

Sports Events in Protected Natural Areas of Catalonia: A Comparative Study (2015-2023)

Eventos Deportivos en Espacios Naturales Protegidos de Cataluña: Un Estudio Comparativo (2015-2023)

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Abstract

Taking as a case study the 17 protected natural areas (PNAs) integrated into Catalonia's Special Protection Natural Areas Network (ENPE), this study examines the trend changes recorded between 2015 and 2023 through the systematization and analysis of all sports events authorized by the management entities of these areas. The main findings include the identification of a global decrease in the number of authorized events, the persistence of the trend in organizing events during the spring season, as well as an increase in sports events linked to the trail running modality. A more detailed analysis of the types of events recorded reveals that, although the majority were organized by non-profit entities, there has been an increase in the presence of for-profit events held outside the federated circuit. The findings highlight the need to implement sustainable management strategies to minimize environmental impacts while maintaining recreational accessibility to the PNAs.

Keywords: Sport events, protected natural areas, Catalonia, sustainability, environmental protection.

Resumen

Tomando como caso de estudio el conjunto de los 17 espacios naturales protegidos (ENP) integrados en la red Espacios Naturales de Protección Especial (ENPE) de Catalunya, el presente estudio examina los cambios de tendencia registrados entre los años 2015 y 2023 mediante la sistematización y análisis de la totalidad de eventos deportivos autorizados por parte de las entidades gestoras de los diferentes espacios. Entre los principales resultados obtenidos destacan, la identificación de una disminución global del número de eventos autorizados, la persistencia de la tendencia en la organización de eventos durante la temporada de primavera, así como el incremento del número de eventos deportivos vinculados a la modalidad de trail running. Un análisis más detallado de la tipología de eventos registrados revela que, aunque la mayoría fueron organizados por entidades sin fines de lucro, ha aumentado la presencia de eventos con fines de lucro y al margen del circuito federativo. Los hallazgos subrayan la necesidad de implementar estrategias de gestión sostenible para minimizar los impactos ambientales, mientras se mantiene la accesibilidad recreativa de los ENP.

Palabras clave: Eventos deportivos, espacios naturales protegidos, Catalunya, sostenibilidad, protección ambiental.

Abbreviations and Acronyms

Acronym	Official name (Spanish)	English translation
PNA	-	Protected Natural Areas
ENPE	Espacios Naturales de Protección Especial	Special Protection Natural Areas
PEIN	Plan de Espacios de Interés Natural	Plan for Areas of Natural Interest
EIN	Espacios de Interés Natural	Areas of Natural Interest
EU	-	European Union
IOC	-	International Olympic Committee
UNEP	-	United Nations Environment Programme
IUCN	-	International Union for Conservation of Nature
CBD	-	Secretariat of the Convention on Biological Diversity
FEDME	Federación Española de Deportes de Montaña y Escalada	Spanish Federation of Mountain and Climbing Sports

Introduction

Tourism in protected natural areas (PNAs) has experienced remarkable growth internationally, becoming one of the fastest-expanding tourism segments over the past two decades (Mendigorrri & Mateos, 2018). Within this growth, physical-sport practices in these areas have gained particular relevance, supported by abundant evidence confirming the consolidation of PNAs as ideal destinations for such activities (Farías-Torbidoni et al., 2018). Catalonia has an extensive network of PNAs, highlighting the Special Protection Natural Areas (ENPEs), which cover 284,774 terrestrial hectares, positioning the region as an ideal place for the practice of physical-sport activities.

PNAs are essential for the conservation of the natural environment. In addition, they provide important social benefits by serving as areas for leisure and recreation. These spaces also play a crucial role in the development of local communities (Preez & Lee, 2016) and generate benefits related to human health and well-being (Saladié & Bustamante, 2022; Taczanowska et al., 2019). However, despite the exponential increase in the sports use of these areas due to their advantages, it has also generated impacts on the natural conditions of the environment (Inglés & Puig, 2016). Typical impacts include soil erosion and compaction (Ng et al., 2017), damage to vegetation, disturbance of wildlife, water pollution, vandalism, and excessive noise (Malchrowicz-Moško et al., 2019).

As sports activities in PNAs increase, new consumption trends also emerge, such as sports events (Farías-Torbidoni et al., 2018), which have been on the rise and are increasingly favored by organizers due to their scenic appeal (Malchrowicz-Moško et al., 2019). This increase has raised concerns about the authenticity and visual value of protected natural landscapes due to the intensive use that these areas may experience when attracting a large number of people (Newsome et al., 2011).

The growth of sports events poses significant challenges for the management of PNAs (Burgin & Hardiman, 2012). In this context, it is essential to oversee the organization of these events, considering their specific characteristics, in order to minimize the negative impacts that may result from them (Newsome, 2014). Moreover, it is imperative to find a balance between environmental conservation and the increase in recreational activities. If not achieved, there is a risk that these spaces may move towards greater commercialization, distancing themselves from the appreciation of nature (Newsome, 2014). According to Newsome and Hughes (2017), this shift could reduce the perception of these areas as essential tools for nature conservation among participants in sports events and practitioners of such activities.

Having updated data on the evolution and characteristics of sports events in PNAs can contribute to improving the management of available resources (Graefe et al., 2019) and influence the management policies of these areas. In this

context, the aim of this study is to analyze the main characteristics of the sports events held in 2023 in Catalonia's ENPE network (17 PNAs: 1 national park, 14 natural parks, and 2 natural parks of national interest) and to compare them with the data from the study by Farías-Torbidoni et al. (2017), in order to identify key changes and trends that may optimize the management and planning of these events.

Regulatory Framework and Management of the Special Protection Natural Areas in Catalonia

The protection and management of natural areas in Spain are regulated by a clearly defined legal framework, with Law 42/2007 on Natural Heritage and Biodiversity as the primary state regulation. Within this framework, autonomous communities such as Catalonia have specific regulations to manage their own protected areas. In this context, the ENPEs are governed by the Plan for Areas of Natural Interest (PEIN), established under Law 12/1985. This plan provides the necessary regulation for the protection and management of the Areas of Natural Interest (EINs), under which a total of 184 protected areas are included (Generalitat de Catalunya, 2024).

The ENPNs represent the highest level of protection under this legislation. They are managed by different governing and participatory bodies in each case and are classified into four geographical categories: high mountain, inland mountain, wetlands, and coastal-marine areas (Medina-Chavarría et al., 2022). Currently, Catalonia has 86 ENPEs, distributed into 1 national park, 14 natural parks, 64 nature reserves, and 7 natural parks of national interest.

In addition to regional regulations, the ENPEs are integrated into the Natura 2000 Network, which adds an additional level of protection by limiting the impact of human activities and ensuring the conservation of habitats and species of community interest (Ministerio para la Transición Ecológica y el Reto Demográfico, 2024).

Regarding recreational activities, the Plan for the Promotion of Nature Tourism in Catalonia's PNAs establishes that most of these areas have recreational and leisure zones (Medina-Chavarría et al., 2022), but it emphasizes that the conservation of ecosystem integrity must be a priority. The PEIN Law regulates such activities, adapting them to the specific characteristics of the natural environment, and is complemented by Law 7/2020 of the Catalonia Nature Agency, which promotes sustainable management and encourages the practice of outdoor sports in a way that respects the environment.

Despite these efforts at both the regional and state levels, nature protection still faces major challenges. In 2018, the Government of Catalonia approved the Strategy for the Natural Heritage and Biodiversity of Catalonia 2030, which sets out specific conservation proposals. However, its impact on other sectoral policies has been minimal (Peñuelas et al., 2021).

