers. Counting station data are available from 2007 onwards, but not yet for 2006, when a visitor survey was conducted. However, the SNP annual reports indicate similar visitor numbers in 2006 and 2007, as estimated by the park

authorities, which led us to use the 2007 visitor numbers as the baseline value for survey interpretations. In 2020, the first trails opened earlier than usual, on 8 May, due to early snowmelt, which resulted in some visitors not being accounted for in our data, since the counting stations are operated over a standardized period of 4 months, starting on 1 June.

Visitor surveys

We used data from 3 visitor surveys conducted in the SNP in 2006, 2012, and 2020. Visitor surveys have been conducted irregularly, typically when certain events gave reason to assume a change in visitor numbers, composition, or behavior. The 2006 visitor survey ($n = 3155$) was conducted after the opening of the Vereina train tunnel, which improved the accessibility of the SNP from urban centers in Switzerland. The 2012 visitor survey ($n = 2474$) was part of a project to gain insights into the economic impact of summer tourism in the region. The design of the 2020 visitor survey ($n = 1357$) (see Appendix S1, *Supplemental material*, https://doi.org/10.1659/mrd.2022.00025.S1) was based on the 2006 and 2012 surveys with additional questions regarding the influence of COVID-19 on visitor motivations and experiences. For instance, respondents indicated the importance of 16 possible visitation reasons using a 6-point agreement Likert scale.

The paper questionnaires (available in German, French, Italian, and English) were distributed to passing hikers at different locations (ie highly frequented rest areas, easy trails, and more demanding trails) in the SNP (Figure 1). Spatial and temporal distributions of survey campaigns in 2020 were matched to those of the preceding surveys and fit relatively well with the distribution of visitor numbers at counting stations (see Appendix S2, *Supplemental material*, https://doi.org/10.1659/mrd.2022.00025.S1). Additionally, quick response (QR)-coded links to the online version of the 2020 questionnaire (on Google Forms) were placed at trail entrances in the SNP.

Quantitative data analysis

All questionnaire data were structured and analyzed with R 4.0.3 (R Core Team 2021), with the exception of the factor analysis and *t*-tests (IBM SPSS Statistics 27). To assess how visitor characteristics were related to COVID-19-motivated visits, we computed a generalized linear model (GLM) analysis with a binary response variable (1 = COVID-19 motivated, 0 = not COVID-19 motivated) and a logit link function, with age, nationality, urbanity, group composition, and the number of previous SNP visits as explanatory variables (Table 1). Furthermore, we used exploratory factor analysis to better understand connections and structures in visitor motivations. Both the Kaiser–Meyer–Olkin measure of sampling adequacy (KMO = 0.738, which was above the commonly recommended value of 0.6) and Bartlett's test of sphericity ($\chi^2[120] = 4,619,224, P < 0.001$) indicated that the variables were suitable for factor analysis. Thus, a principal component analysis (PCA) with varimax rotation was performed. Based on the Kaiser criterion of eigenvalues greater than 1 (Kaiser 1960), the analysis yielded a 6-factor solution as the best fit for the data, explaining 64% of the variance (Table 2).

