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ORIGINAL ARTICLE

Segmenting the Geotourist Profile in the Caminhos dos Cânions do Sul UNESCO Global Geopark Based on Motivations: a Categorization Proposal for a New Territory

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Abstract

Understanding visitor motivations is essential for developing effective geotourism strategies and enhancing the management of UNESCO Global Geoparks. This study analyzes and segments the geotourist profile of visitors to the Caminhos dos Cânions do Sul UNESCO Global Geopark (CCSUGGp), southern Brazil, based on their travel motivations. Data were collected through 83 structured questionnaires applied at six Sites of Geological Interest between May 2024 and February 2025. The survey combined socioeconomic, behavioral, and motivational variables, and the data were analyzed using descriptive statistics and exploratory factor analysis with principal component extraction and varimax rotation. The results indicate that visitors are predominantly middle-aged women, with higher education qualifications and middle-income levels. Most visitors originate from southern Brazil, travel with friends or family, use private vehicles, and are mainly motivated by nature tourism and adventure tourism. Factor analysis identified eight distinct geotourist segments: (i) nature/geodiversity contemplative geotourists, (ii) sharing and learning geotourists, (iii) exploring nature geotourists, (iv) adventure geotourists, (v) independent geotourists, (vi) planning geotourists, (vii) runaway geotourists, and (viii) casual geotourists. These segments reveal different levels of engagement with geoheritage and geotourism awareness, demonstrating that geotourism extends beyond a specific interest in geology. The findings contribute to visitor management, tourism planning, environmental interpretation, and the development of sustainable geotourism strategies in UNESCO Global Geoparks.

Keywords Geoconservation · Market segmentation · Tourism · Geotourism · Sustainable Development · Geoheritage

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Introduction

Motivations play a crucial role in the examination of travel behavior and influence various elements of tourism, such as the reasons for travel, the selection of particular destinations, and the overall satisfaction experienced with the visited location (Carvache-Franco et al. 2019). In this context, the components that constitute the visitor's profile and motivations are crucial for evaluating their satisfaction and loyalty regarding the tourist offerings (Carrascosa-López et al. 2021).

The motivations underlying tourism research can be elucidated through the framework of psychological and biological needs that affect, guide, and unify an individual's decision to engage in a tourism-related activity (Dann 1981; Pearce 1982). Consequently, the reasons that drive tourists to travel are diverse, as an individual may possess multiple specific needs that they aim to fulfill, taking into account various motivations (Park et al. 2008). Additionally, sociodemographic and behavioral elements observed while traveling are commonly employed in tourism studies to ascertain the profile of travelers (Ozdemir et al. 2012).

At present, nature tourism has prompted political decision-makers and various stakeholders to align with the preferences of the target demographic in the tourist region, while also facilitating the adaptation of tourism products to the prevailing trends in the area, thereby striving for competitiveness within the sector (Fung and Jim 2015; Martins and Silva 2019; Marjanovic et al. 2023).

A tourist's experience is generally deemed satisfactory when the expectations and desires of visitors are fulfilled at the destination, as evidenced by reviews on social media (Silva et al. 2019; Pereira et al. 2020). Consequently, to enhance the appeal of the visiting experience for tourists, it is essential to ascertain their travel motivations, particularly in destinations that are either under-researched or undergoing expansion (Beh and Bruyere 2007), such as the UNESCO Global Geoparks (UGGp), in this case we will focus more specifically on the UGGps located in Brazil.

Currently in 2026 there are six designated UGGps in Brazil that enhances new tourist destinations and regions through the designation and organization of these areas (Silva et al. 2024a, 2025a). These areas play a crucial role in the development of regional tourism routes, emphasizing the economic and socio-environmental advancement of geoheritage. This strategy aids in the cataloging and preservation of heritage, encompassing both natural and cultural aspects, particularly via geotourism.

In this context, geotourism is recognized as a developing form of sustainable tourism on a worldwide scale (Dowling 2013; Ólafsdóttir and Tverijonaite 2018; Chylińska and Kołodziejczyk 2025), propelled by the growing number of destinations that highlight their geodiversity as attractions for tourists (Rivero et al. 2019), whether in natural (Pralong 2006), rural (Carrillo-Hernández et al. 2024), urban (Del Lama et al. 2015; Chylińska and Kołodziejczyk 2025) or perhaps a combination of ex situ and in situ assets (Guglielmi et al. 2026).

Geotourism is defined in this context according to the framework established by the Global Geoparks Network (GGN) and the Center for Sustainable Destinations of the National Geographic Society. They describe it as "tourism which sustains and enhances the identity of a territory, taking into consideration its geology, environment, culture, aesthetics, heritage and the well-being of its residents" (Arouca Declaration 2011). In addition to this definition, Silva et al. (2025b) refer to geotourism as "mother earth" tourism.

Therefore, as tourism grows within a particular area, it becomes essential to comprehend the characteristics and motivations of individuals pursuing it (Line and Wang 2017). This comprehension can assist policymakers in formulating sustainable tourism strategies (Carvache-Franco et al. 2019).

The rationale behind this is that the motivations driving individuals to travel influence tourists' decisions, and grasping these core needs is crucial for devising sustainable development strategies (Fung and Jim 2015; Silva et al. 2024b).

In this context, the primary aim of this study is to comprehend and suggest a segmentation of the geotourist profile, which is based on the motivations of visitors to Sites of Geological Interest (SGI) - commonly referred to as geosites - within a Brazilian UGGp. This updated nomenclature is employed in this study as it aligns with the latest guidelines from the International Union of Geological Sciences (IUGS 2023) regarding UGGp. In order to achieve this goal, a sample was taken from six SGI within the Caminhos dos Cânions do Sul UNESCO Global Geopark (CCSUGGp).

This study is justified by the fact that, although the international literature features numerous studies on geotourist segmentation and motivation in UGGps (Dowling 2013; Fung and Jim 2015; Daprela et al. 2021; Amaro et al. 2023), a critical knowledge gap remains regarding how these dynamics operate in recently designated territories characterized by high landscape heterogeneity within a Latin American context. Most existing typologies tend to adopt binary or restricted models, polarising visitors into 'specialist' geotourists (strictly focused on geosciences) versus casual 'general tourists', or evaluating territories with fully consolidated and homogeneous tourism infrastructure.

This research advances the current literature by proposing a nuanced motivational categorization tailored to the CCSUGGp, a newly recognized territory encompassing contrasting ecosystems, ranging from massive canyon escarpments to coastal plain sand dunes. In this regard,

the primary objective of this article is not to introduce an entirely new statistical or conceptual framework, but rather to complement and extend prior motivational typologies by adapting them to the empirical reality of a newly designated UNESCO territory.

Study area

At present, CCSUGGp encompasses seven municipalities: four situated in the state of Santa Catarina (Praia Grande, Morro Grande, Timbé do Sul, and Jacinto Machado) and three in the state of Rio Grande do Sul (Torres, Mampituba, and Cambará do Sul). Spanning a total area of 2,830 km² (Fig. 1), it serves a population of 79,040 inhabitants (Brazilian Institute of Geography and Statistics - IBGE 2022a).

The CCSUGGp is characterized by a variety of geological and geomorphological features, which include a broad spectrum of unique structures, lithologies, topographic forms, and geomorphological processes (Rapanos and Valdati 2024).

The region is distinguished by its geodiversity, featuring lithological formations and geomorphological features that are a result of significant volcanic activity that transpired between 135 and 119 million years ago, which is associated with the disintegration of Gondwana (Godoy et al. 2011; Rossetti et al. 2018). The CCSUGGP showcases exceptional landscape compartmentalization and encompasses a notable escarpment that contains various geomorphological units (Rapanos et al. 2022). These units include the Campos Gerais Plateau, the Serra Geral, the Serra Geral Plateaus, the Colluvial-Alluvial Plain, and the Coastal Plain. The distinctive features of these units are acknowledged as geomorphosites of significance at regional, national, and international levels (Gomes et al. 2022).

The region has experienced significant dissection throughout history, resulting in the formation of numerous deep canyons. These canyons have not only influenced the area's topography for an extended period but have also emerged as distinctive tourist attractions (Rapanos et al. 2022). Following a thorough evaluation and inventory of the region's geodiversity, 28 SGI features were recognized.

Consequently, this study concentrates on the SGI situated within the municipalities of Santa Catarina, specifically: (i) Malacara Canyon, Rio do Boi Canyon, and Pedra Branca (municipality of Praia Grande) (ii) paleoburrow Portal do Palmiro (municipality of Timbé do Sul) and (iii) paleoburrow of Três Barras along with Queda do Risco Waterfall (municipality of Morro Grande) (Fig. 2). The selection of these sites was based on their accessibility and their high levels of visitation within the territory.

Methodology

For this study, visitors and tourists have been identified as the main local stakeholders. Visitors and tourists are characterized as individuals who are present in the SGI area, regardless of whether they are residents or non-residents of the municipalities located within the CCSUGGp region. Additionally, participants must be at least 18 years old and have consented to take part in the study by signing the Informed Consent Form (ICF).