In the European context, the European Union (EU) adopted in 2020 the UE Biodiversity Strategy for 2030, a document that emphasizes that "nature is in crisis" and presents proposals to create a coherent network of PNAs, restore nature in the UE, and promote a transformative change. This strategy has begun to influence some sectoral policies, such as agriculture, urban greening, and a new governance model (Peñuelas et al., 2021).

Sports Events in Protected Natural Areas

Since the conception of the national park concept in the United States at the end of the 19th century, this conservation model has been adapted to various social, political, and cultural realities as it spread to other continents (Frost & Hall, 2015). Initially, these areas were designed with the purpose of preserving nature, providing public enjoyment, and fostering socioeconomic development (Rubio & Lara, 2011). Today, although conservation remains the primary goal (Tolón & Lastra, 2008; Tolón & Ramírez, 2001), it now shares importance with other activities, which can generate tensions between the protection of natural resources and their recreational use, particularly regarding the organization of physical and sports activities in these environments.

In the 21st century, the management of sport and tourism in national parks, especially in Europe, faces new challenges. Visits are no longer limited to individual leisure activities and are increasingly linked to the organization of large-scale sports events, whether competitive or recreational (Malchrowicz-Moško et al., 2019). These activities must be integrated in ways that respect and contribute to the conservation objectives of these areas.

In this context, various sports disciplines have experienced remarkable growth in these environments worldwide. For example, in the United States, this growth has been particularly notable in regions such as the northeast in the discipline of mountain biking (Nogueira et al., 2021). In Europe, mountain races have experienced significant growth in France, Germany

(Houdek, 2015), Poland, Slovakia, and Central European countries (Malchrowicz-Moško et al., 2019). In other continents, such as South Africa, an increase in the organization of these types of events has also been observed (McKay et al., 2019). Alongside this growth, new trends in sports events and activities have emerged, such as the popularity of PNAs among extreme sports enthusiasts (Perrin-Malterre & Chanteloup, 2018).

In the case of Spain, the increase in sports events in natural areas is equally evident. According to Ropits Social Running (2020), the number of mountain races rose from 196 in 2000 to 2,211 in 2019, representing a 1,000% increase in two decades (Babí-Lladós et al., 2021). Likewise, Farías-Torbidoni et al. (2018) reported that between 2010 and 2015, the annual growth rate of mountain race sports events in Spain was 8%, with a heterogeneous regional distribution and an overall incidence rate of 86%, with Catalonia being the region with the highest number of events (43.1%). In the case of Castilla y León, Redondo Castán et al. (2023) notes that competitive events, including mountain events, represent 67.5% of all sports events in the region, underlining the growing importance of this activity in the community.

These data confirm the growing trend toward the use of natural areas for the organization of sports events (Farías-Torbidoni et al., 2018; Fernández-Arroyo, 2015). This phenomenon highlights the need for PNA managers to adapt their strategies to the new demands arising from this evolution.

Impacts and Initiatives for Their Mitigation

The study of the impacts of sports events in natural areas, with a focus on sustainability in their planning and execution, is crucial due to their effects not only on environmental issues but also on economic and social aspects. This approach responds both to environmental conservation and to the need to generate sustainable benefits for local communities and ensure the long-term viability of the events themselves. From an environmental perspective, these events can cause significant ecological damage if not properly managed, such as air and water pollution, waste generation, vegetation deterioration, and degradation of surrounding ecosystems (Holmes & Mair, 2020; McCullough et al., 2018; Eriksson et al., 2023).

The social dimension, although it has received less attention compared to the environmental dimension (Brown, 2016; Newsome, 2014), plays a key role in ensuring that events generate lasting benefits for host communities (Polcsik & Perényi, 2021). Events can have a significant impact on the social fabric, promoting community pride, local development, and the strengthening of cultural identity. However, they can also generate negative effects, such as increased congestion, safety issues, and associated costs for the community (Kim et al., 2015).

Regarding the economic dimension, events can significantly contribute to local development by generating income through tourism and promoting the region as a destination (Comley & Mackintosh, 2014; Wanyonyi et al., 2021). Nevertheless, the lack of planning can put at risk the long-term economic viability and the economic momentum of the host community (Kim et al., 2015).

The lack of adequate regulation can not only negatively impact local communities but also compromise the long-term sustainability of natural areas. For this reason, various international and national initiatives demand greater responsibility in the organization of sports events in these spaces. A prominent example is the commitment of the International Olympic Committee (IOC) to environmental protection, formalized in 1995 with the creation of the Sport and Environment Commission, which since then has led multiple initiatives, such as the creation of the Manual on Sport and the Environment, and has since consolidated itself as a benchmark in the field of environmental protection of sports events (Fermeglia, 2017). In addition, the Olympic Movement's Agenda 2020 and its successor, the Olympic Agenda 2020+, which act as guidelines for the IOC, advocate promoting the sustainability of sports events (IOC, 2021). Likewise, in line with international initiatives, the United Nations Environment Programme (UNEP), together with the International Union for Conservation of Nature (IUCN) and the Secretariat of the Convention on Biological Diversity (CBD), launched an initiative called Sports for Nature: Setting a Baseline (UNEP, 2022), which demonstrates how sport in natural areas can move forward positively by building good practice guidelines, establishing a baseline for organizations to collaborate and achieve a greener future for sports events (Ulloa-Hernández et al., 2024).

At the local level, in Spain, some initiatives have been promoted by Europarc España, which developed the Guide to Good Practices for the Development of Mountain Races in PNAs (Europarc-España, 2016). In addition, in the island context, the Cabildo de Tenerife published the Manual of Good Practices for Sports Events in Nature (Cabildo de Tenerife, 2018),

and at the regional level, the Fundació Món Rural issued the Code of Good Practices in the Organization and Celebration of Mountain Races and Walks (Fundació Món Rural & Centre Tecnològic Forestal de Catalunya, 2017). More recently, and as a continuation of these actions, in 2021 the environmental label Green CXM Trail FEDME was created, a certification promoted by EUROPARC España and the Spanish Federation of Mountain and Climbing Sports (FEDME), which recognizes good nature conservation practices within the organization of mountain races (FEDME, 2021). These initiatives reflect a growing commitment to ensuring that sports events generate benefits both for local communities and for the ecosystems where they take place.

Materials and Methods

The present study adopted an exploratory and descriptive approach, carried out through the collection, systematization, and analysis of the information provided by the management teams of the 17 PNAs that make up the ENPE network (Figure 1). These were: 1) Muntanya de Montserrat Natural Park; 2) Aigüestortes i Estany de Sant Maurici National Park; 3) Cadí-Moixeró Natural Park; 4) La Vall del Monestir de Poblet Natural Park of National Interest; 5) Delta de l'Ebre Natural Park; 6) Montseny Natural Park; 7) Zona Volcànica de la Garrotxa Natural Park; 8) Massís de Sant Llorenç del Munt i Serra de l'Obac Natural Park; 9) Els Ports Natural Park; 10) Serra de Collserola Natural Park; 11) Serra del Montsant Natural Park; 12) Alt Pirineu Natural Park; 13) Aiguamolls de l'Empordà Natural Park; 14) Massís de l'Albera Natural Park of National Interest; 15) Montgrí, Medes Islands and Baix Ter Natural Park; 16) Cap de Creus Natural Park; 17) Delta del Llobregat Natural Park. With regard to the sports events held in each of them during the year 2023, these data were compared with those obtained in a previous study conducted by Fariás-Torbidoni et al. (2017).