FIGURE 1   Map of the Swiss National Park with hiking trails and surveying points. (Map by Christian Rossi 2023)
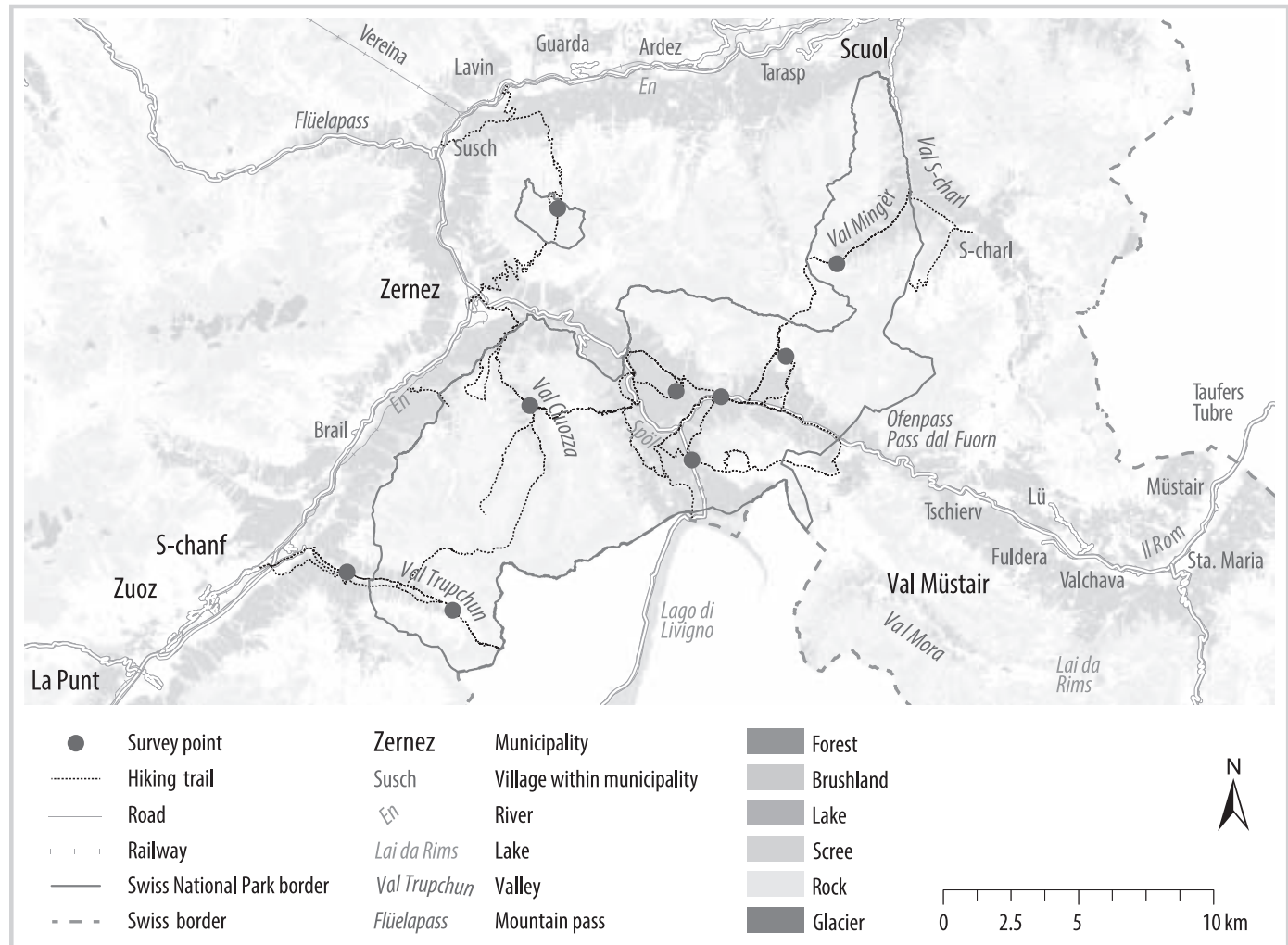
Next, we used *t*-tests to test whether the motivation (ie factors of the above PCA) differed between visitors who responded that their visit would have taken place regardless of the COVID-19 pandemic (group 1, $n = 999$) and respondents who reported that they would not have visited without the pandemic (group 2, $n = 253$). Equality of variance was checked using Levene's test (see Appendix S3, *Supplemental material*, https://doi.org/10.1659/mrd.2022.00025. S1). For the 3 factors where equality of variance was not given, we conducted a Welch's *t*-test; for the others, we conducted a *t*-test for independent variables (Table 3).

Qualitative interviews

To gain more detailed insights into the motivations and experiences of visitors, 19 qualitative interviews following a semistructured format were conducted in summer 2020. At the end of the quantitative questionnaire, respondents were given the option to sign up for an in-depth interview. Subsequently, interview participants were selected via a "purposeful sampling" approach (Patton 1990: 169–186). We selected participants according to age group (21–40, 41–60, >60), gender, the number of times they had visited the SNP (first time, twice or more), and the role COVID-19 played in their decision to come to the region (played a role, did not play a role).

We asked the interviewees questions such as whether other regions or national parks were considered before coming to SNP, what visitors expected and how experiences differed, and what they thought about the park's rules. All interviews were conducted by telephone, subsequently transcribed verbatim (Poland 1995) in the original language (except for French and Italian transcripts, which were translated to German), and coded using an inductive coding approach based on grounded theory (Corbin and Strauss 1990) with the software MAXQDA (VERBI Software 2019).

Results

Change in visitor numbers and composition over time

In 2020, the number of visitors in the SNP—as modeled based on counting station data—was 136,813 people. This is 55.6% higher than the average over the previous 5 years and 13.8% and 63.6% higher than in 2007 and 2012, respectively (Figure 2). In 2021, 113,988 people visited the park, which is 27.4% higher than the average for 2016–2019 and higher than 2014, the 100-year anniversary of the SNP, when the park received substantial media coverage (Backhaus and Hartmann 2018).

The increase in visitor numbers was also perceived by interviewees who had visited the SNP multiple times before.

TABLE 1 Generalized linear model of the effect of demographics (age, gender), urbanity, country of residence (Swiss/international), park experience (number of visits in the last decade), and usual holiday location (Switzerland versus abroad) on likelihood that a visitor's decision to visit the National Park region was influenced by COVID-19.