The sample population for this group was refined through a non-probability convenience sampling method. This technique involves selecting individuals for participation based on their availability and the ease with which they can be accessed by the researcher during the study period (Galloway 2005; Stratton 2021).

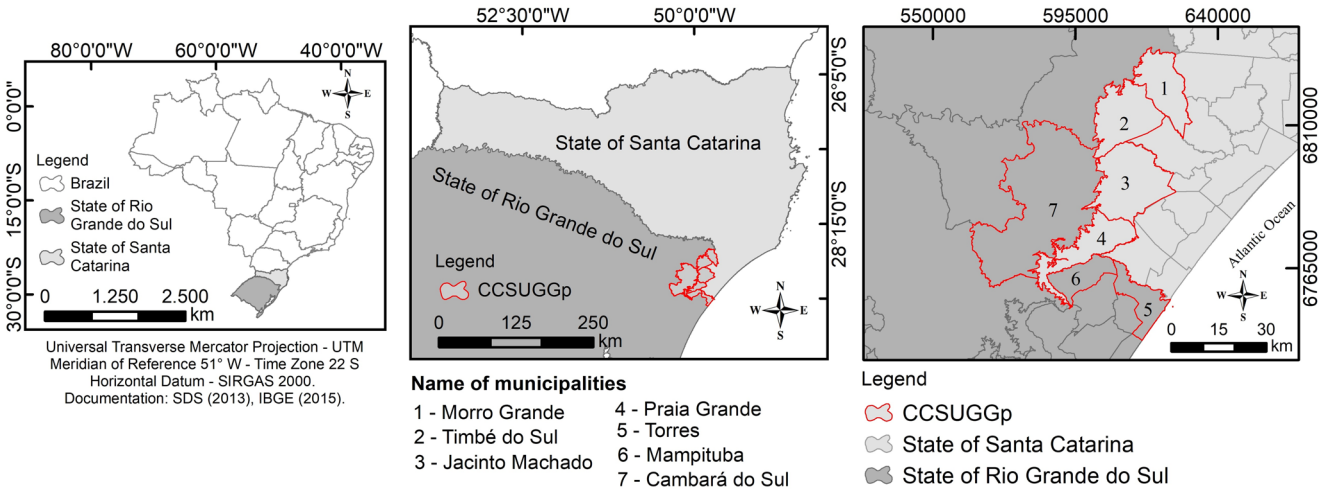

Fig. 1 Geographical location of CCSUGGp. Source: Author, 2025

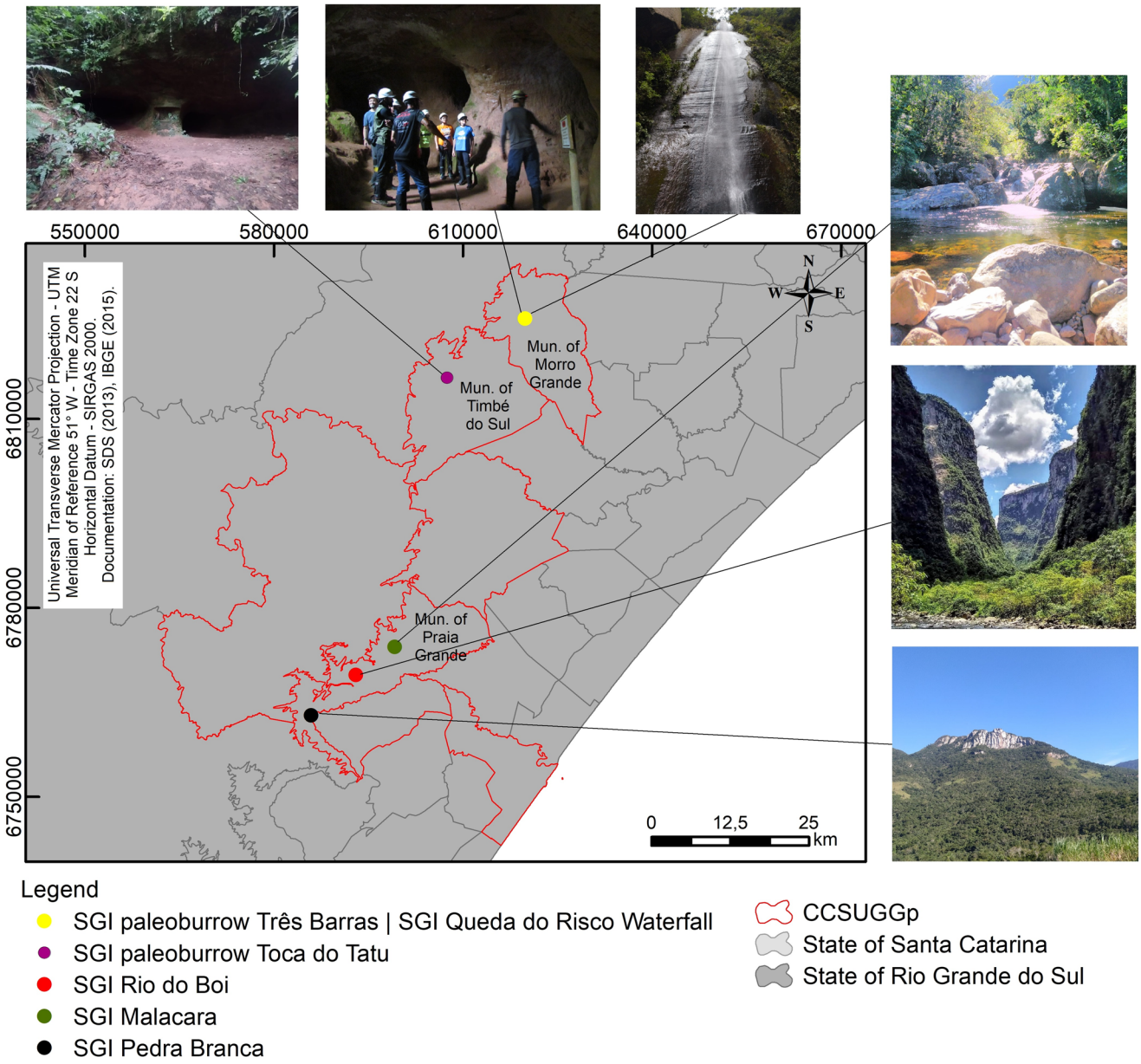

Fig. 2 Interview locations at CCSUGGp. Source: Author, 2025

In this specific investigation, the researchers were on-site at the locations of the study. Every group of individuals either arriving or leaving the attraction was encouraged to take part by filling out a questionnaire.

The questionnaires were administered in situ, with each participant being approached individually or in small groups immediately upon completing their tourist activity. Participants were informed that the survey was part of a non-profit academic research project, and completion took an average of 25 min per participant.

As emphasized by Gil (2026), the data collection method utilized self-administered questionnaires, as respondents completed them autonomously and independently following an initial brief orientation by the research team regarding completion procedures.

Data collection was predominantly concentrated during the summer months to capture peak visitor flows across the SGI. However, long holiday weekends and major regional festival events were deliberately avoided. This methodological strategy aimed specifically to sample 'spontaneous/occasional' tourists attracted by the territory itself, rather than visitors driven by short-term seasonal events.

Participants who consented to provide their responses formed the sample for this research, contingent upon their completion of the questionnaire in its entirety.

Consequently, data were gathered utilizing a 5-point Likert scale. The inquiries are organized in matrix formats, where the response options are as follows: 1 - strongly disagree; 2 - disagree; 3 - neutral; 4 - agree; 5 - strongly agree; IDWA=I don't know/I don't want to. The questions presented in this second phase of the questionnaire draw upon the research conducted by Vasiljević et al. (2018), Amaro et al. (2023), and Marjanović et al. (2023).

The participants were engaged on-site. The interviews took place from May 2024 to February 2025, encompassing a total of 83 participants across six SGI, averaging 14 interviews per SGI. This research received approval from the Ethics Committee of the University of Southern Santa Catarina, under CAAE 6.736.500.

A particular form of interview was utilized, characterized by both qualitative and quantitative elements, organized into two distinct stage (refer to appendix A):

The survey instrument was structured into two distinct stages integrated within a single questionnaire. The first stage gathered the socioeconomic and demographic profile of the participants, capturing variables such as age, gender, educational attainment, and income. The second stage comprised a battery of items designed to identify and evaluate the participants' travel motivations, evaluated using a Likert-type scale. Although organized into two structural stages for analytical purposes, the questionnaire was administered in its entirety during a single sitting, immediately following the participants' completion of their tourist activity.

Stage I - The first stage aims to delineate the socioeconomic profile of the visitor by analyzing data points such as: i) age category, ii) gender, iii) educational attainment (schooling), iv) income bracket, and v) ethnicity or race. The inquiries in this phase are derived from a Brazilian tool known as the 'Household Sample Questionnaire' from IBGE (2022b).

Stage II - The third phase emphasizes the primary aim of the research: to categorize and classify visitors and tourists in relation to geotourism. The research tool was structured into three parts containing 32 questions designed to explore the key characteristics: (i) Motivations for the visit; (ii) Visitor/tourist classification based on the geological and natural features of the site; and (iii) Behavioral patterns.