Figure 1

Network of Protected Natural Areas of Catalonia (ENPE) Considered in the Study



Note. Authors' elaboration

Data Collection and Organization of Obtained Data

The data collection was carried out via email, following prior telephone contact with the managers of the 17 PNAs, who were asked to provide the following information: event name, month of occurrence, sport modality, and routes. The information request process was conducted between February and May 2024. It is worth noting that, as in the study by Farías-Torbidoni et al. (2017), only sports events that required prior registration and the payment of some type of entry fee were included in the analysis. Thus, events such as student group hikes, senior group walks, charity marches, among others, were not included in the analysis.

Once the information from the corresponding agencies was received, a database was created using Microsoft Excel to organize the obtained data and detect any missing information. The selected variables were: i) PNA where the event took place, ii) Year of the first edition, iii) Number of the edition, iv) Nature of the organization, v) Federative status, vi) Month of occurrence, vii) Sport modality, viii) Number of participants, ix) Number of routes, and x) Route distances.

Systematization of the Information

To complete the missing information on various variables, secondary information sources were used. Generally, the available information on the sports events' websites was consulted or, if these were not active, reliable sources such as federation and sports club websites, as well as sports journalism articles, were used. To validate the information, data obtained from these different sources were usually compared.

Data Analysis

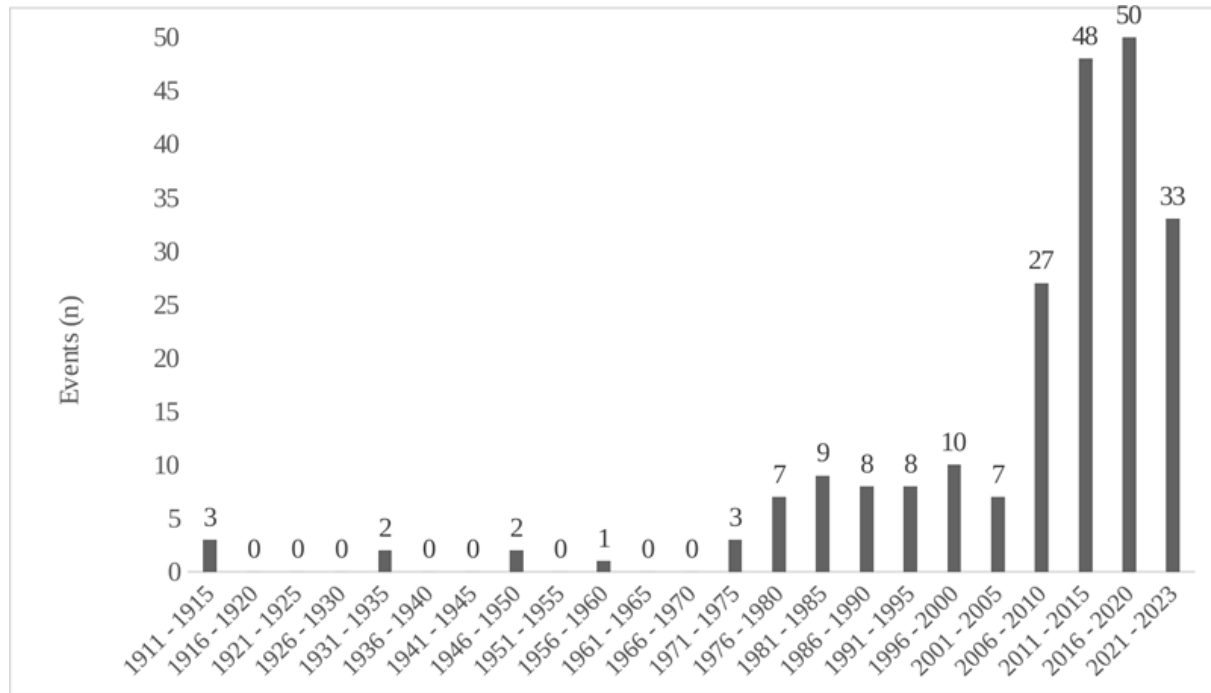
Once the database was completed, Microsoft Excel was used for data analysis. This analysis was structured in two parts: first, a descriptive analysis was carried out, including the identification of averages and trends in the characteristics of each indicator collected in 2023; subsequently, the results obtained were compared with the 2015 data from the previous study by Farías-Torbidoni et al. (2017).

Results

Sports Events in 2023

Year of the First Edition

The analysis of the temporal distribution of sports events according to the year of their first edition, grouped in five-year intervals (1911–2023), shows a clearly sustained increase, with the exception of the periods 2001–2005 and 2021–2023, highlighting the period 2016–2020 with the creation of 50 new events (Figure 2).

Figure 2*Year of the First Edition of Sports Events Held in 2023*

Main Characteristics

Of the 218 sports events identified in 2023, most are between their fourth and tenth editions ($n = 80$), organized by non-profit entities ($n = 152$) and non-federated ($n = 131$). They are held mainly in May ($n = 46$) and October ($n = 34$), with trail running standing out as the most common modality ($n = 90$). The events mainly include between 101 and 200 participants ($n = 51$), featuring a single route ($n = 96$), and a total sum of more than 100 km ($n = 55$) (Table 1).

Table 1*General Description of Sporting Events in 2023*

Variables	Total $n = 218$	%
Edition number		
1-3 editions	37	17.0%
4-10 editions	80	36.7%
11-20 editions	48	22.0%
21-30 editions	12	5.5%
>30 editions	41	18.8%
Type of organizing entity		
For-profit	66	30.3%
Non-profit	152	69.7%
Federation status		
Affiliated	87	39.9%
Non-affiliated	131	60.1%
Month of the event		
January	6	2.8%
February	10	4.6%
March	17	7.8%
April	19	8.7%
May	46	21.1%
June	18	8.3%
July	10	4.6%
August	6	2.8%

Variables	Total <i>n</i> =218	%
September	20	9.2%
October	34	15.6%
November	24	11.0%
December	8	3.7%
Disciplines		
Trail running	90	39.3%
Hiking	57	24.9%
Mountain bike	36	15.7%
Cycling	14	6.1%
Triathlon	4	1.7%
Open water swimming	4	1.7%
Orienteering	2	0.9%
Others	24	9.6%
Number of participants		
1-100	33	15.1%
101-200	51	23.4%
201-300	44	20.2%
301-400	21	9.6%
401-500	26	11.9%
501-1000	28	12.8%
>1000	15	6.9%
Number of routes		
1 route	96	44.0%
2 routes	45	20.6%
3 routes	35	16.1%
4 routes	17	7.8%
5 routes	9	4.1%
6 routes	1	0.5%
Not applicable	15	6.9%
Total distance (km)		
0-10 km	28	12.8%
11-21 km	28	12.8%
22-42 km	41	18.8%
43-100km	51	23.4%
More than 100 km	55	25.2%
Not applicable	15	6.9%

Note. In the variable Modalities, the category “Others” includes the following disciplines: Olympic cross-country mountain biking (MTB XCO), raid, skiing, kitesurfing, motor racing, running, canicross, mountain obstacle race, equestrian, crossfit, and sailing. In the variables Number of routes and Total km, the category “Not applicable” is used for those sports whose structure is not based on routes or covered distances.

Comparison of Sports Events in the Period 2015 and 2023

Number of Sports Events

The analysis of the evolution of the number of sports events organized in Catalonia's PNAs between 2015 and 2023 reveals a significant reduction of around 26.85%, decreasing from a total of 298 events organized in 2015 to 218 in 2023 (Table 2).