Predictor	Odds ratios	Confidence interval	Statistic	$P^{a)}$
Intercept	0.92	0.40–2.17	−0.18	0.855
Age	1.02	1.01–1.03	3.58	**<0.001**
Gender (male versus female)	1.09	0.83–1.44	0.62	0.537
Group structure (as a couple versus alone)	1.53	0.83–2.76	1.39	0.164
Group structure (in a group versus alone)	1.29	0.61–2.70	0.67	0.502
Group structure (with family versus alone)	1.58	0.85–2.89	1.48	0.139
Number of previous park visits (1 versus 0)	2.50	1.69–3.76	4.52	**<0.001**
Number of previous park visits (2 versus 0)	1.48	1.00–2.23	1.93	0.054
Number of previous park visits (3 versus 0)	4.06	2.31–7.64	4.63	**<0.001**
Number of previous park visits (>3 versus 0)	8.85	4.72–18.48	6.32	**<0.001**
Holiday location (mostly in Switzerland versus always in Switzerland)	1.21	0.70–2.07	0.70	0.483
Holiday location (mostly abroad versus always in Switzerland)	0.39	0.23–0.63	−3.68	**<0.001**
Holiday location (almost always abroad versus always in Switzerland)	0.16	0.08–0.28	−6.18	**<0.001**
Holiday location (left blank)	0.95	0.40–2.45	−0.11	0.913
Urbanity of place of residence (urban or rural)	1.19	0.85–1.64	1.02	0.305
Country of residence (international versus Switzerland)	4.21	2.53–7.31	5.33	**<0.001**
Observations	1510			
R^2	0.180			

$^{a)}$ Bold script denotes high significance.

In particular, some pointed out that there was an increased number of hikers on easier trails (4, 7, 9, 17; numbers refer to the persons interviewed).

Mostly on easy hiking trails, on longer and more difficult trails there was not much of a difference.

(Interviewee 17)

In contrast, 4 other interviewees felt that there were not many people around when they started early in the morning (6, 12, 14, 16).

We were practically alone when we hiked up but when we went back, we saw quite a lot of people coming up [the trail]. Not a huge amount, but that was something we noticed, that a lot of people are hiking [at a] relatively late [hour], that surprised me.

(Interviewee 6)

These quotes indicate that visitors' temporal and spatial movements differ, which leads to an uneven distribution across the park. In addition to visitor numbers, several interviewees mentioned that they noticed a change in the composition of visitors, mentioning that there were more different "types" of SNP visitors than in the past (2, 4, 6, 8, 11, 12, 14).

[T]here were more people, [and] one notices that these are not the kind of people who normally come. Who haven't been here before, which is nice.

(Interviewee 11)

The "new" visitors were described as being—based on their appearance and hiking pace—less experienced hikers:

[U]sually there are many more people who are much more prepared. This year, there were a lot of different types of visitors.

(Interviewee 2)

This observation is supported by quantitative data. Overall, first-time visitors and those who had not visited the park in the past 10 years made up the largest fraction of visitors in all 3 surveys. However, whereas roughly 30% of visitors were first-time visitors in previous years, the proportion rose to almost 40% in 2020. The proportion of frequent visitors (more than 3 visits in the past 10 years) in 2020 dropped to almost half compared to 2006 and 2012.

The increase in first-time visitors is, presumably, also reflected in the disproportionate increase in fines (eg for leaving hiking trails, bringing dogs into the park, or biking) issued by park rangers. Rangers tend to inform and warn visitors for most infractions and only fine heavy offenses or intractable persons. The number of fines (36 in 2020 and 40 in 2021) was very low, but nevertheless double the amount compared to previous years.

In line with the qualitative results, the survey results showed a change in visitor composition in terms of age, country of residence, and travel group composition in 2020 compared to the previous surveys. Regarding age, people between 41 and 60 years made up the largest proportion of visitors in all surveys. However, the age distribution of

TABLE 2 Rotated component matrix of visitor motivations.

Visitor motivation	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor name
Peace, isolation	**0.728**	0.114	0.126	0.089	0.089	0.005	Landscape/nature
Intact landscape	**0.658**	−0.047	0.026	0.417	−0.016	0.152	
Pleasant climate	**0.620**	0.247	0.158	−0.192	−0.043	0.242	
Untouched nature	**0.588**	−0.082	0.054	0.533	−0.012	−0.012	
Events	0.053	**0.771**	0.115	−0.019	−0.023	0.150	Events and activities
Museums	0.129	**0.710**	0.116	0.053	−0.010	0.122	
Bogn Engiadina Scuol (thermal spa)	0.015	**0.695**	0.185	0.137	0.137	0.020	
Opportunities for doing sports	0.382	**0.337**	−0.078	−0.198	0.439	−0.156	
Regional Nature Park Val Müstair	0.116	0.191	**0.922**	0.067	0.014	0.006	Labels
UNESCO Biosphere Reserve Engiadina Val Müstair	0.137	0.225	**0.904**	0.077	0.018	0.038	
Chance to see wild animals	0.144	0.110	−0.070	**0.748**	−0.044	−0.011	National Park
Swiss National Park	−0.023	0.064	0.201	**0.718**	0.103	0.034	
Consequence of COVID-19	−0.136	0.004	0.001	0.046	**0.772**	0.212	COVID-19
Destination in Switzerland	0.118	0.023	0.046	0.044	**0.752**	0.047	
Price	−0.044	0.157	0.055	0.064	0.154	**0.792**	Amenities
Accessibility	0.264	0.104	−0.022	−0.026	0.062	**0.762**	

Note: Extraction method: principal component analysis. Rotation method: Varimax with Kaiser normalization. Bold script denotes high factor loadings.
[a] The rotation converged in 7 iterations.