The data collected from responses were analyzed utilizing the Statistical Package for the Social Sciences (SPSS) software. In this phase, a Factor Analysis (FA) employing a varimax rotation method was performed to classify and assess the possible dimensions of the respondents' attitudes towards their motivation to visit SGI. The extraction technique applied was Principal Component Analysis (PCA). To ensure the adequacy of the sample, the Kaiser-Meyer-Olkin test yielded a value of 0.744. Additionally, Bartlett's test of sphericity was conducted to evaluate the interdependence among the variables, resulting in a Chi-square value of 1352.391 (df=496 and $p=0.000$).

The results of these tests suggest that the covariance matrix is suitable for performing the factor analysis (FA). A total of eight factors were identified (Table 1) that account for 70.65% of the variance in the construct, based on eigenvalues exceeding 1.

As proposed by Aldenderfer and Blashfield (1984), the algorithm developed was employed to categorize respondents into distinct groups that do not overlap, utilizing the PCA extraction technique along with varimax rotation and Kaiser normalization. The determination of the number of groups was influenced by the clarity of interpretation and the quantity of cases present in each cluster.

Results and Discussion

Socioeconomic Profile of Respondents

The findings discussed in this initial section pertain to five socioeconomic factors: (i) age category, (ii) gender, (iii) educational attainment, (iv) income bracket, and (v) ethnicity or race. The results are illustrated in Table 2 below.

Regarding the age of the interviewees, most of the sample was between 30 and 39 years old (28.92%) and 40 and 49 years old (27.71%). This finding suggests that the visiting public at the CCSUGGp is predominantly middle-aged.

In a similar vein, Amaro et al. (2023) carried out research at UGGp Arouca in Portugal, where 64% of the participants were between the ages of 40 and 50, thereby underscoring the prevalence of this demographic in geotourism regions. The predominance of visitors within middle-aged categories indicates a population that possesses enhanced economic stability and the capacity to engage in cultural and environmental pursuits, including geotourism.

Concerning the gender distribution of the interview participants, a certain equilibrium is observed in the findings; nevertheless, it is evident that women made up the majority, representing 56.63% of the interviewees, while men accounted for 42.17% of the sample. Similar results are documented in the studies by Vasiljević et al. (2018), Amaro et al. (2023), and Marjanović et al. (2023), all of which likewise emphasize a greater percentage of women among the SGI visitors who participated in the interviews. The dominance of women could suggest an increasing female engagement in cultural and environmental tourism pursuits (Zhang et al. 2024).

Table 1 Total sample variance

Component	Initial eigenvalues			Extraction sums of squared loadings			Rolling sums of squared loadings		
	Total	% variance	% cumulative	Total	% de variance	% cumulative	Total	% variance	% cumulative
1	8,879	27,745	27,745	8,879	27,745	27,745	6,103	19,072	19,072
2	3,243	10,135	37,880	3,243	10,135	37,880	4,326	13,519	32,591
3	2,757	8,615	46,495	2,757	8,615	46,495	2,785	8,703	41,294
4	2,046	6,395	52,890	2,046	6,395	52,890	2,093	6,540	47,834
5	1,778	5,557	58,447	1,778	5,557	58,447	2,077	6,491	54,325
6	1,493	4,665	63,112	1,493	4,665	63,112	1,749	5,465	59,789
7	1,285	4,016	67,129	1,285	4,016	67,129	1,739	5,433	65,223
8	1,126	3,520	70,648	1,126	3,520	70,648	1,736	5,425	70,648
9	,983	3,071	73,720						
10	,940	2,936	76,656						
11	,860	2,686	79,342						
12	,773	2,415	81,757						
13	,721	2,254	84,010						
14	,612	1,913	85,923						
15	,580	1,813	87,736						
16	,550	1,718	89,454						
17	,456	1,426	90,880						
18	,417	1,302	92,182						
19	,335	1,047	93,229						
20	,307	,958	94,187						
21	,272	,851	95,037						
22	,246	,770	95,807						
23	,218	,680	96,487						
24	,191	,597	97,085						
25	,179	,561	97,645						
26	,161	,502	98,147						
27	,144	,449	98,596						
28	,119	,372	98,968						
29	,106	,330	99,299						
30	,093	,289	99,588						
31	,072	,225	99,813						
32	,060	,187	100,000						

Source: The Authors (2025)

Regarding education, the findings reveal that the majority of respondents possessed higher education credentials, accounting for 62.65% of the sample. This group encompasses individuals with undergraduate degrees, lato sensu (specialization), and stricto sensu (master's and doctoral) qualifications. Conversely, respondents with primary and secondary education, whether complete or incomplete, represented 36.14%.

Concerning this matter, individuals surveyed who possessed a postgraduate degree were inquired about the relevance of their degree to the domain of geosciences. The outcomes suggest a significant interest in natural attractions, which will be examined further below. Nevertheless, the results demonstrate that none of the respondents holding postgraduate degrees were connected to the field of geosciences. This pattern is consistently noted in studies that concentrate on the particular characteristics of geotourists, whether in UGGps (Fung and Jim 2015; Amaro et al. 2023).

Concerning the distribution of income among the respondents, the data indicate that the largest segment consists of individuals earning between three and five minimum wages, accounting for 41.51% of the sample. Additionally, the findings show that 19.28% of participants report incomes between six and ten minimum wages, while 9.64% are situated within the income bracket of ten to seventeen minimum wages. This information implies that individuals engaged in SGI and tourism within the CCSUGGp region predominantly belong to socioeconomic classes C and B. The comparatively elevated prices of tourism offerings suggest that these services are more easily accessible to individuals belonging to the affluent classes.

Concerning race or ethnicity, the findings reveal that 81.93% of participants identify as white, whereas 15.66% identify as black or of mixed race. These outcomes may be associated with the observation that the Southern region

Table 2 Socioeconomic profile of CCSUGGp geotourists

Socioeconomic characteristics	f	*p*%
Age category		
Under 19 years old	-	-
19 to 24	6	7.23
20 to 29	8	9.64
30 to 39	24	28.92
40 to 49	23	27.71
50 to 59	16	19.28
60 to 69	3	3.61
70 years or older	2	2.41
IDWA	1	1.20
Gender		
M	35	42.17
F	47	56.63
Other	-	
IDWA	1	1.20
Educational attainment		
Elementary Education	4	4.82
Incomplete high school	5	6.02
Complete high school	15	18.07
Incomplete higher education	6	7.23
Completed higher education	25	30.12
Postgraduate studies	14	16.87
Specialization	6	7.23
Master's degree	5	6.02
Ph.D	2	2.41
IDWA	1	1.20
Income bracket		
Less than 1 MW	1	1.20
Up to 1 MW	2	2.41
From 1 to 2 MW	11	13.25
From 3 to 5 MW	33	39.76
From 6 to 10 MW	16	19.28
From 10 to 17 MW	8	9.64
IDWA	12	14.46
Ethnicity or race		
White	68	81.93
Black	2	2.41
Brown (mixed race)	11	13.25
Yellow (Asian descendants)	-	-
Indigenous	-	-
IDWA	2	2.41

Source: Authors, 2025. MW = minimum wage (minimum income defined by the Brazilian government, at the time of the interviews at R$1.320,00 (ca. US$ 266.00)

f frequency, *p* proportion, *IDWA* I don't know/I don't want to answer

is especially distinguished by its significant proportion of white individuals, which stands at 72.6%, in stark contrast to just 5% for black individuals and 21.7% for those of mixed race (IBGE 2022c).

In conclusion, the socioeconomic characteristics of the CCSUGGp visitor can be summarized as follows: female, middle-aged, Caucasian, belonging to the middle class, and possessing a completed higher education (Fig. 3).

Respondents' Travel Profile

The findings presented in the following section pertain to ten unique variables: *i*) place of origin, *ii*) type of accommodation, *iii*) duration of stay in the city, *iv*) category of accommodation utilized, *v*) travel motivation, *vi*) factors influencing the decision-making process, *vii*) travel group composition, *viii*) mode of transportation, *ix*) average spending within the area, and *x*) attractions that most captivated the visitors (Table 3).

An examination of the geographic backgrounds of the interview participants indicates that a substantial majority, precisely 95.18%, are from the two states that accommodate the CCSUGGp (Rio Grande do Sul and Santa Catarina). In contrast, 4.82% hail from other adjacent states within the Brazilian federation (São Paulo, Paraná, and Minas Gerais), with no respondents from more remote areas (Central-West, Northeast, and North). A diverse array of cities was noted among the participants, particularly highlighting visitors from the Porto Alegre metropolitan area. In total, 26 distinct municipalities were recognized as contributing visitors (excluding those within the geopark territory) (Fig. 4). Consequently, every participant in this research identified themselves as domestic tourists.

Concerning accommodation, it was noted that most respondents resided within the area (56.6%), thereby identifying themselves as day-trippers. The findings indicate a preference for stays lasting two nights (38.55%).