Among the parks with a decrease in the number of events are: Muntanya de Montserrat Natural Park (decrease of 16 events), Cadí-Moixeró Natural Park (decrease of five events), La Vall del Monestir de Poblet Natural Park of National Interest (decrease of eight events), Montseny Natural Park (decrease of four events), Massís de Sant Llorenç del Munt i Serra de l'Obac Natural Park (decrease of 18 events), Els Ports Natural Park (decrease of 7 events), Serra del Montsant Natural Park (decrease of three events), and Montgrí, Medes Islands and Baix Ter Natural Park (decrease of one event) (Table 2). Muntanya de Montserrat Natural Park shows the greatest proportional reduction in the number of sports events, with a decrease of 72.73% between 2015 and 2023. However, in absolute terms, Zona Volcànica de la Garrotxa Natural Park presents the largest decrease, with 37 fewer events in 2023 compared to 2015 (Table 2).

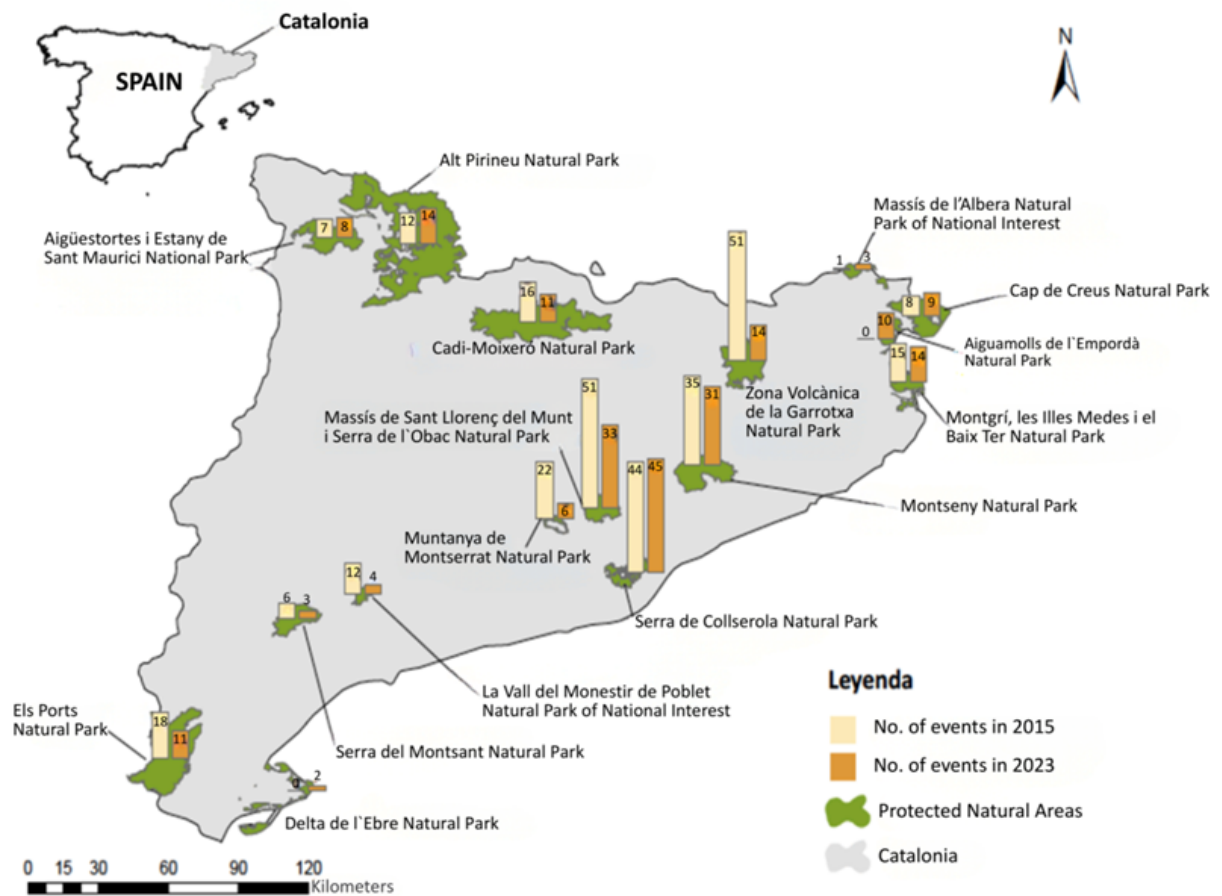
Table 2*Number of Sports Events (2015 vs 2023)*

Protected Natural Areas	2015		2023	
	n	%	n	%
Muntanya de Montserrat Natural Park	22	7.3	6	2.8
Aigüestortes i Estany de Sant Maurici National Park	7	2.3	8	3.7
Cadi-Moixeró Natural Park	16	5.3	11	5.0
La Vall del Monestir de Poblet Natural Park of National Interest	12	4.0	4	1.8
Delta de l'Ebre Natural Park	0	0.0	2	0.9
Montseny Natural Park	35	11.7	31	14.2
Zona Volcànica de la Garrotxa Natural Park	51	17.1	14	6.4
Massís de Sant Llorenç del Munt i Serra de l'Obac Natural Park	51	17.1	33	15.1
Els Ports Natural Park	18	6.0	11	5.0
Serra de Collserola Natural Park	44	14.7	45	20.6
Serra del Montsant Natural Park	6	2.0	3	1.4
Alt Pirineu Natural Park	12	4.0	14	6.4
Aiguamolls de l'Empordà Natural Park	0	0	10	4.7
Massís de l'Albera Natural Park of National Interest	1	0.3	3	1.4
Montgrí, Medes Islands and Baix Ter Natural Park	15	5.0	14	6.4
Cap de Creus Natural Park	8	2.6	9	4.1
Delta del Llobregat Natural Park	0	0	0	0
Total	298	100.0	218	100.0

In contrast, some parks show a moderate increase in the number of events, such as Aigüestortes i Estany de Sant Maurici National Park (increase of one event), Delta de l'Ebre Natural Park (increase of two events), Serra de Collserola Natural Park (increase of 1 event), Alt Pirineu Natural Park (increase of two events), Massís de l'Albera Natural Park of National Interest (increase of two events), and Cap de Creus Natural Park (increase of one event). The most significant increase in both absolute and proportional terms is observed in Aiguamolls de l'Empordà Natural Park, which went from no events recorded in 2015 to a total of 10 events in 2023 (Table 2).

Figure 3 complements this information by showing the geographical location of the PNAs and their evolution in the number of sports events, facilitating the identification of the areas with the greatest changes between 2015 and 2023.

Figure 3
Number of Sports Events (2015 vs 2023)