TABLE 3 Group statistics of the factors for group 1 (non-COVID-19-motivated) and group 2 (COVID-19-motivated) and results of the t-tests for independent samples (equal variances assumed) or Welch's t-tests (equal variances not assumed).

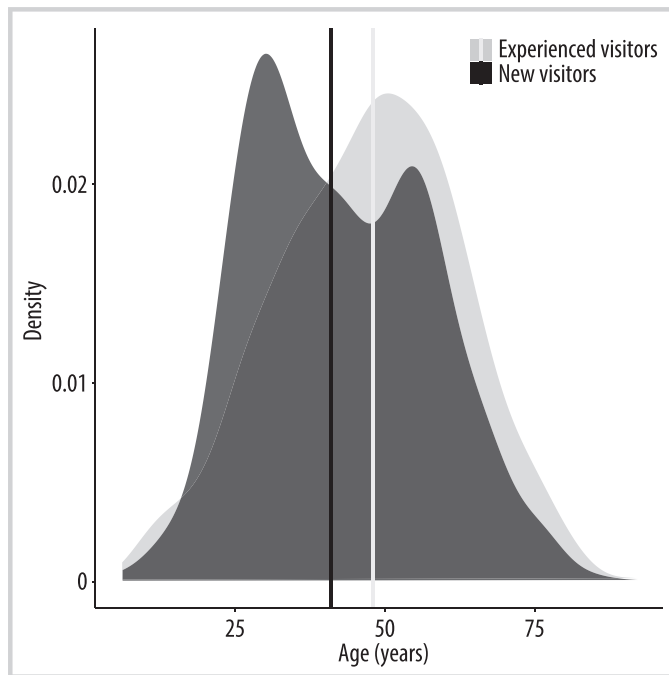| Factor	Group	Mean	Standard deviation	t	df	Significance (2-tailed)	Mean difference	Standard error difference	95% CI Lower	95% CI Upper
Landscape/nature	1	0.103	0.898	5.803	316.812	0.000**	0.497	0.086	0.329	0.666
	2	−0.394	1.286							
Events and activities	1	0.051	1.002	3.567	1250.000	0.000**	0.252	0.071	0.113	0.390
	2	−0.201	1.002							
Labels	1	0.034	1.015	2.506	1250.000	0.012*	0.178	0.071	0.039	0.317
	2	−0.144	0.978							
National Park	1	0.035	0.968	2.214	355.830	0.027*	0.168	0.076	0.019	0.318
	2	−0.134	1.106							
COVID-19	1	−0.163	0.970	−11.553	1250.000	0.000**	−0.780	0.067	−0.912	−0.647
	2	0.617	0.914							
Amenities	1	−0.013	0.986	−0.558	361.764	0.577	−0.042	0.076	−0.191	0.107
	2	0.030	1.097							

** $P < 0.001$.
* $P < 0.05$.

FIGURE 2 Total SNP visitor numbers from 2007–2022 estimated based on visitor counting stations.
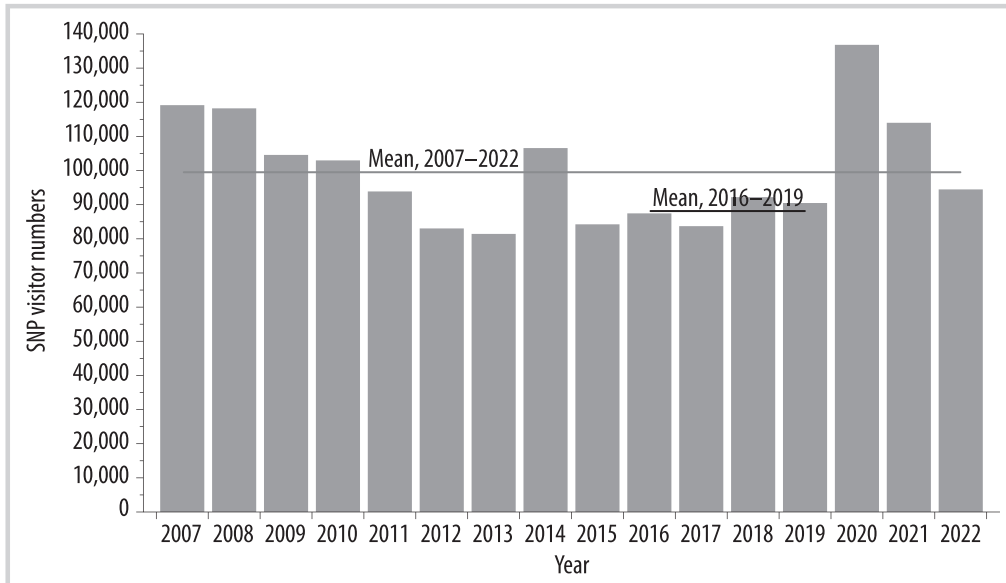
visitors was more even in 2020 than in previous surveys (Figures 3 and 4), resulting from a particularly large increase in the 21–40 years age category. Compared to 2012, there were approximately 29,000 more visitors in this age category, whereas the 41–60 years age category only increased by approximately 15,000 people.