Regarding accommodation preferences, the majority of participants selected inns (24.71%) and chalets (15.59%), which collectively represented approximately 40% of the total responses. This indicates a growing popularity of inns and chalets in the area. Lins and Rocha (2018) note a significant rise in both the supply and demand for accommodations in the Praia Grande area. The authors highlight the relationship between the growth of these establishments and the surge in tourist traffic, particularly emphasizing the role of local geological features (e.g., canyons as the primary draw for visitors). Additionally, various forms of accommodation were referenced, including Airbnb or similar hosting applications (9.41%), camping (3.53%), hotels (1.18%), and staying with friends or relatives (1.18%).

The primary motivations identified were nature tourism (42.31%) and adventure tourism (21.54%), with vacations, leisure, and recreation following at 17.69%. The results suggest a notable correlation between nature tourism and adventure tourism as the leading motivations, exhibiting a directly proportional relationship between adventure tourism and vacations, leisure, and recreation. Additional motivations were recognized, including scientific/educational (6.15%), which was associated with the geoscience motivation (knowledge of certain SGI) (6.15%).

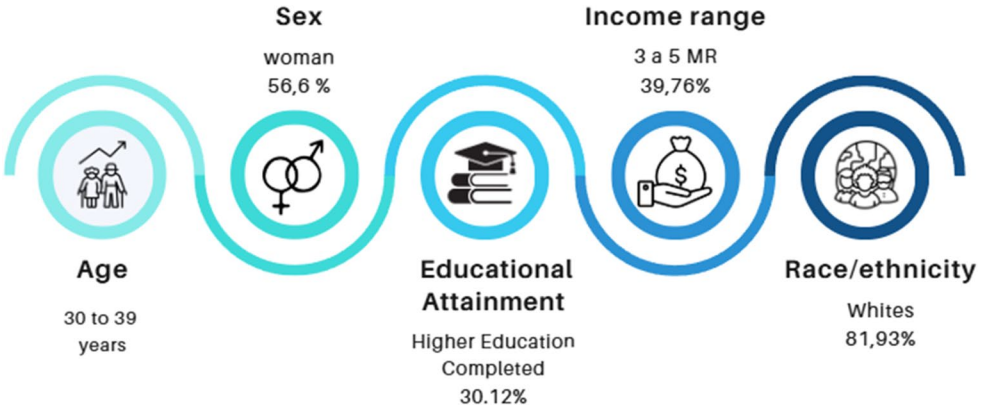

Fig. 3 Summary of the socio-economic profile.Source: Author (2024)

It is crucial to recognize that a significant portion (74.69%) of participants indicated that they were visiting the area for the first time. This information underscores the region's capacity to draw in new tourists. Correspondingly, 25.30% of participants reported having visited the area on multiple occasions. These results imply that, alongside attracting first-time visitors, the CCSUGGp demonstrates a remarkable rate of return, thereby indicating a level of loyalty to the destination.

In the analysis of the elements that notably affect tourists' choices regarding destination selection, social media platforms were identified as the most impactful, with Instagram cited most often at 43.61%. Following this were Facebook at 7.44%, YouTube at 3.19%, and blogs at 2.12%. Important to notice that when referring to social networks, it does not mean the specific profiles of the geopark.

In contemporary times, social networks have emerged as essential mediums for engagement within today's society, enabling connections among individuals while also serving as platforms that bolster product promotion. These networks have transformed into crucial instruments for amplifying and reinforcing the visibility of diverse locations (Liu et al. 2019).

As a result, the prominence of a tourist destination is intricately linked to the communication strategies utilized, which play a crucial role in influencing tourists' perceptions of the destinations they contemplate visiting (Amaro et al. 2016; Barbosa and Feger 2020).

In terms of grouping, friend groups constituted the most significant category at 43.37%. This particular form of grouping was highlighted in the research conducted by Mustafa et al. (2021), which examined the profiles of tourists in Langkawi UGGp and Jeju UGGp, revealing that friends were recognized as the predominant travel companions by the participants. The family group, accounting for 39.76%, represented the second largest category, succeeded by tour groups (6.02%), coworkers (6.02%), and solo travelers (6.02%).

Regarding the transportation methods employed to arrive at the destination, the primary mode is road transport, utilizing vehicles (either private cars or motorcycles), which constitutes 91.57% of the total. In contrast, rental vehicles (including cars and motorcycles) account for 7.23%. No additional transportation modes were referenced; however, related research indicates that alternative modes, such as bicycles, are frequently utilized for visits to natural areas (Senese et al. 2023).

Concerning the typical expenditures of each participant, the findings indicate that the average expenses amounted to. US$ 235,00, exhibiting a significant range from US$ 14,00, to US$ 920,00. Participants noted that the majority of their main costs were linked to lodging, meals, and entry fees for attractions and related services. In total, the expenses documented during the interviews for an average two-day stay in the region reached around US$ 16,000.00.

The findings indicate that the average expenditures are primarily reflective of the spending habits of two individuals (45.61%), illustrating that visitors typically travel as couples. This information aligns with a survey carried out by the Booking platform, which reveals that 47% of Brazilians plan to embark on at least one leisure trip in 2025 with a partner (Booking 2025). Additionally, another opinion poll conducted by MaxMilhas and Opinionbox in 2022 reported a 33% rise in travel interest among couples following the pandemic (Max Blog 2022).

In discussing the subject of attractions, participants in the interview were prompted to specify the attraction that piqued their interest the most during their visit. This inquiry was open-ended, enabling respondents to refer to any attractions they deemed pertinent. The responses were recorded with utmost accuracy and subsequently classified according to shared characteristics.

The analysis indicated that trails overall (16.48%) and Paleotocas (16.48%) were the most frequently cited attractions. In terms of specific trails, the following are particularly notable: Rio do Boi (4.40%), Malacara

Table 3 Travel profile of CCSUGGp visitors

Tourist profile questions		
Place of origin		
a	f	*p*%
State of Santa Catarina	48	57.83
State of Rio Grande do Sul	31	37.35
State of São Paulo	2	2.41
State of Paraná	1	1.20
State of Minas Gerais	1	1.20
You stayed in the place you traveled to?		
a	**f**	**p%**
Yes	47	56.62
No	36	43.37
What is the total number of nights spent in the city?		
a	**f**	**p%**
2	32	38.55
1	7	8.43
4	1	1.20
NS/NR	7	8.43
Category of accommodation utilized		
a	**f**	**p%**
I didn't stay	36	42.35
Lodge	21	24.71
Chalets	13	15.29
Aibnb or other accommodation apps	8	9.41
Camping	3	3.53
Friends/relatives' house	1	1.18
Hotel	1	1.18
NS/NR	2	2.35
Travel motivation		
a	**f**	**p%**
Nature Tourism	55	42.31
Adventure Tourism	28	21.54
Holidays, Leisure and Recreation	23	17.69
Scientific/educational	8	6.15
Geology (know some of the SGI)	8	6.15
Culture	4	3.08
Business	2	1.54
Others: Tour	1	0.77
Others: Balloon flights	1	0.77
Site(s) that most influenced your purchase		
a	**f**	**p%**
Instagram profiles	41	43.61
Facebook profiles	7	7.44
Airbnb	6	6.38
Booking	3	3.19
Youtube channels	2	2.12
Blogs	2	2.12
Hurb	1	1.06
Tripadvisor	1	1.06
Others: Friends	2	2.12
IDWA	29	30.85
Travel group composition		
a	**f**	**p%**
Friends	35	43.37
Family group	33	39.76
Alone	5	6.02

Table 3 (continued)

Tourist profile questions		
Excursion	5	6.02
Work	5	6.02
IDWA	1	1.20
Mode of transportation		
a	**f**	**p%**
Own car	76	91.57
Rent car	6	7.23
IDWA	1	1.20
Attractions that most captivated the visitors		
a	**f**	**p%**
Trails (in general)	15	16.48
Paleotocas (Paleoburrows)	15	16.48
Balloon flight	13	14.29
Waterfalls	9	9.89
Canyons	6	6.59
Nature	5	5.49
All attractions	5	5.49
Boi River Trail	4	4.40
Pedra Branca Trail	3	4.40
Malacara Trail	2	3.30
Landscape	2	3.30
River between the mountains	2	3.30
Balonismo (event)	2	3.30
Adventure	1	1.10
Canyons and nature	1	1.10
Trail in the canyons	1	1.10
Geopark (in general)	1	1.10

Source: Authors, 2024. *a* answer, *f* frequency, *p* proportion, *IDWA* I don't want to answer

(2.20%), and Pedra Branca (3.30%). The balloon ride/flight emerged as the third most frequently mentioned attraction by visitors, representing 14.29% of the responses. Additional attractions were also referenced, including waterfalls (9.89%), canyons (6.59%), and nature in general (5.49%). It is crucial to highlight that while the canyons serve as the primary postcard image and lend their name to the UGGp and the tourist region (Caminhos dos Cânions/canyon paths), they were not the most frequently mentioned attraction, indicating that other sites are currently capturing the interest of visitors.