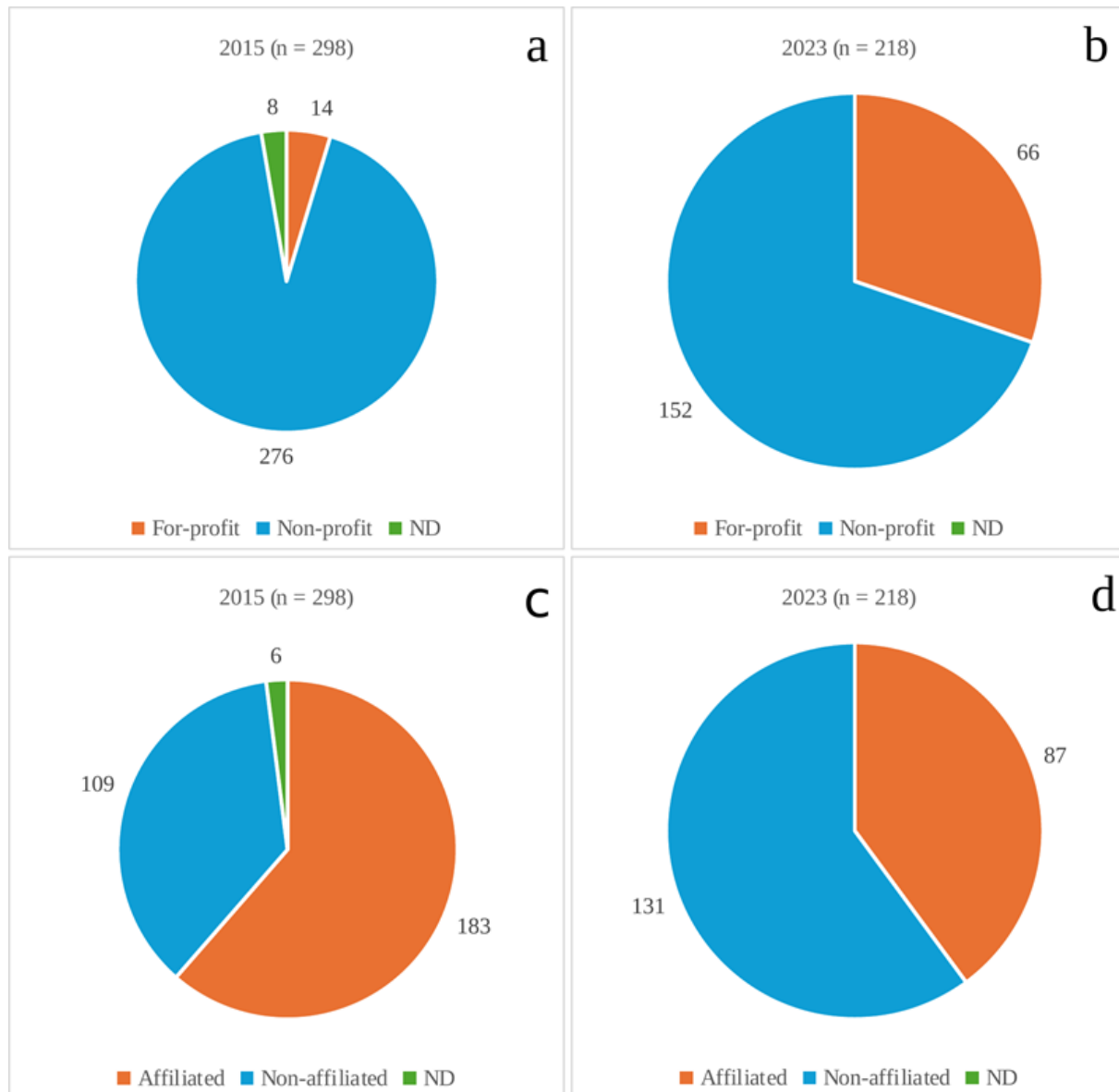


Note. Authors' elaboration

Type of Organization According to Purpose and Federative Status

In 2015, there was a predominance of non-profit sports events ($n = 276$), as in 2023 ($n = 152$). However, a significant increase can be observed in for-profit sports events, which rose from 14 in 2015 to 66 in 2023 (Figure 4a–b).

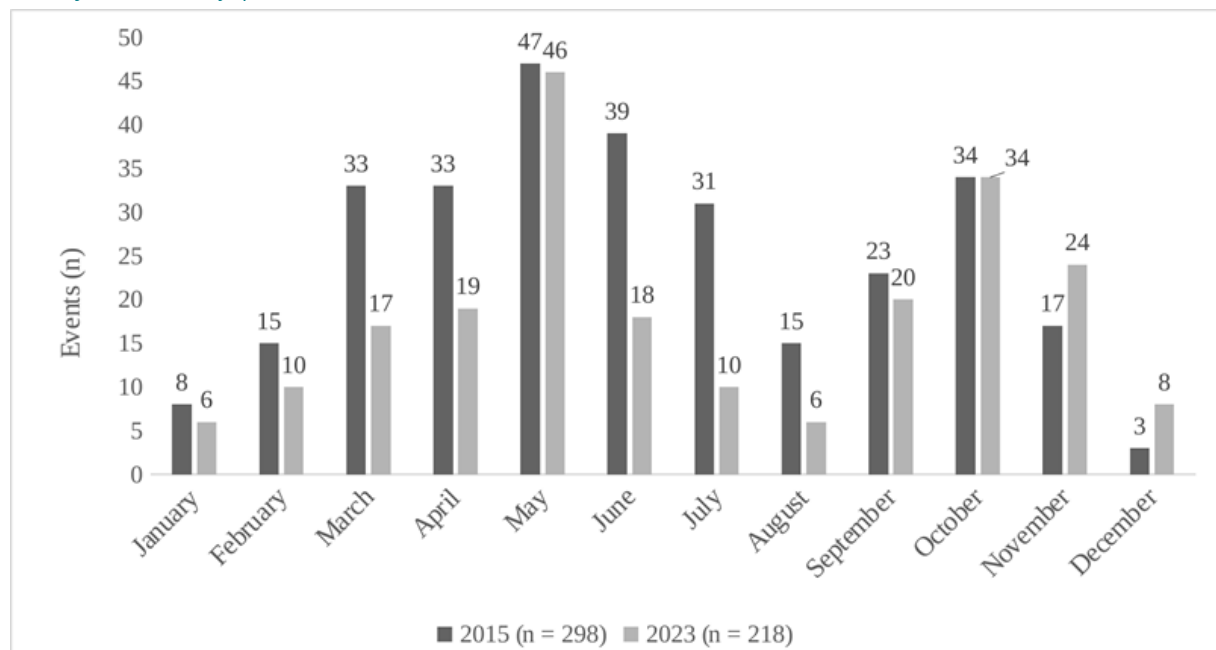
Regarding federative status, in 2015 there was a greater prevalence of federated events ($n = 183$). Nevertheless, in 2023 this trend was reversed, with non-federated events ($n=131$) prevailing over federated ones ($n = 87$) (Figure 4c–d).

Figure 4*Type of Organization According to Profit Orientation (4a-b) and Federative Status (4c-d) (2015 vs 2023)*

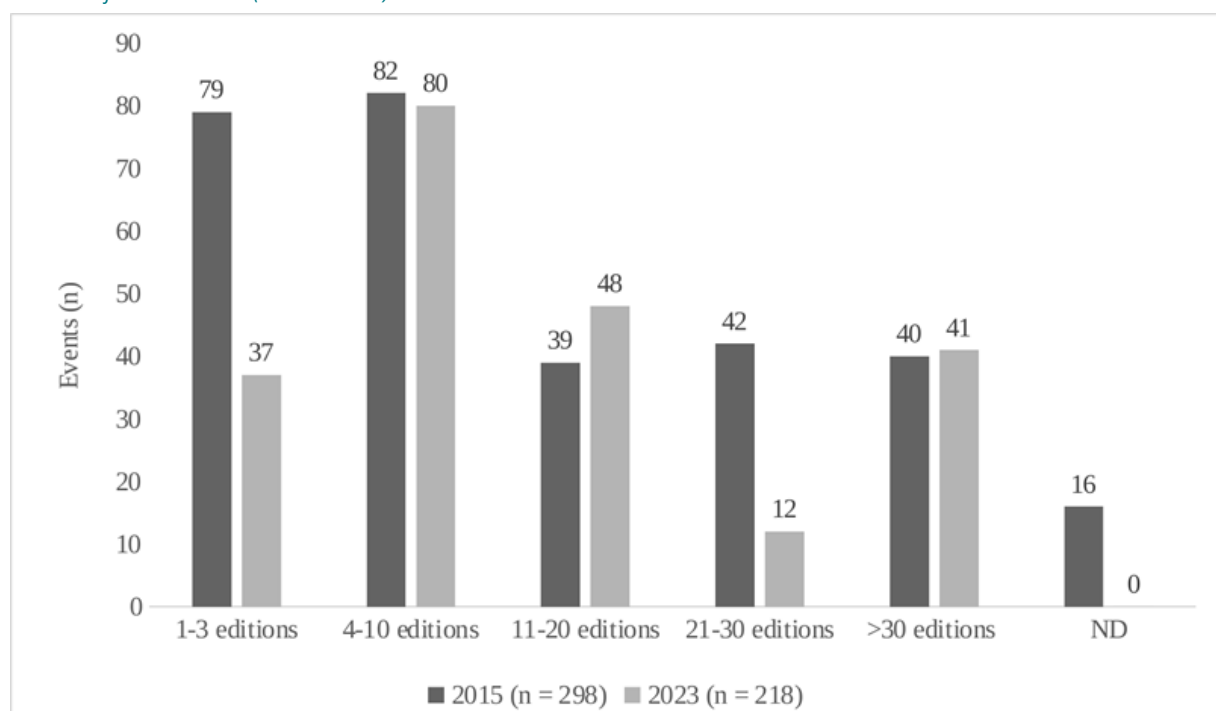
Note. ND= no data.