In the 2006 and 2012 surveys, 22.3% and 19.2% of respondents visited from abroad, with visitors from Germany making up the largest share of this group. In 2020, the percentage of visitors from abroad dropped to 7.5% (Figure 3), indicating that people mostly abstained from international travel. In absolute numbers, this corresponds

FIGURE 3 The proportion of visitors divided into categories depending on (A) age, (B) country of residence, (C) number of previous visits in the last 10 years, and (D) mode of transport. Data are based on self-declaration in questionnaires conducted among hikers in 2006 ($n = 3155$), 2012 ($n = 2474$), and 2020 ($n = 1357$).
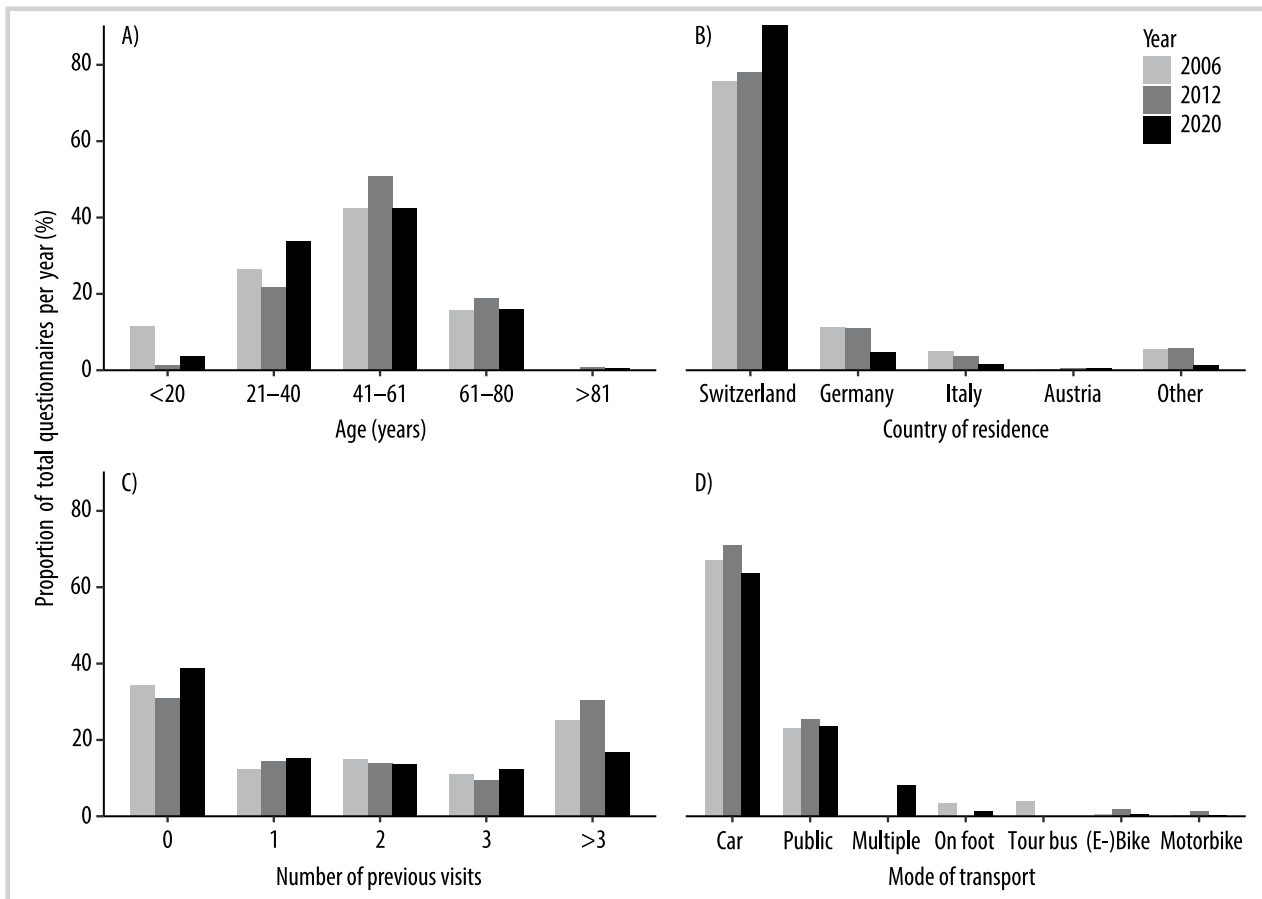
FIGURE 4 Distribution and median (lines) of age of experienced (1 or more visits in the past years) and new visitors (never visited in the past 10 years) in the park.

FIGURE 5 Links between (A) visitor experience and influence of COVID-19 pandemic on the decision to visit the SNP, (B) COVID-19 influence and usual holiday destination, and (C) visitor experience and usual holiday destination.

to an increase of approximately 61,000 visitors from Switzerland and a decline of approximately 8000 visitors from abroad as compared to 2012.

Almost half of the visitors were hiking in the SNP in groups of 2. People hiking with their family made up the second largest visitor group. As compared to the 2006 survey (the question was not asked in 2012), these 2 categories increased in 2020, while the fraction of people visiting in groups dropped by half. The share of visitors participating in an organized tour was small in 2006 and almost disappeared in 2020.