Segmentation of the Geotourism Profile of the Interviewees

Utilizing the factor analysis of the gathered data, eight unique profiles of geotourists frequenting CCSUGGp were identified. Each profile illustrates varying motivations, behaviors, and preferences, thereby providing a comprehensive perspective on the tourism dynamics within the region.

Factor Analysis was conducted on the 32 motivational items, uncovering 8 interrelated factors, which were designated as (i) nature/geodiversity contemplative geotourists, (ii) sharing and learning geotourists, (iii) nature exploring geotourists, (iv) adventurous geotourists, (v) independent geotourists, (vi) planning geotourists, (vii) runaway geotourists, and (viii) casual geotourists. The nomenclatures employed are derived from earlier research conducted by Fung and Jim (2015), Timčák et al. (2014), Hurtado et al. (2014), Tessema et al. (2022), Vasiljević et al. (2018), Amaro et al. (2023), and Marjanović et al. (2023). An examination of Table 4 indicates that the interactions among the responses are categorized into three primary groups, where a more significant interaction is noted, alongside five smaller groups. The values presented in Table 4 correspond to the rotated factor loadings obtained through the varimax rotation procedure. These coefficients represent the strength and direction of the relationship between each observed variable (survey item) and the extracted components (factors).

In this study, the interpretation of factors was primarily based on the highest loadings observed for each variable, allowing the identification of coherent groups of items that reflect underlying motivational dimensions.

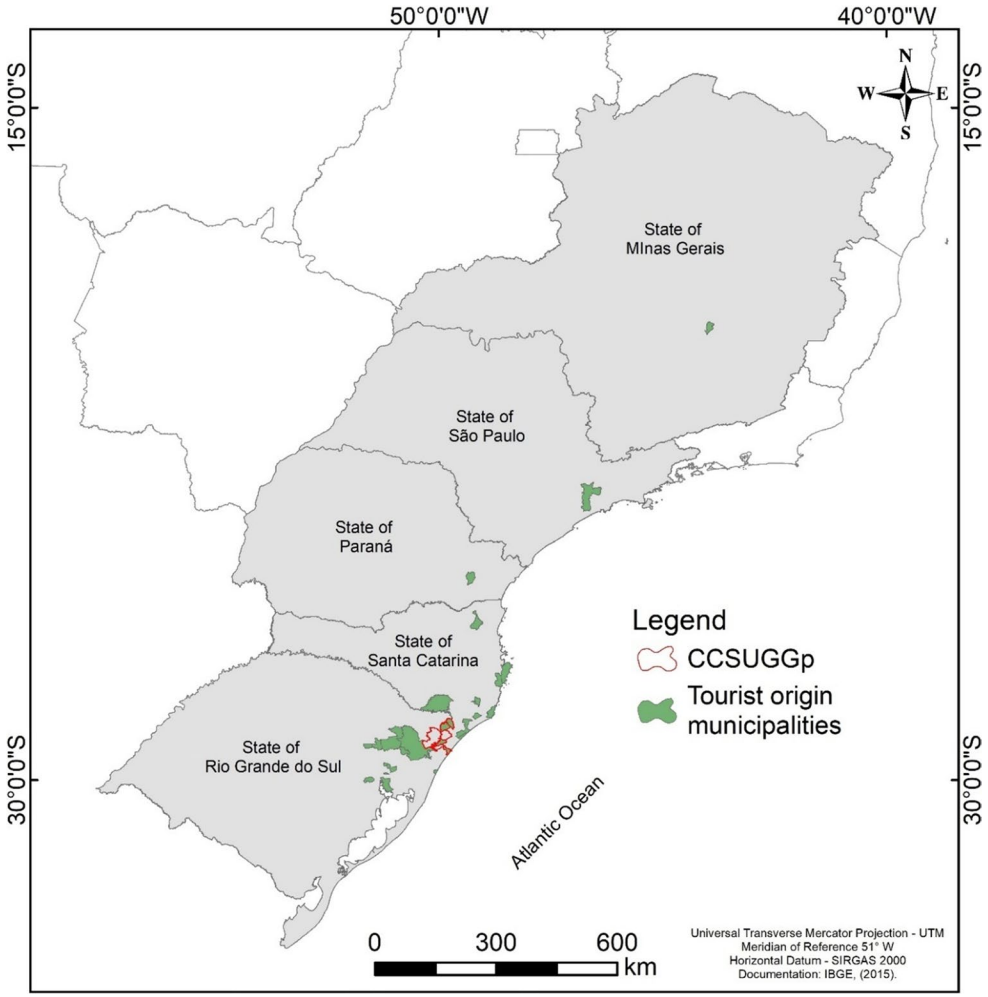

Fig. 4 Distribution of visitor-sending municipalities. Source: Author, 2025

Analysis of CCSUGGp Geotourist Groups

Thus, all groups segmented here are classified as geotourists, and additional nomenclatures are given according to their motivational characteristics (Table 5).

Segmented Groups

In order to enhance the understanding of the identified segments and to offer a more comprehensive overview of their unique features, a synthesis table has been provided (Table 6). This table encapsulates the fundamental motivations, essential behavioral characteristics, and the connection of each group to geotourism, while also integrating the degree of awareness regarding geotourism. This extra dimension facilitates a deeper comprehension of the diversity among visitors, recognizing that not every individual is chiefly driven by geotourism or is familiar with the concept of geoparks. Instead, the segments reflect varying degrees of intentionality and engagement with geoheritage, ranging from highly conscious geotourists to those whose interaction with geodiversity is largely incidental.

Group 1 demonstrates a significant correlation with the variables "visitors focused on nature/local geology" and their "travel behaviors," solely categorizing the responses pertaining to these two variables. This indicates a direct connection with the travel profile outlined in the questionnaire, where 42.31% of participants indicated that their primary motivation for visiting the area is the pursuit of nature tourism.

This group exhibits a profound connection to natural environments and places significant importance on geodiversity, particularly in situ geodiversity. These tourists are driven by the aesthetic appreciation of landscapes and the pursuit of experiences within nature. Allan and Shavanddasht (2017) discovered comparable traits within this group during their segmentation study. The authors recognized a category they refer to as "geological attraction" seekers.

Upon examining the interactions among the responses, it becomes evident that opting for a natural destination, as opposed to urban ones, is the most significant factor within

Table 4 Rotational component matrix of CCSUGGp visitors

Question number	Component							
	1	2	3	4	5	6	7	8
18	,825	,263	-,065	,106	,064	,091	,042	-,015
26	,816	,228	-,012	,062	,054	-,106	,038	-,137
17	,798	,311	-,051	,116	,100	,016	-,031	-,012
20	,776	-,089	,312	-,091	,055	,135	,140	,079
19	,766	-,100	,283	-,072	-,069	,183	,108	,221
24	,727	,277	,062	-,080	-,159	-,248	,262	-,044
25	,700	,130	,155	-,036	,280	-,175	,157	,225
22	,643	,282	,071	,087	,316	,229	,061	,051
21	,600	,301	,063	,284	,052	,200	-,065	-,072
4	,093	,856	-,032	,021	-,054	-,099	,135	,045
6	,233	,837	,121	-,002	,103	,118	-,098	,156
3	,161	,810	-,009	,091	-,087	-,092	,123	,056
7	,377	,739	,155	,008	,083	,173	,003	,007
5	,068	,715	,062	,319	,049	-,226	-,128	,036
11	,182	,507	,254	,154	,097	,178	-,106	,297
10	,223	,111	,775	-,121	,121	,243	,256	,080
16	,016	,150	,764	,259	,027	-,117	-,039	,086
13	,106	-,018	,719	,422	,013	-,049	,062	,134
9	,284	,357	,470	-,102	,264	,413	-,006	-,128
15	,076	,163	,420	,350	,404	,220	-,381	,022
14	-,073	,076	,227	,749	-,204	,115	,134	,121
12	,067	,213	,077	,634	,157	,006	,022	,034
27	,554	-,025	,093	,595	-,030	,006	,080	-,035
31	,153	-,040	,013	,008	,811	,047	,136	,146
32	,063	,025	,109	-,028	,713	-,192	-,080	-,061
8	,176	,112	,129	,181	,019	,694	,066	-,043
23	,118	,268	,083	,077	,262	-,663	-,003	,013
2	,319	,035	,131	,114	,046	,027	,788	,047
1	,445	-,108	,355	,162	-,089	,225	,549	-,033
28	,157	,147	,222	,113	-,258	,031	-,224	,798
30	-,066	,136	,109	,002	,289	-,162	,256	,698
29	-,059	,208	-,227	,142	,308	,034	,472	,512

this initial group. Additionally, a crucial aspect of interaction identified in this first group is the influence of geodiversity on the visitor's decision-making process; this aspect is further emphasized in the findings of Fung and Jim (2015).

This particular group often garners the most attention. The findings documented in the tourism segmentation literature typically indicate a larger cohort of individuals who have an interest in nature, and they are referred to by various designations. For instance, Gorman (2007) refers to them as "interested" geotourists, whereas Hose (2007) labels them as "dedicated". Fung and Jim (2015) describe them as "escapists in search of nature", while research conducted by Vasiljević et al. (2018) identifies them as "nature-based travelers", characterizing them as a demographic that values nature and considers it a crucial element in their travel decisions. A significant aspect to emphasize within this group is the inherent connection between enhanced interaction with nature and a heightened appreciation for it, as observed by Aquino et al. (2017).

