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HIKING TRAILS EVALUATION IN THE NATURAL PARK OF SERRAS DE AIRE E CANDEEIROS, PORTUGAL

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ABSTRACT: The practice of hiking is one of the nature-based sports and active tourism that mobilizes more participants and also has more potential in terms of healthy lifestyles adoption and local sustainability. For this to become a reality, it is necessary to meet a set of requirements through quality standards, accessibility, and social responsibility. Thus, this study intends to perform a technical evaluation on the hiking trails of the Natural Park of Serras de Aires e Candeeiros, in order to contribute to the development and sustainability of this region. The sample was composed by the totality (n=16) of the hiking trails identified in the Nature-based Sports Map. The instrument used for data collection was the "Hiking Trails Technical Evaluation", validated for this purpose. The results indicated the typology of the main problems in each trail, considering the following dimensions: i) Trail (15.7%); ii) Marking (63.7%); iii); Conservation (15.7%); iv) Safety (4.8%). On the other hand, the severity index of the problems identified ranged from serious problems (4.4%) to problems with simple solutions (95.6%). The results showed the quality of the hiking trails studied, providing relevant information to the management entity, stakeholders, and general visitors. **Keywords:** Hiking trails, technical evaluation, sustainability.

INTRODUCTION

Nature-based sports and active tourism: a growing phenomenon

The social paradigms associated with occupations of leisure time are changing in modern societies. It is in this context that there is an increase of recreational practices in touch with nature around the world (Bell, Tyrväinen, Sievänen, Pröbstl, & Simpson, 2007; Rosa & Carvalhinho, 2012). Among these, there are the nature-based sports, denominated in the Portuguese territory by "Desporto de Natureza",

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whose motivations and consequent benefits practices differ, in a way, from "conventional" sport (Rosa & Carvalhinho, 2012). The obvious increase in demand for these practices is due to their ability to serve different purposes of modern societies (Carvalhinho, 2006; Pröbstl, 2010). Thus, considering the different aspects related to outdoor education (Becker, 2010; Light, 2006), environmental education (Brymer & Gray, 2010; Lee, 2011), health promotion and wellness (Rodrigues, Kastenholz, & Rodrigues, 2010) and the socio-economic potential (Beedie & Hudson, 2003; Kastenholz & Rodrigues, 2007), it can be seen that these activities have been given more attention by academia and professionals.

Moreover, its suitability for the tourism phenomenon founded on the principles of experiential economy (Ek, Larsen, Hornskov, & Ole, 2008), as a vehicle for fun, knowledge of the natural territory, and appreciation, among others, makes these practices also assume an important role as a factor of local development, especially in protected areas (Bourdeau, Corneloup, & Mao, 2002). It is for this reason that there has been a greater concern in the development of these activities within spaces endowed with protected status, of tourism in general and sport tourism in particular, since these are also an addition to traditional natural conservation policies. The responsible development of recreational, sporting, and tourist practices in protected areas requires new methodological approaches that should go beyond overly restrictive natural conservation practices (typical of many natural areas management). As a complement, one should seek to meet the indirect management practices, more focused on social most participated factors, and the maintenance and space optimization (Manning, 2007; McCool, 2006; Rosa, Almeida, & Carvalhinho, 2011), thereby contributing for the preservation of ecosystems and local development. For this to become a reality, it is necessary to meet a set of requirements, supported on quality criteria, of accessibility and social responsibility (Torbidoni, 2010).

Hiking: Concepts and multidisciplinary approaches

The concept of hiking presented by "Federação de Campismo e Montanhismo de Portugal" (FCMP, 2012) is defined as "*sport of walking usually in nature and in traditional trails, but also in urban areas. In fact, the hiking can be seen as a multilayered activity related to the areas of sport, tourism and the environment. The practice of hiking can be done in unmarked hiking trail on the ground or marked routes: "Grandes Rotas (GR), Pequenas Rotas (PR) ou Percursos Locais (PL)*". Among the countless outdoor activities available, the practice of hiking usually pursues pleasant sensations of relaxation, the opportunity to enjoy nature, and approach local people and their

customs. In its essence, it contributes to the adoption of healthy and active lifestyles for many practitioners, including local visitors and tourists, allowing privileged observation of surroundings, particularly in terms of geology, geomorphology, flora, fauna, culture, history, archaeology and architecture. Currently, in Portugal, are identified about 29 routes GR, 6 of which are trans-European level, for a total of 1013 km signposted. Regarding routes PR**,** 157 routes are identified, corresponding to 1536 km marked and distributed in 62 municipalities of Portugal.