Although the use of public transport was discouraged by officials during the pandemic, the mode of transport to the SNP did not significantly change in 2020 in relative terms. However, the topic did arise in the interviews:

I said, only by car, only by car, not by train. Right now, with Corona and everything, we go by car.

(*Interviewee 12*)

### COVID-19 influence on visitor numbers and composition

Of the visitors, 20.2% indicated that they would not have visited the SNP region were it not for the COVID-19 pandemic crisis. These visitors were more often new to the region, whereas regular visitors indicated less often that COVID-19 influenced their decision to visit the SNP (Figure 5). As shown in Figure 5, both pandemic-influenced and new visitors usually spent their vacation abroad.

Furthermore, data from the interviews suggest that the COVID-19 pandemic not only influenced the choice of destination, but also the type of accommodation booked. One interviewee explained their avoidance of shared accommodation in Alpine huts:

Right now . . . we decided that we would not go to the Cluozza dormitory, as long as COVID is present.

(*Interviewee 7*)
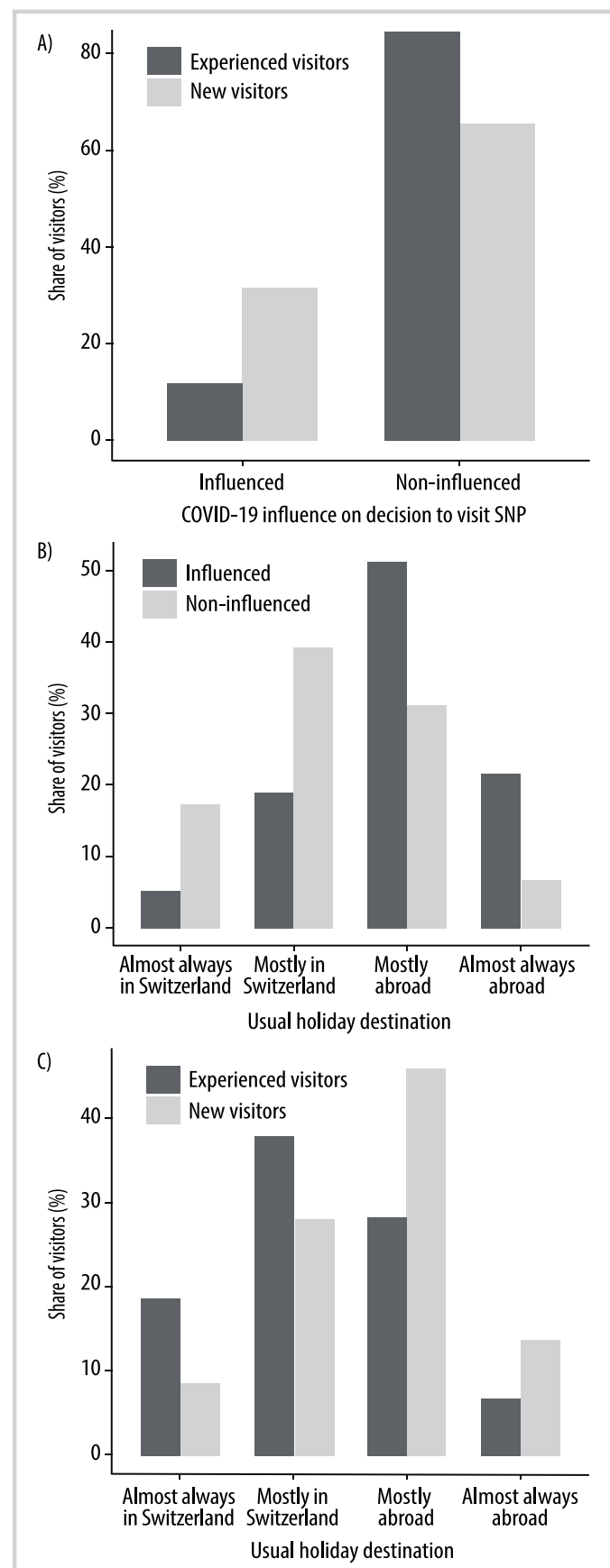
The GLM (see Table 1) indicates that the likelihood that a visitor would not have come to the SNP region without the pandemic was higher for younger visitors, visitors who had not been to the SNP in the past 10 years, visitors who usually spend summer holidays abroad, and those who live in Switzerland. The GLM analysis thus confirms the descriptive results of Figure 5, identifying the connection between spending holidays abroad and the influence of the pandemic on visitors' decisions. Gender, urban place of residence, and group structure of visitors had no effect on this likelihood.