Group 2 encompasses geotourists who perceive their visit as a chance for cultural enrichment, appreciate the importance of learning about geodiversity, biodiversity, and local culture, and engage with individuals who share similar interests. They align with the characteristics of "convenience-oriented socializers" tourists (Fung and Jim 2015), with an inclination toward learning and interaction, reinforcing the role of UGGps as spaces for education and community integration.

A link can be established between this group and two segments of tourism that are already acknowledged in Brazil. The first is cultural tourism, defined as a form of tourist activity where the primary motivation of the visitor is to learn, explore, experience, and engage with both tangible and intangible cultural attractions or products at a tourist destination (Richards 2018). The second segment is study and exchange tourism, which refers to the movement of tourists driven by activities and programs focused on learning and experiential opportunities aimed at enhancing

Table 5 Description of segmented groups

Groups	Description	*N*°	Component
Nature/geodiversity contemplative geotourists			
	When traveling, I prefer to visit natural destinations rather than man-made destinations (cities, villages, cultural sites).	18	,825
	I prefer to visit nature in its original form rather than a modified natural tourist attraction.	26	,816
	When traveling, I prefer wild/untouched nature to an organized natural tourist destination.	17	,798
1	When traveling, I choose routes that pass through natural landscapes and stop at beautiful views.	20	,776
	When traveling, the beauty of a landscape and its geology are for me a basic component of a tourist experience.	19	,766
	I like to spend most of my time in nature during my travels.	24	,727
	Natural rarities and beauties are the basic components of the tourist experience on the trips I take part in.	25	,700
	When I look for a tourist destination, the geological and geomorphological diversity (e.g. rocks, mountains, rivers and other different features) affects my decision.	22	,643
	When traveling, in natural environments I try to learn about the local geology.	21	,600
Sharing and learning geotourists			
	Share knowledge with others	4	,856
	Develop knowledge and experience in geology and geoheritage	6	,837
2	Meet people with similar values/interests	3	,810
	Develop knowledge about biodiversity	7	,739
	To learn about new things/places/cultures	5	,715
	Participate in cultural activities	11	,507
Exploring nature geotourists			
	To engage in nature-based activities	10	,755
	To visit/explore new places	16	,764
3	To have fun	13	,719
	Visit a spectacular relief	9	,470
	Because it is an exotic place	15	,420
Adventure geotourists			
4	Participate in sports	14	,749
	To experience adrenaline	12	,634
	I enjoy practicing sports and recreational activities during my travels (hiking, trails, kayaking, caving, canyoning, rafting, cycling)	27	,595
Independent geotourists			
	I prefer to organize my trip independently, according to my own wishes and preferences, rather than having someone else do it (a travel agency or a third party)	31	,811
5	I prefer to travel in a group as small as possible, or individually, as I want to feel comfortable traveling in my own way and dynamically.	32	,713
Planning geotourists			
	To escape from everyday life	8	,694
6	Before traveling, I like to get detailed information about the destination I'm visiting (attractions, tours, how to get there, trip duration, pros and cons of the destination)	23	,-663
Runaway geotourists			
7	Relieve daily stress	2	,788
	To relax mentally	1	,549
Casual geotourists			
8	During the trip, as well as on the website, I prefer specialized guides as sources of information, rather than other sources (internet, information panels, brochures, maps).	28	,798
	I prefer to stick to existing tour itineraries and rarely create new ones on my own.	30	,698
	I'd rather spend my trip relaxing than learning something new.	29	,512

Source: Authors, 2025

qualifications and broadening knowledge (Brasil 2010). Thus, Grobbelaar et al. (2019) emphasize that activities and networking fulfill the social desires of the interviewees who wish to spend more time with individuals who share similar interests, whether socially or in terms of activities.

Comparable findings are reported in the research conducted by Marjanovic et al. (2023), which indicates that "socialization" ranks as the second most frequently noted factor in their study. The authors connect this to individuals' pursuit of opportunities to engage with new people and cultures,

Table 6 Summary table of identified groups

Group	Segment name	Core motivations	Key behavioral traits	Relationship with geotourism	Level of geotourism awareness
1	Nature/geodiversity contemplative geotourists	Appreciation of landscapes, geodiversity, and natural environments	Preference for pristine nature, scenic routes, and passive enjoyment of landscapes	Strong and direct; geodiversity is central to the experience	High
2	Sharing and learning geotourists	Knowledge acquisition, cultural exchange, and social interaction	Engagement in learning activities, interest in geo/biodiversity, interaction with like-minded individuals	Strong; aligned with educational and interpretive geotourism	High
3	Exploring nature geotourists	Curiosity, discovery of new places, and experiential travel	Active exploration, interest in exotic environments, search for novelty	Moderate to strong; geotourism combined with experiential/ecotourism	Medium
4	Adventure geotourists	Adrenaline, sports, and outdoor challenges	Participation in adventure and extreme activities (e.g., hiking, canyoning, rafting)	Indirect; geodiversity acts as a setting rather than a primary motivation	Low to medium
5	Independent geotourists	Autonomy and flexibility in travel planning	Self-organized trips, preference for small groups or solo travel	Variable; engagement depends on individual interests rather than geotourism itself	Low to medium
6	Planning geotourists	Organization, safety, and anticipation of the trip	Detailed pre-trip planning, information seeking, structured itineraries	Weak to moderate; geotourism not necessarily a central driver	Low
7	Runaway geotourists	Escape from routine, stress relief, and relaxation	Search for tranquility, mental rest, and disconnection from daily life	Indirect; natural settings valued more for well-being than geodiversity	Low
8	Casual geotourists	Leisure, relaxation, and convenience	Preference for predefined itineraries, low engagement with interpretation	Weak; incidental contact with geotourism elements	Very low

Source: Authors, 2025

in addition to forming new friendships. Similarly, Tomic and Marjanovic (2022) recognized a related group in their investigation of SGI in Serbia, emphasizing the quest for "acquiring new knowledge" as the primary motivator for visitors.

Group 3 consists of individuals who are driven by curiosity and an eagerness to uncover "new experiences," appreciating exotic and distinctive locations, and integrating geotourism with ecotourism and experiential tourism. Dowling (2011) emphasizes that this profile pursues immersive experiences that are deeply connected to distinctive landscapes. This cohort exhibits motivations akin to those of group 1, also reflecting a desire for interaction and a quest for natural settings. Nevertheless, group 3 places greater emphasis on the exploration of the natural environment, whereas the initial group is oriented towards contemplation.

This category can likewise be linked to what Hurtado et al. (2014) refer to as "intentional geotourists," or what Timčák et al. (2014) describe as "nature-seeking geotourists." These individuals exhibit a strong motivation to explore geodiversity, typically enjoy a favorable experience during their visit, and value the availability of fundamental information.

Group 4 consists of individuals who are drawn to adventure tourism, particularly engaging in nature sports or adventure/extreme sports that evoke emotions within natural settings. Amaro et al. (2023) emphasize a deficiency in the existing literature concerning the potential of UGGp for adventure tourism, particularly in areas like CCSUGGp. These tourists exhibit an allocentric profile, defined as adventurers who prioritize the exploration of novel locations and experiences.

Additionally, it is important to highlight that this group includes visitors who are driven by the desire for more extreme sports, including long-distance hiking, speleotourism, canyoning, and rafting. This particular motivation was also recognized by Timčák et al. (2014) and Amaro et al. (2023). This demographic is seldom addressed in the literature concerning visitor motivations in UGGps, despite the fact that numerous destinations provide activities tailored to this segment.