Hiking is one of the most popular sporting activities in contact with nature, much because of its inclusive and accessible character to the most varied audiences and it has been studied in different areas of knowledge. This multidisciplinary approach is reflected at several levels, including: i) education, particularly environmental education (Ferreira, 1998); ii) its economic potential associated with tourist activities (Kastenholz & Rodrigues, 2007); iii) new prospects for management of natural areas associated with psychological and experiential factors, (Lynn & Brown, 2003); iv) the phenomena of recreation conflict (social and interpersonal) in natural spaces (Ramthun, 1995; Tumes, 2007; Watson, Niccolucci, & Williams, 1994); v) environmental impacts arising from these practices under the perspective of recreational ecology (Leung & Marion, 2000); vi) under the perspective of health (Barton, Hine, & Pretty, 2009; Rodrigues et al., 2010).

Apparently a lesser extent, other approaches of more technical and scientific nature have been developed, associated with the level of difficulty, energy cost, and biomechanical loading of hikers (Alencoão, Gomes, Quaresma, Sousa, & Gabriel, 2011).

The management of natural spaces for hiking practice

Considering that the quality of recreational and sports areas is critical to the design of a quality experience (Manfredo, Driver, & Brown, 1983; McCool, 2006), that a supply of quality is the basis of demand and increasing visitation of natural spaces (IUCN, 2002) and that the safety of these activities is also associated with risk factors related to the environment (Carvalhinho, Frazão, & Moutão, 2013), we believe that the proper management of natural spaces where the hiking activities are held is necessary and emergent so as to become more attractive tourist destinations. The bodies responsible for the natural habitats play a very important role in creating and maintaining spaces for the practice of these activities, in order to balance the level of supply and demand. Correia (1991) suggests that the increase of the practice of adventure and risk activities in nature should involve rethinking the spaces for these activities and the appropriate security measures to be adopted. In the view of Cunha (2007), the planning and the im-

provement of natural spaces for sport is crucial and involves a lot of planning factors, namely: i) Survey and characterization of the natural spaces; ii) Identification of their inclusion or not in the national, regional, or local network of protected areas; iii) Identification of areas eligible for the practice of nature-based sports; iv) Identification of natural features (local) with environmental significance; v) Identification of environmental and sports constraints or restrictions, features of the different sports to practice, accessibility/inaccessibility regarding geographical and temporal characteristics and services, among others. Environmental risks, the quality of the physical space (natural), the supporting infrastructures, environmental restrictions, or safety issues should be taken into account in the creation and management of sports and recreational spaces and, in the long term, it can contribute appropriately to a sustainable development and the experience of visitors. Therefore, it is expected that the protected areas and other natural areas can assert themselves as a stage of excellence and high demand.

It is therefore considered that a signposted trail on the ground can be matched to a sports facility, implying a greater responsibility on the part of those who perform the marking in their management and maintenance. There are technical guidelines governing the marking, signalling, and maintenance of these spaces, mainly within the sport federations or sport associations. Therefore, in our view, it could be beneficial to join the more technical knowledge of these themes to other information of more scientific nature, thus resulting in a greater consistency and reasoning about the variables that constitute the processes and assessment decisions and the consequent maintenance of the signed hiking trail. Some studies on this topic have been developed in Portugal (Brandão, 2011; Carvalhinho & Rosa, 2012; Rosa, Almeida, & Carvalhinho, 2013), but are still insufficient with regard to the importance and necessity that this area offers in terms of development and recognition. On the other hand, concerns related to characteristics of the markings, other variables related to the quality of signage, conservation of the environment, and safety aspects are essential to the success of these activities and consequently to improve the experience of hikers.

Natural Park of Serras de Aire e Candeeiros – Nature-based Sports Map

The Natural Park of Serras de Aire e Candeeiros (NPSAC) was established on the 4th of May 1979 by the D.L. nr. 118/79, which aims to protect natural aspects and defend the existing architectural heritage. In fact, the NPSAC is the most important repository of existing limestone formations in Portugal, its karst morphology, nature of vegetation, network of underground watercourses, specific fauna, including

cave and intense activity in the field of extraction of stone, are the key issues that led to the classification of this area as a Natural Park. It has a surface of 38,900ha, covering two districts and seven municipalities. In the district of Santarém, we have the municipalities of Alcanena, Rio Maior, Santarém, Torres Novas, and Ourém. In the district of Leiria, we have the municipalities of Alcobaça and Porto de Mós (ICN, 2004).

The NPSAC was pioneered in Portugal with regard to the publication of the 'Nature-based Sports Map' (NBSM). The requirement of the publishing of these documents for the Portuguese protected areas dates back to 1999 (nr.1 of art. 6 of D. R. nr. 18/99, of 27th of August, altered by D. R. nr. 17/03 of 10th of October). However, apart from the NBSM from NPSAC, only the Natural Park of Sintra-Cascais held its publication. The NBSM acts as a key tool in the management, development, and regulation of sporting activities in protected areas, identifying areas and activities that could be developed in the territory without directly harming the conservation of nature, as well as the respective load capacities or other restrictions inherent to this. On the other hand, the existence of an NBSM alone is clearly insufficient to ensure the quality of the spaces at all the different levels previously identified, therefore being necessary to implement monitoring and management processes that can be appropriate and duly substantiated (Rosa, Almeida & Carvalhinho, 2011). Hence it becomes vital to create instruments that allow planning processes and management of sports areas. These should have a strong theoretical and practical support, be specific enough, be according to the sport in question, and be capable of producing effective results that assist in the adoption of procedures for improvement.