Characterization of visitor motivations

Table 2 shows the results of the exploratory factor analysis (EFA) of visitors' motivations. Some items were loaded weakly on different factors, with factor loadings close to or lower than 0.5. Hence, we resorted to interpretative steps in order to generate meaningful factors (see Bortz et al 2008). For example, factor loadings of the item "untouched nature" were close to 0.5 for factor 1 "landscape/nature" (0.588) and factor 4 "national park" (0.533). We assigned it to factor 1, since this loading was slightly higher, and we observed consistency with the other items loading on this factor, which all expressed the longing for a peaceful outdoor experience in a healthy environment. Furthermore, the item "opportunities for doing sports" showed weak factor loadings with 3 different factors (factor 1 = 0.382, factor 2 = 0.337, factor 5 = 0.439). We assigned this item to factor 2, "events and activities," as we saw a connection to the other variables referring to events and activities, "events," "museums," and "Bogn Engiadina Scuol" (thermal spa). The EFA resulted in 6 new variables describing visitor motivations: because of its landscape and nature (factor 1, "landscape/nature"), due to different activities in the region ("events and activities"), based on label regions (factor 3, "labels"), based on the destination being a national park (factor 4, "national park"), because of COVID-19 and thus having to choose a domestic destination (factor 5, "COVID-19"), and based on the destination's accessibility (factor 6, "amenities"). Interestingly, the high factor loadings on factor 4, "national park," indicated how closely visitors associated iconic species with the SNP itself.

Table 3 shows the results of the *t*-tests calculated using the factors to reveal differences in motivation between visitors who would have come to the SNP regardless of COVID-19 (group 1) and COVID-19-motivated visitors (group 2). We found a significant difference between group 1, claiming that the pandemic was not the reason for their visit, and group 2, who claimed that COVID-19 had a decisive impact on their planning. The factors "landscape/ nature," "events and activities," "labels," and "national park" were rated significantly higher by group 1, indicating a higher importance of these factors for visitors not influenced by COVID-19. We assume that compared to group 2, group 1 was more familiar with the SNP area, its opportunities, and the experiences offered, as well as the meaning of the region's labels. Accordingly, group 1 rated possible motivations such as the national park label, events, and nature experiences as more important for their decision, whereas the main driver for group 2 was circumstances related to the pandemic.

The only factor that did not differ significantly between the 2 groups was factor 6, "amenities." Most visitors came

from Switzerland and were, thus, familiar with prices and infrastructure in vacation areas.

Discussion

In the SNP, the COVID-19 pandemic strongly impacted nature tourism and thus brought along new management issues. Our study indicated a strong increase in visitor numbers, driven by younger people from Switzerland and visitors who would have traveled abroad if not for the pandemic. Compared to COVID-19-influenced visitors, survey respondents who had planned their visit regardless of the pandemic indicated different motivations, such as the national park label, events, and nature experiences. In the following, we discuss our results, how they correspond to findings and anecdotal experiences from other protected areas during the pandemic, and what they imply with regard to park management.

Visitor numbers

The 55% rise in visitor numbers in 2020 (and 27% in 2021) compared to the previous 5 years is a clear and unprecedented deviation from any trend in the existing 14-year time series and much stronger than previous fluctuations caused by 3 influential events: the opening of the new park visitor center in 2008, the upward revaluation of the Swiss currency in the wake of the global financial crisis between 2008 and 2011, and the centennial of the SNP with extensive media coverage in 2014. The latter 2 events explained significant variation in visitor numbers in a previous analysis (Millhäusler et al 2016). However, the spike in 2020 is unique in its magnitude and can be attributed to a large extent to COVID-19-related decisions. An increased interest in nature experiences by visitors, alongside extremely high visitor frequencies in protected areas and other green spaces, was noticed throughout Switzerland (Schnabel-Jung and Wipf 2021), but also in other countries where park visits were not confined by COVID-19 restrictions during the summer of 2020 (eg McGinley et al [2020] for European parks, and Ziesler and Spalding [2021] for US national parks).

The surge in visitor numbers poses various challenges and opportunities for protected area management. On the one hand, such an interest, along with positive visitor experiences, may raise awareness for environmental processes and issues (Beery et al 2021). On the other hand, increased visitor numbers may negatively impact animal behavior, vegetation, and biodiversity in general (and more specifically sensitive mountain ecosystems) and could also impair visitor experience due to social crowding (eg Taff et al 2022; Ferguson et al 2023). In this regard, the prolonging of the season due to reduced snow cover in spring and autumn has not yet eased crowding significantly. However, in the SNP, the numbers to date have not reached thresholds that would require the implementation of new restriction measures (as proposed in other parks; see Jones et al 2021).

Visitor motivation and COVID-19 effects

More than 40% of the survey respondents indicated that the pandemic had a "strong" or "some influence" on their decision to visit the park. Thus, the 55% increase in visitor numbers compared to previous years can be attributed with

high certainty to the pandemic. Yet, seemingly in contradiction to this, only 20.2% of survey respondents answered that they would not have visited the region without the COVID-19 pandemic. This indicates that there could have been additional factors not attributed to the COVID-19 situation that influenced visitor behavior. An alternative explanation is that visitors tended to downplay the importance of the pandemic during the relatively relaxed summer months, thus answering the dichotomous question differently than when asked to indicate importance on a more nuanced Likert scale. In general, a bias could arise based on the individual interpretation of the question of whether COVID-19 was the reason for the visit. Some interviewed visitors mentioned that they would certainly have visited the SNP "at some point" without COVID-19—but not necessarily in 2020, and thus answered "no" in the dichotomous question.