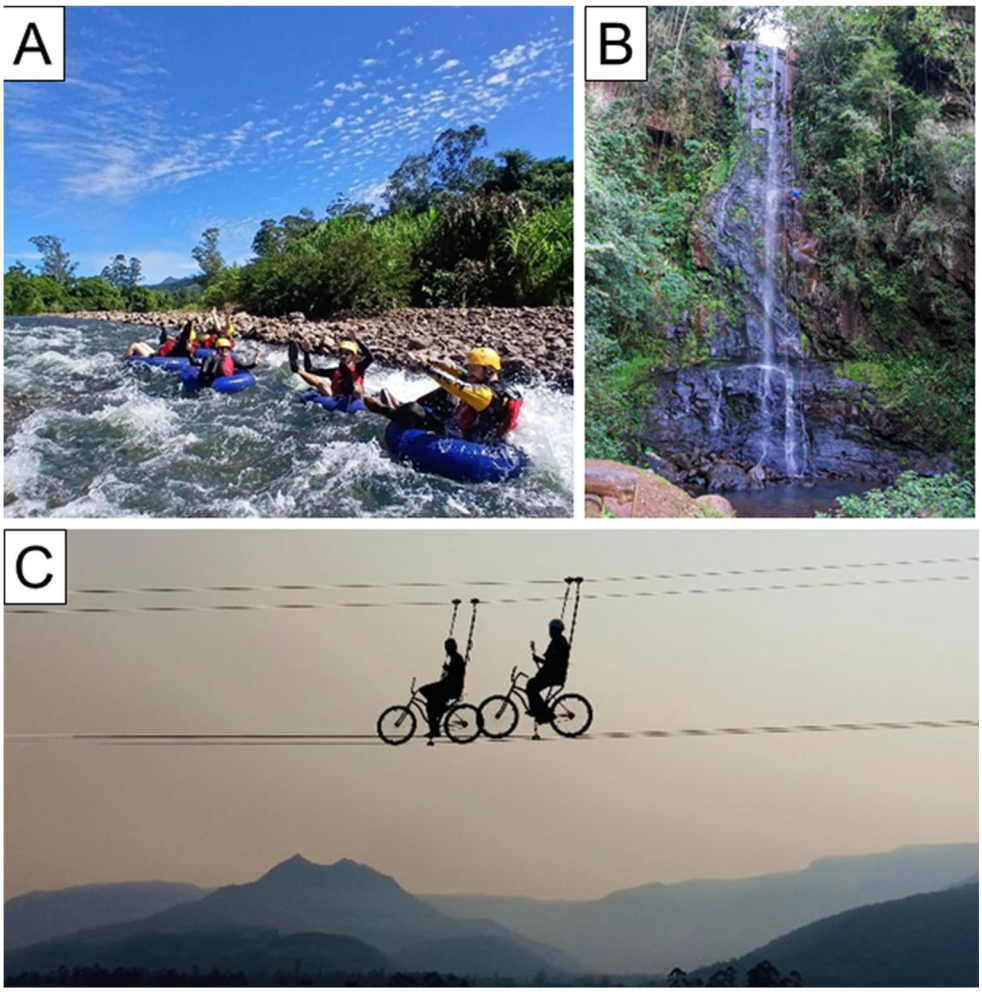

Fig. 5 Adventure Sports practiced in CCSUGGp. Legend. **A** Boia Cross in the municipality of Praia Grande. **B** Canyoning at Magia das Águas waterfall. **C** Sky Biking in the municipality of Mapituba. Source: Boraboicross, trips and trails and getting to know the Rio Grande. Source: Author, 2025

The CCSUGGp is particularly notable in this category of attractions, which encompasses nature-based activities that feature more immersive sports. For instance, activities conducted in the municipality of Praia Grande (Bazotti and Bressel 2022) include Bóia-cross[1] (Fig. 5-A) canyoning (Fig. 5-B), rafting and extensive trails like the SGI Rio do Boi (approximately 7 h of hiking), along with the Sky Bike (Fig. 5-C) available at the Ecoparque dos Canyons in Mampituba.

Group 5 consists of travelers who value independence, opting for self-organized journeys in small groups. This group aligns with the characteristics of "soft tourists" (Timčák et al. 2014), who steer clear of mass tourism and pursue tailored experiences, resembling what Plog's theory identifies as mesocentric visitors (Plog 1974, 2001).

The authors propose that this demographic values nature and its aesthetic qualities (such as picturesque landscapes), yet they do not gravitate towards outdoor pursuits. Instead, they prefer social engagements and the amenities offered in their surroundings (including wellness and health services).

Group 6 comprises individuals who prioritize safety, time management, and meticulous planning. Their motivations stem from a desire for escapism and psychological reassurance, alongside a propensity for thorough information gathering. The specific inclinations of this group regarding nature or geodiversity-related matters remain ambiguous.

This group may be connected to what Fung and Jim (2015) refer to as "passive visitors." The authors link this category to a diminished level of experiential, spiritual, and intellectual enrichment; it is probable that this group favors spending their time in different settings. Furthermore, it has been noted that this group pursues an escape from the routine of daily life, albeit without significant focus or intention during their travels.

Group 7 comprises individuals who primarily aim to alleviate daily stress and achieve mental relaxation, particularly in major urban areas. This demographic

[1] An activity conducted in an inflatable mini-boat, where an individual lies prone on the river, positioning their head at the front of the buoy and their feet at the rear, nearly submerged in the water. Commonly referred to as acqua-ride, this activity in the municipality of Praia Grande entails navigating the rapids of the Mampituba River using inner tubes derived from tractor or truck tires. This sport has been a part of the community's events in the municipality since 1984.

is frequently identified in research concerning tourist motivation (Almeida et al. 2014; Lim et al. 2016; Lee et al. 2020). They approach the profile of psychocentric traveling tourists (Plog 1974, 2001).

Lim et al. (2016) and Lee et al. (2020) highlight that one of the primary motivations for contemporary tourism is the desire to escape from daily life, thereby emphasizing the comprehensive value of UGGps and safeguarded natural environments. Engaging in tourism within these natural settings can provide advantages for human health (Holland et al. 2018) by promoting a reconnection with nature, which is frequently diminished in urban living, and aiding in the restoration of both physical and mental equilibrium.

This group aligns with the discussion presented by Zenker and Kock (2020). The authors contend that, in light of the reflections brought about by the COVID-19 pandemic, there is a likely reduction in the frequency of long-term trips, as numerous international tourist destinations will need to rebrand themselves to draw in visitors, particularly those with a more sensitive perspective. The authors suggest that this shift would result in an increase in visits to tourist locations nearer to the travelers' places of origin, thereby fostering a "reconnection with nature." In this context, the tourist profile indicates that all participants in this study are domestic tourists who engage in internal travel.

Comparable findings were reported by Marjanovic et al. (2023), who, in their classification of the motivational factors influencing geotourists, identified that the primary motivators for geotourists to travel to their chosen destinations are "health and relaxation".

Tomic and Marjanovic (2022) recognized a comparable profile, which they termed "rest and relaxation," ranking it as the third most significant factor influencing travel decisions. In the research conducted by Amaro et al. (2023), it was determined that the primary motivations for visitors to Arouca UGGp included escape, relaxation, and enjoyment.

Grobbelaar et al. (2019) delineate the "escapists" profile, which may exhibit a dual motivation: encompassing both intrinsic and extrinsic factors. Consequently, the visitor might primarily seek to escape the monotony and unwind as their intrinsic motivation, while the intention to attend a SGI could serve as a secondary, extrinsic motivation.

Fung and Jim (2015) link this profile in their research to individuals who exhibited the least interest in resource conservation and in exploring regional tourism offerings. Furthermore, Almeida et al. (2014) connect it to tourists who are keen on engaging in diverse activities, typically traveling alongside their families. Group 8 is defined by minimal proactive engagement, a preference for pre-arranged itineraries, and reliance on conventional information sources. This characterization has also been noted by Kim et al. (2008), Allan and Shavanddasht (2017), and Prendivoj (2018), and bears resemblance to Plog's allocentric (Plog 1974, 2001).

Prendivoj (2018) designates this group as "mass geotourists," who engage with geodiversity in a superficial manner through geotourism. While they find enjoyment in a SGI the underlying geodiversity is typically not the primary attraction for their visit.

Allan and Shavanddasht (2017) describe this group as "multipurpose seeker geotourists." Individuals within this category generally select destinations based on a variety of attractions, rather than being attracted to any particular feature. They pursue relaxation, prioritize privacy, and appreciate a tranquil, leisurely environment. Allan et al. (2015) refer to these individuals as "accidental geotourists," emphasizing that geotourism is not a major factor in their destination selection, and that such tourists may not even realize they are engaging with a SGI.

General Discussions

An integrated analysis of the empirical findings reveals significant synergy among the visitors' socioeconomic profiles, their spatial/logistical behavior, and their underlying motivational drivers. The high concentration of visitors holding or pursuing higher education degrees and possessing middle-to-high income levels directly correlates with autonomous travel arrangements. Specifically, personal vehicles (75.90%) and rental cars (13.25%) served as the dominant modes of transportation, providing the necessary mobility to navigate geographically dispersed SGI across the geopark territory. This same financial and educational background appears to explain the strong demand for formal lodging options (such as inns, hotels, and vacation rental cabins) as well as guided activities.

From a motivational perspective, the demographic predominance of adults aged 30 to 49 traveling in family units or small groups of friends strongly aligns with the emergence of Factor 2 ("Sharing and Learning Geotourists") and Factor 7 ("Runaway Geotourists"). For these segments, the geopark experience serves both as an educational platform for interpersonal exchange and as a decompression mechanism from urban routine and stress.

Furthermore, the high representation of intrastate and regional tourists, with 95.18% of respondents hailing from the states of Santa Catarina and Rio Grande do Sul, underscores the destination's territorial identity as a short-to-medium-haul market. This geographic proximity connects directly to the primary information channels used by visitors: Instagram (43.61%) and word-of-mouth recommendations from friends and family (36.10%). Social media platforms function as an immediate visual catalog of geomorphological attractions (such as canyons, waterfalls, and coastal dunes), while word-of-mouth reinforces trust within the regional network.

Ultimately, synthesizing these empirical data demonstrates that geotourists in this territory do not consume geoheritage in isolation. Instead, their motivations, whether driven by adventure tourism, landscape contemplation, or cultural heritage, are shaped by logistical accessibility, regional digital communication, and the pursuit of authentic experiences within a consolidating UNESCO territory.