Monthly Distribution of Sports Events

May stands out with the highest frequency of sports events, maintaining its predominance both in 2015 ($n = 47$) and in 2023 ($n = 46$). In 2015, the months of June ($n = 39$) and October ($n = 34$) also stood out for their activity. However, in 2023, October maintained its relevance with a higher concentration of events ($n = 46$), while June was no longer among the most active months, being replaced by November, which showed a significant increase in the number of events ($n = 24$) (Figure 5).

Figure 5*Monthly Distribution of Sports Events (2015 vs 2023)**Total Number of Editions*

A change in trend is evident in 2023, with a significant decrease in events between the 1st and 3rd editions ($n = 37$). In 2015, the highest concentration of events was found between the 4th and 10th editions ($n = 82$), followed by events within their first editions ($n = 79$). Similarly, in 2023, most events were also between the 4th and 10th editions ($n = 80$), but an increase was observed in events reaching between the 11th and 20th editions ($n = 48$) (Figure 6).

Figure 6*Number of Event Editions (2015 vs 2023)*

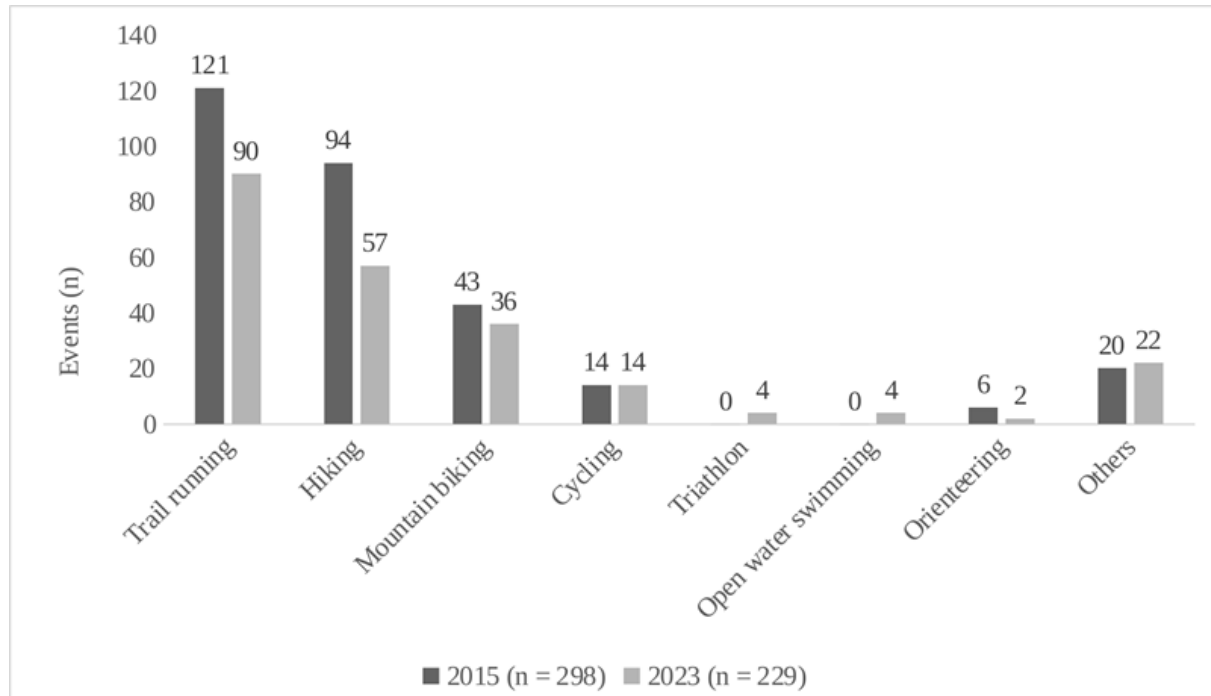
Note. ND= no data.

Sport Modalities

It is important to note that one event may include more than one modality, so the total number of modalities represented in each year may exceed the total number of events. In both 2015 and 2023, the same three sports modalities remain predominant in the events. Trail running is the leading one in both years, with 121 events in 2015 and 90 in 2023. It is followed by hiking, with 94 events in 2015 and 57 in 2023, and finally mountain biking, with 57 events in 2015 and 43 in 2023 (Figure 7).

Figure 7

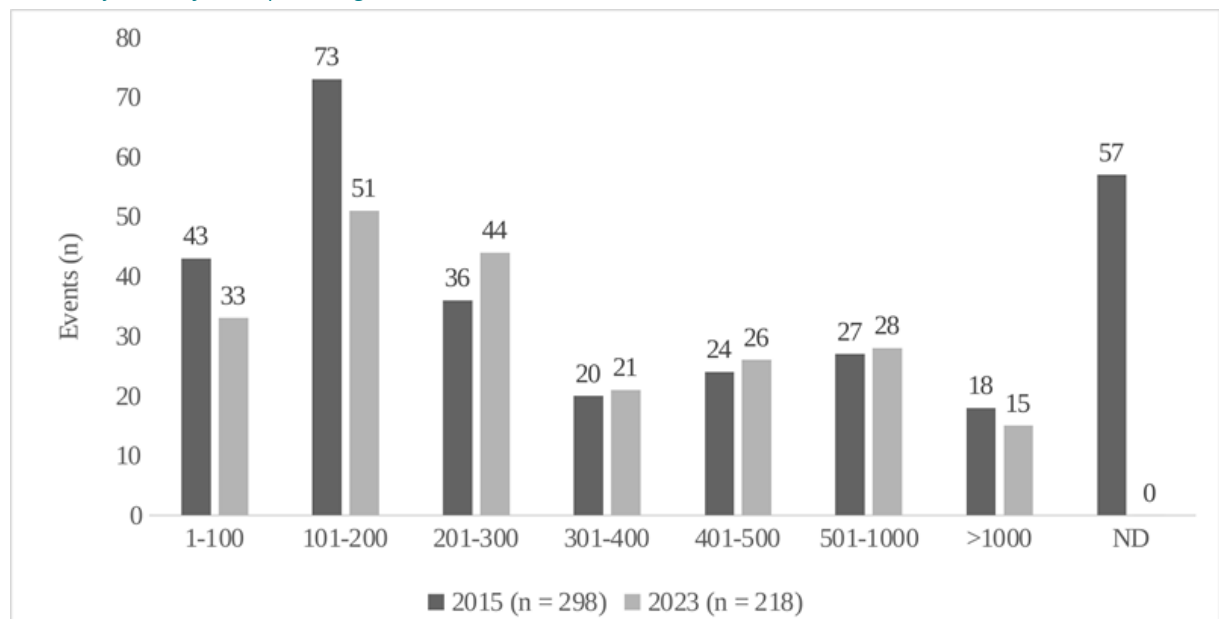
Number of Events by Sport Modality (2015 vs 2023)



Note. The category “Others” includes the following disciplines: Olympic cross-country mountain biking (MTB XCO), raid, skiing, kitesurfing, motor racing, running, canicross, mountain obstacle race, equestrian, crossfit, and sailing.