Regarding other visiting reasons, we found that non-COVID-19-influenced visitors (group 1) were motivated by a more diverse set of reasons. The destination, its labels, events, and offered nature experiences were rated significantly more important by this group compared to respondents who indicated COVID-19 as their main reason for the visit (group 2). This indicates that the different visitor groups also differed in their perception of the SNP and expectations for their visit.

Visitor composition

Compared to previous surveys, the demographic composition of visitors changed and became more diverse in various ways. The most evident change was the strong increase of domestic and younger visitors (age group between 21 and 40 years). With travel restrictions in place until early summer for neighboring countries (Italy: 3 June, Germany: 15 June, Austria: 4 June, France: 2 June), strongly restricted air travel, and high uncertainty due to often-changing travel rules, many people preferred domestic holidays over international travel. Accordingly, people from Switzerland indicated a higher probability of having been influenced by the COVID-19 pandemic in their travel plans than residents from other countries (Table 1).

The trend toward younger guests and a more balanced age distribution among visitors is especially relevant, since it contrasts with the general demographic change and expected aging of visitors in the coming decade. As discussed by Schamel and Job (2017), the expected aging of visitors would lead to a general decrease in walking speed and, therefore, to greater concentrations of visitors in the more easily accessible areas of a national park. This would reduce human pressure on more remote areas of parks. Regarding our case, an increase of younger but less experienced hikers could lead to similar outcomes, especially since the SNP exclusively offers narrow mountain foot paths. Both groups deviate from the stereotypical image of a national park visitor as an able-bodied, well-equipped, middle-aged (white, male) person (see Stanley 2019), which was also perceived by interviewees commenting on differences in equipment between experienced and new visitors. It remains to be seen whether this trend toward a more diverse group of hikers will persist in the SNP post-COVID-19. However, in line with Stanley (2019) and Arts et al (2021), this change should also lead us to question the concept of a normative "ideal hiker"

as the main visitor to the SNP region, which holds implications for both research and management.

The disproportionately higher number of fines (Hanselmann and Haller 2021) indicates that new visitors tended to break rules more often than returning visitors. Park rangers' experiences showed that the (large) signposts at the park entrances were sometimes ignored by inexperienced visitors, who consequently broke rules unwittingly. To accommodate this, easily accessible information on "dos and don'ts" that can reach all visitor types is needed. In fact, the SNP website, where such information is displayed, had a strong increase in visitations over the summer of 2020. However, whether information on the regulations was not picked up or was simply ignored needs to be explored, particularly since COVID-19-motivated visitors in our study indicated other, destination-related characteristics significantly less often as their motivation. This was potentially because they lacked the specific knowledge.

In line with an increase of new visitors, park officials are challenged with greater demands for information and with keeping offenders/trespassers in check (see Schnabel-Jung and Wipf 2021; Singh et al 2021). Moreover, a shift in visitor composition to more first-time visitors may call for a higher demand for in situ information (ie orally from rangers). However, in multilingual countries such as Switzerland, an increase in visitors speaking different languages (as in our case, more French-speaking visitors) can present additional communication challenges. To respond to these issues, to foster positive visitor experiences, and to avoid negative impacts, park managers must either acquire additional or reallocate existing resources. In the case of the SNP, rangers have been supported at times by other staff members and volunteers in areas experiencing high visitor frequencies.

Limitations and general implications for future studies

Generalizations of COVID-19-related implications across multiple protected areas are currently hampered by the lack of overview studies (eg Tin 2022, who compared 4 wilderness areas) or meta-analyses across multiple parks and countries. The latter research, in particular, is complicated due to large variability in COVID-19 restrictions between countries, hindering meaningful comparisons. Therefore, many reports of COVID-19-related effects on national parks remain anecdotal knowledge. Our study, although restricted to a single region, differs from this by adding a longer-term perspective due to previously available data. Thus, it could contribute to setting up hypotheses that can be tested in a larger setting spanning multiple protected areas or, more generally, in (mountainous) areas with nature-based tourism foci in the future. By repeating our surveys in the years after the pandemic, we will further test whether these shifts in visitor numbers, composition, and motivations will persist.

Conclusion: implications for park management

With our research, we aimed to provide baseline knowledge about changes in visitor numbers and composition, and their consequences for the management of protected areas. We do not yet know whether the increase in visitor numbers and

change in visitor composition represent a temporary spike due to the COVID-19 crisis or a more permanent change. However, the shift in visitor composition does require a rethinking of the image of the "ideal" hiker as being middle-aged, able bodied, and well informed and equipped, toward a more diverse set of people seeking outdoor mountain experiences.

A change in outdoor recreation patterns will not only impact protected areas, but many other mountainous areas as well. This study's implications thus go beyond park management and are relevant to sustainable tourism in general. Tourism and conservation practitioners should aim to address questions such as: How do the expectations of visitors change, and are they in line with nature protection and sustainability goals? How do regular visitors respond to overcrowding? How can a new clientele be sensitized for environmental issues? These issues will become more relevant in the coming years.

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Supplemental material

APPENDIX S1 Questionnaire (English version).
APPENDIX S2 Distribution of visitors.
APPENDIX S3 Levene's test for equality of variances.

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