Regarding the eight motivational factors, a deeper interpretation extends beyond mere empirical description to uncover the sociocultural significance of visitation within the CCSUGGp. When analyzed through the lens of existing literature, these factors reflect a continuous gradient of engagement with geoheritage. On one end of the spectrum lie profiles characterized by explicit cognitive engagement (such as "Sharing and Learning Geotourists"); on the other, segments predominate whose engagement with heritage occurs indirectly or is mediated by landscape aesthetics, family leisure, and urban stress relief (such as "Runaway Geotourists" and adventure-motivated visitors).

This motivational distribution appears to be a characteristic feature of newly established geoparks or territories undergoing spatial and institutional consolidation. In emerging territories such as CCSUGGp, initial tourist flows are primarily driven by the scenic appeal of major landforms and pre-existing regional nature tourism, prior to the widespread establishment of public awareness surrounding geodiversity and geoheritage concepts. Therefore, the prevalence of 'casual' or indirect motivations does not signal a deviation from the territory's geotourism vocation, but rather reflects the baseline stage of destination maturity.

In this scenario, heritage and environmental interpretation plays a vital strategic role. Visitors who arrive primarily seeking photography, leisure, or escape from urban routines represent a priority target audience for "geotourism conversion" strategies. Through high-quality interpretive panels, guided trails led by trained local geoguides, and educational infrastructure across SGIs, the geopark possesses the pedagogical potential to transform a purely recreational experience into cognitive and affective engagement with geoconservation. Thus, the proposed typology not only maps current visitor profiles, but also delineates strategic pathways for geopark management to develop interpretive products capable of elevating public engagement with Earth history.

Final Remarks

Segmenting geotourists enables a deeper comprehension of the varied profiles that visit a UGGp, aiding in the formulation of more efficient management, destination marketing, and environmental education initiatives. Additionally, it underscores the diverse motivations that propel geotourism, reinforcing the perception of UGGp as multifunctional and inclusive areas.

Consequently, as articulated in this study, a geotourist encompasses far more than merely a geological tourist. This individual is not simply someone with a pre-existing interest in geodiversity; rather, they are an individual who pursues enjoyment through tourism, gains insights into the geodiversity characteristics of the destination, and engages with the local community.

One of the most compelling findings of this study lies in the fact that motivations linked to nature-based tourism, outdoor recreation, and adventure top visitor preferences, whereas explicit and direct interest in geosciences or geology represents a minor fraction. This observation prompts a central reflection for the contemporary debate on the role and effectiveness of UGGp, to what extent does the designation drive tourist flows due to its underlying geological concepts, versus serving as an amplifier for pre-existing recreational dynamics?

In the context of the CCSUGGp, the answer is grounded in the territory's historical trajectory. Decades prior to its UNESCO designation in 2022, the region had already established itself nationally as an ecotourism and adventure hub, leveraged by the presence of National Parks and the grandeur of its canyons. Therefore, the UNESCO designation did not create tourist flows from scratch; rather, it intersected with an already consolidated nature destination. For the majority of visitors, the UNESCO seal operates as an endorsement of environmental quality and scenic beauty, rather than a summons to technical-scientific tourism.

Furthermore, it is essential to reinterpret the apparent scarcity of "direct geological interest". Lay audiences rarely engage with geology through academic jargon or the pursuit of abstract lithological processes; instead, geology is experienced and appreciated through landscapes and monumental landforms. When visitors hike at the bottom of a canyon, navigate its rivers, or contemplate plateau escarpments, they are actively consuming geological heritage, even if they perceive the activity under the labels of "adventure tourism" or "nature appreciation".

This finding aligns closely with the holistic vision advocated by UNESCO, in which geosciences are not treated in isolation, but integrated with the environment and society. From a territorial planning and marketing perspective, this outcome demonstrates that attempting to position the geopark exclusively as a destination for "pure geotourists" would be strategically inefficient.

The inclusion of the "level of geotourism awareness" dimension allows for a more nuanced interpretation of the identified segments. It acknowledges that not all visitors are primarily motivated by geotourism itself, nor are they necessarily aware of the geopark concept. Instead, different

groups engage with geodiversity at varying levels of intentionality, ranging from highly conscious geotourists to visitors whose interaction with geoheritage is largely incidental.

Consequently, this research aimed to analyze and categorize the visitor profiles of six CCSUGGp SGI according to their motivations for attending, which was successfully accomplished. Furthermore, we aimed to comprehend the socioeconomic and tourist profiles of the participants, along with their awareness of the destination they visited, based on three hypotheses. Additionally, we endeavored to explore how these tourists perceive various elements of their visit.

Consequently, the primary findings presented in this study are categorized according to the analyses conducted:

i) The socioeconomic characteristics of the participants in the interview are primarily female, within the age range of 30 to 49, predominantly white, belonging to the middle class, and possessing a college education. This demographic exhibits considerable purchasing power and the capacity to participate in mindful and sustainable tourism activities.
ii) The analysis of motivational factors uncovered eight unique geotourist profiles. These profiles illustrate the varied interests and expectations of visitors, indicating that geotourism at CCSUGGp is a complex activity that transcends a mere focus on geodiversity. Gaining insight into these profiles enables us to formulate targeted strategies for creating tourism products that better cater to diverse audiences.

It is crucial to emphasize certain challenges faced in the field. Firstly, the quantity of suitable responses was limited, as numerous interviewees expressed concerns regarding the length of the questionnaire employed, indicating they lacked sufficient time to complete it. For subsequent studies, it is evident that utilizing segmented questionnaires may enhance both adherence and the reliability of the responses obtained. We recommend that future research persist in monitoring through the suggested methodology, as the incorporation of technology can further support adherence to the required number of responses.

Although the analytical procedures and statistical tests confirm the suitability of the data for FA, certain limitations associated with the sampling design must be acknowledged. First, a non-probability convenience sampling approach was adopted, a common and accepted strategy in tourism fied research; however, this restricts the unrestricted statistical generalizability of the findings to the entire annual visitor population.

Second, the dimension of seasonality must be taken into account. Sampling was conducted predominantly during the summer period, focusing on the increased influx of visitors across the SGIs. To mitigate distortions caused by atypical motivations, questionnaire administration was intentionally avoided during long holiday weekends or specific festival events, aiming to capture tourists genuinely attracted by the territory's heritage and dynamics. Nevertheless, because visitor perception and behavior involve subjectivities linked to travel timing and weather conditions, motivational patterns may vary throughout the year.

Accordingly, future studies are recommended to adopt longitudinal approaches that cover visitor flows during the autumn and winter months (a period when canyon visibility conditions fluctuate), as well as to expand the sample size to investigate whether the 8-factor motivational structure remains stable under varying seasonal conditions.

Consequently, the findings derived from this study provide an extensive understanding of the sociodemographic, behavioral, and motivational traits of geotourists visiting the area, thereby offering significant insights for enhancing regional tourism management.

Accordingly, to mitigate overcrowding and unregulated use in areas with high scenic appeal, managers can leverage segmentation to establish "themed routes" tailored to the primary visitor segments. This approach allows for the spatial distribution of tourist flows and reduces pressure on specific sites. The segmentation conducted in this study clearly illustrates the diversity of visitor groups traversing the territory.

Furthermore, to enhance the visibility of the CCSUGGp, greater emphasis should be placed on social media channels, as they represent the primary information source influencing travel decision-making. Consequently, Geopark management should design targeted digital marketing campaigns aligned with each identified segment.

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Authors' contributions José Gustavo Santos da Silva: Writing – review & editing, Writing – original draft, Methodology, Investigation, Data curation, Conceptualization. Ricardo Eustáquio Fonseca Filho: Writing – review & editing, Visualization, Validation. Álvaro José Back: Project administration, Data curation, Conceptualization. Juliano Bitencourt Campos: Writing – original draft, Supervision, Project. Methodology. Administration. Emmaline M. Rosado-González: Writing – review & editing, Validation, Supervision. Artur Abreu Sá: Writing – review & editing, Validation, Supervision.

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Declarations

Ethical approval and informed consent statements The researchers state that this investigation includes human subjects and has been granted approval by the ethics committee of the Universidade do Extremo Sul Catarinense – UNESC, as evidenced by opinion number 6.736.500. Given that participation is voluntary and contingent upon the signing of a Consent Form, the anticipated risk is minimal. The confidentiality and anonymity of the participants will be safeguarded throughout the interview process. Furthermore, all individuals involved in the study must be at least 18 years of age and have provided their consent by signing the Free and Informed Consent Form (FICF), in accordance with the inclusion criteria set forth by the Research Ethics Committee of the Universidade do Extremo Sul Catarinense – UNESC.

Declaration of generative AI and AI-assisted technologies in the writing process During the preparation of this work the author(s) used Ahrefs Free AI Paragraph Rewriter (https://ahrefs.com/writing-tools/paragraph-rewriter) in order to enhance the document's readability in English, considering that English is not the authors' native language. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

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