Range of Participants in Each Event

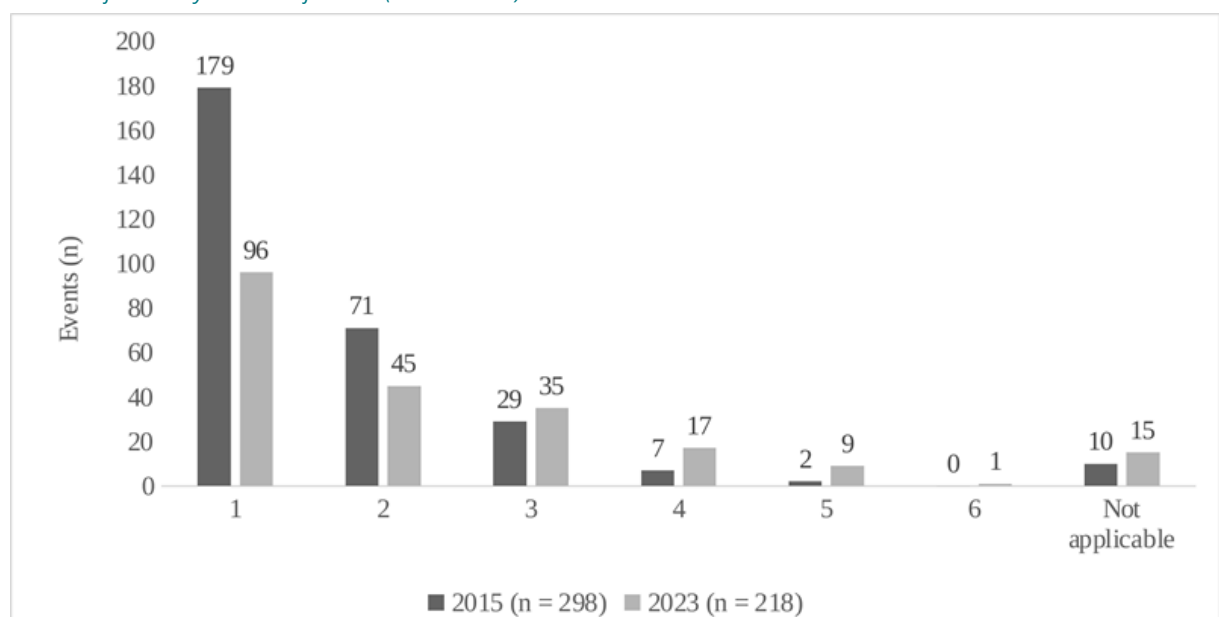
The comparison between both years reveals a decrease in the number of events with participation ranges between 1 and 200 participants in 2023. In contrast, events with more than 200 participants increased, especially those between 201 and 1000 participants. Events with between 101 and 200 participants were the most common in both years, with 73 events in 2015 and 51 in 2023. In 2015, the next most frequent were events with between 1 and 100 participants ($n = 43$), while in 2023, events with between 201 and 300 participants increased ($n = 44$) (Figure 8).

Figure 8*Number of Events by Participant Range (2015 vs 2023)*

Note. ND= no data.

Number of Routes per Event

Although in 2015 events with one and two routes predominated, with 179 and 71 events respectively, in 2023 a significant decrease was observed in these categories, with 96 and 45 events in each category. In contrast, an increase in events with between 3-6 routes stands out, reflecting a shift in the trend toward greater route diversity (Figure 9).

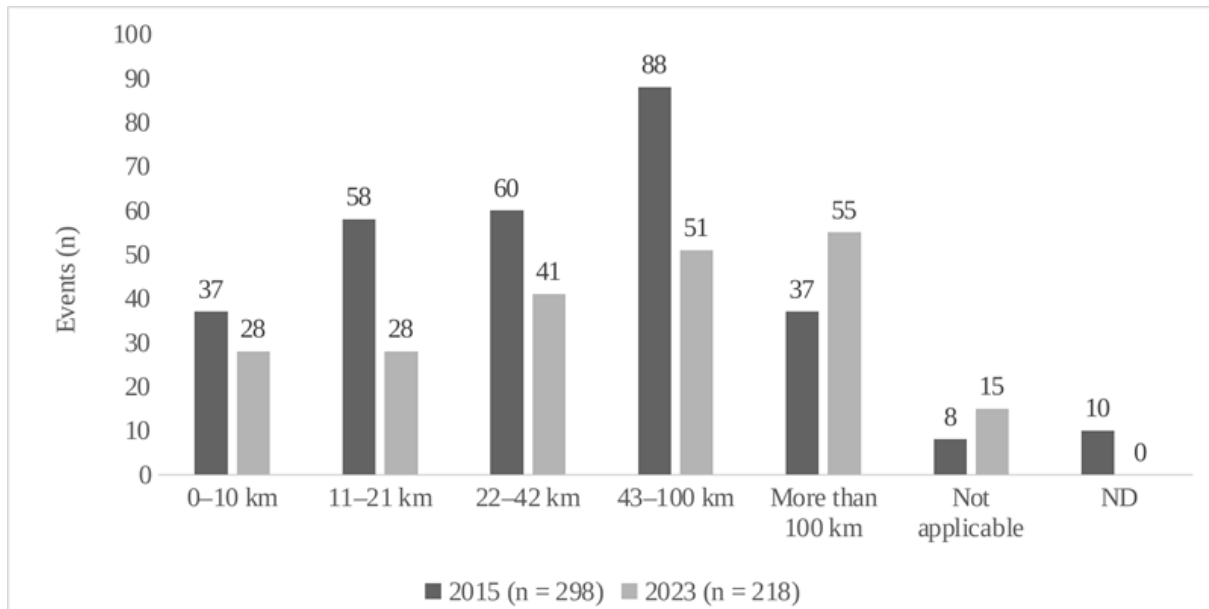
Figure 9*Number of Events by Number of Routes (2015 vs 2023)*

Total Distance of Routes per Event

In 2015, most events were concentrated in routes of up to 100 km, with the category between 43 and 100 km standing out as the most representative ($n = 88$). In contrast, in 2023 an expansion toward longer routes was observed, with a significant increase in the category of events with more than 100 km, which became the most relevant that year ($n = 55$) (Figure 10).

Figure 10

Number of Events by Total Distance Range of Routes (2015 vs 2023)



Note. ND= no data.

Discussion

Characteristics of Sports Events in 2023

The results on the main characteristics of sports events in 2023 revealed that most of the events analyzed originated between 2011 and 2020. These findings coincide with those reported by Farías-Torbidoni et al. (2018), who identified that most trail running races and mountain walks in Spain in 2015 were in their early editions (between the first and third). This reinforces the observed trend of significant growth in sports events during this period.

In particular, it was highlighted that the creation of new events was concentrated between 2016 and 2020, which allowed many of them to be consolidated in the category of between four and 10 editions by 2023. This suggests that most events identified in this study, as noted by Barajas et al. (2019), are in an intermediate phase and may be playing a key role in tourism promotion and local development, in this case, in various localities of Catalonia, reinforcing their relevance and long-term stability.

Non-profit sports events predominated in the 2023 analysis. On the one hand, this may reflect an opportunity to stimulate rural areas by prioritizing community participation, as indicated by Iglesias Cayuela (2022). On the other hand, most of the events identified were non-federated, which, according to Coleman and Ramchandani (2010), may be linked to the fact that organizing this type of event can be less costly, considering that these events usually receive less media coverage and large-scale sponsorship.

There was also a predominance of events held in spring, specifically in May, a month within a season attractive for sports events due to the lower probability of rain and more pleasant weather. However, according to Oñorbe (2014), it is a critical month for organizing sports events because of maximum flowering and plant growth, as well as bird nesting.

The results also showed that trail running was the main modality in the events, in line with the global trend of growth in outdoor sports activities and the increasing popularity of this discipline. According to Grafnetterova (2022), this modality

has experienced significant growth due to its combination of physical effort and connection with nature, which attracts both amateur runners and professional athletes.

Continuing with the analysis of event characteristics in 2023, sports events with between 101 and 200 participants predominated, which may offer an ideal balance between sustainability and local development, especially in rural or protected areas. According to McKay et al. (2019), this event size allows for moderate economic impact that benefits host communities without overburdening their infrastructure or natural resources. Regarding event structure, most included only one route, which reflected a preference for logistical simplicity and more efficient resource management. Likewise, events with accumulated distances of more than 100 km predominated, aligning with the growing interest in ultra-endurance competitions. This trend, supported by studies such as McKay et al. (2019), responds to the demand from athletes seeking more intense physical challenges in nature.

Comparison of Sports Events in the Period 2015 and 2023

When comparing the main changing trends between sports events in 2015 and 2023, a significant decrease can be observed both in the total number of events and in the number of editions between 1-3. This reduction can be explained by multiple factors. On the one hand, the COVID-19 pandemic, according to Grix et al. (2020), led to the cancellation of numerous sports events and made their reactivation difficult in subsequent years, which particularly affected recently created events. On the other hand, this situation may have accelerated or reinforced the implementation of stricter regulations in PNAs, aimed at ensuring environmental recovery and avoiding the overloading of these environments after the pandemic. In fact, Peñuelas et al. (2021) warn that the excessive use of natural resources in Catalonia has led to the implementation of more rigorous policies aimed at protecting these areas. Together, these factors may be limiting the number of sports events with the aim of minimizing negative environmental impacts.

Although in 2023 events organized by non-profit entities predominated, the comparative analysis with respect to 2015 shows an increase in for-profit events. This change, as pointed out by Newsome et al. (2011), should be closely monitored as it may reflect a trend toward the commercialization of events in PNAs, which could compromise their value as a conservation tool by turning them into highly commercialized tourism products.

The shift from federated events in 2015 to non-federated events in 2023 may reflect a growing preference for more flexible and autonomous formats, less constrained by federative regulations. As noted by Visa Carol et al. (2023), this organizational format considerably simplifies logistics, favoring organizers' preference for this type of event.

Spring continued to be the main season for these events in both 2015 and 2023, which is in line with the results of the study by Fariás-Torbidoni et al. (2018), who also identified a clear predominance of trail running and mountain walk events during this season in Spain. In that study, natural area administrations and sports organizations were urged to prioritize measures to manage environmental impact during these periods. However, eight years later, no significant changes have been implemented, underscoring the urgency for both organizers and administrations to adopt measures to mitigate environmental impact in these critical times.

The trail running modality has maintained its leadership from 2015 to 2023. This phenomenon underscores its relevance not only as a sports activity but also as an effective strategy to promote local development in regions with natural resources of high scenic value, as evidenced in the study by Duglio and Beltramo (2017) on the Italo-Swiss Mountain Trail CollonTrek, which explains why it continues to be the predominant modality.

When comparing the number of participants between the two years, an increase was identified in events with more than 200 participants and in events that included more than three routes with a total distance exceeding 100 km. These results can be explained by the growing popularity of natural areas as sports venues, a phenomenon supported by research such as Funk et al. (2011), which highlights how events attract participants by diversifying their offerings and adapting to different skill levels and preferences.

These changing trends pose important challenges in environmental sustainability, especially when they take place in PNAs. The fact that there are longer routes increases the likelihood of environmental impacts in larger and generally less disturbed areas, which are often key for biodiversity conservation, according to Smith and Pickering (2024). This highlights the need to balance tourism and sports appeal with the preservation of natural environments, as indicated in the study

by Newland et al. (2021), when analyzing the Grand Trailfest of Vacation Races, held in a rural mountain village in Utah, United States.

On the other hand, the results highlight a trend toward organizational stability, characterized by greater autonomy in event management, not always linked to federations. This may raise concerns about environmental impacts, as the lack of centralized coordination and oversight may lead to less rigorous organizational practices in terms of environmental sustainability. It will be essential for PNA managers and organizers to work together to ensure that events are carried out sustainably, protecting the environmental values of the territory.

In addition, it is emphasized that it is necessary not only to mitigate environmental impact but also the social and economic effects of these events. In this regard, good practice manuals, such as the one developed by Europarc España, provide a solid basis to guide these adaptations. At the international level, initiatives led by the IOC and UNEP, together with IUCN, also offer useful guidelines to promote the long-term sustainability of sports events.

Despite the findings of this study, it is important to note some limitations. First, the analysis was based exclusively on descriptive data and did not incorporate qualitative techniques such as interviews with organizers or PNA managers. The absence of these tools may have limited a deeper understanding of organizational decisions. Furthermore, a detailed normative analysis of the procedures and legal requirements necessary to authorize events in PNAs was not included, which would have allowed for a better contextualization of the observed trends. These limitations open new opportunities for future research that integrates mixed approaches and regulatory analyses.

Conclusions

This study has made it possible to identify several key trends. First, there has been a significant decrease in the total number of events between 2015 and 2023. At the same time, although non-profit events have predominated, an increase in the organization of for-profit sports events has been identified when comparing the studied years, which may represent a trend of change in the management model of these activities and pose both challenges and opportunities from the perspective of sustainability. On the other hand, a relevant shift toward the organization of non-federated events is evident, which increases the need to establish control mechanisms that ensure environmental conservation and protect the authenticity of PNAs as tools of natural preservation.

In addition, the prevalence of these events in spring, a critical period for flora and fauna, remains concerning despite previous recommendations based on other studies. Therefore, it would be necessary for PNA administrations to control or propose a specific schedule for the organization of events, with the aim of reducing their impact during these sensitive periods.

The study has also identified a decrease in the number of events with between 1 and 3 editions, which has revealed a recent difficulty in the creation of new sports events at present.

On the other hand, trail running continues to lead the organization of events, consolidating itself as the leading practice in Catalonia's PNAs. In addition, a growing trend has been observed toward the organization of events with more than 200 participants, more routes, and longer distances, which increases the complexity and potential impact of these events.

Finally, this study highlights the need for PNA managers and organizers to work together to ensure that sports events in these areas are more sustainable. By providing a detailed analysis of the trends and characteristics of sports events in Catalonia's PNAs, this study becomes a tool for more efficient planning and for the implementation of management strategies that balance environmental conservation with economic and social development. Its relevance lies in the fact that it provides information that can guide decision-making, allowing managers of these areas to anticipate challenges and design solutions that minimize the negative impacts on these fragile ecosystems.

Statement of the Ethics Committee

It does not apply because this study is based on the collection and analysis of public information about sporting events and does not involve human participants or the use of sensitive data that requires the approval of an Ethics Committee.

Conflict of Interest

The funding entities or institutions had no influence on the study design, data analysis, or interpretation of the results.

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Contribution of the Authors

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Data Availability Statement

Data available on request from the corresponding author mulloa@euncet.com

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