METHODS

The sample was constituted by all the 16 hiking trails signposted and recorded in the NBSM from NPSAC according to the official document nr. 1465/2004 of 17th of December, adopting the rules for nature-based sports in this Natural Park.

To characterize the sample, the identification of each hiking trail, the name, type, extension, duration, departure /arrival and the difficulty level of each hiking trail was considered in Table 1.

Table 1: Sample

Municipality	Ident. initials	Name	Type	Km	Dur.	Departure /Arrival	Dificulty
Alcanena	PR1 (ACN)	Olhos d'Água do Alviela	Linear	2km	1.00h	Olhos d'água Alviela Amiais de baixo	Low
Alcobaça	PR1 (ACB)	Vale de Ventos	Circular	3km	1.30h	Casas de Abrigo – Vale de Ventos	Low
Porto Mós	PR1 (PMS)	Serra da Lua	Circular	6km	3.00h	P.C. Rural-Arrimal	Low
Porto Mós	PR2 (PMS)	Arco da Memória	Circular	6km	3.00h	P.C. Rural-Arrimal	Low
Porto Mós	PR3 (PMS)	Lapa dos Pocilgões	Circular	3km	1.30h	Cabeço das Pombas	Low
Porto Mós	PR4 (PMS)	São Bento	Linear	12km	6.00h	Cabeço Pombas/estrada de Serro Ventoso-Amiais Cima	Medium
Porto Mós	PR5 (PMS)	Castelejo	Circular	12km	6.00h	Centro de Atividades de Ar Livre-Alvados	Medium
Porto Mós	PR6 (PMS)	Fórnea	Linear	1km	1.00h	Café da Bica-Alcaria	Low
Porto Mós	PR7 (PMS)	Corredoura	Circular	13km	6.00h	Campo de futebol da Bezerra	Medium
Porto Mós	PR8 (PMS)	Serra Galega	Circular	11km	5.00h	Valicova-Cortinas	Medium
Porto Mós	PR9 (PMS)	Estrada romana	Circular	9km	5.00h	Estrada Romana – Alqueidão da Serra	Low
Rio Maior	PR1 (RMR)	Marinhas de Sal	Circular	3km	1.30h	Centro de Tecelagem Artesanal-Chãos	Medium
Rio Maior	PR2 (RMR)	Chãos Alcobertas	Circular	15km	5.00h	Cooperativa Terra Chã	Medium
Santarém	PR1 (STR)	Algar do Pena	Circular	9km	3.00h	Centro de Interpretação Subterrâneo da Gruta-Algar	Low
Torres Novas	PR1 (TNV)	Grutas do Almonda	Linear	18km	4.00h	Centro Interpretação Grutas do Almonda – Vale Serra	Low
Vila Nova Ourém	PR1 (VNO)	Bairro/Casal Farto	Circular	13km	5.00h	Monumento Natural Pegadas Dinossáurios SA	Medium

In general, and considering the total of 136 km of marked hiking trails, we can see that there is a good range of choice, varying between 1 km and 18 km long, between 1 hour and 6 hours long and a balanced distribution of the difficulty level (Low=56%; Medium=44%). Moreover, it appears that most trails have a circular typology, i.e., the point of departure is the same as the place of arrival, thus facilitating the logistics and movement of hikers.

The measuring instrument used to collect the data was the "Hiking Trails Technical Evaluation" (HTTE), previously used (Brandão, 2011) and validated in other studies (Carvalhinho & Rosa, 2012).

Thus, we could assess 4 dimensions and 21 variables:

i) Trail Dimension: Identification of the signage; Obstacles; Visibility; Crossings.
ii) Marking Dimension: Wear marking; Damage to the marks and signs; Lack of signage, Incorrect signage, Covered signs and marks.
iii) Conservation Dimension: Garbage in the trails; Damage to vegetation, Drainage, Waste dumps, Side trails.
iv) Safety Dimension: Falling stones; Falling trees; Exposure to fall; Wildlife; Protection Works.

To facilitate interpretation of the results, tables were used with information collected in the field which allows characterizing each of the hike trails, depending if the used variables were selected.

RESULTS

The data collected through the measuring instrument 'HTTE' allowed to present the results for the dimensions of the aforementioned variables: i) Trail Dimension; ii) Marking Dimension; iii) Conservation Dimension; iv) Safety Dimension.

In Table 2, we can identify the quantity and magnitude of the problems diagnosed in the trail dimension, in relation to each of the hiking trails in NPSAC. Therefore, to evaluate this aspect, we used the following variables: Ease of identification (A); Obstacles (B); Visibility (C) and Crossings (D). The magnitude of the problems encountered was evaluated on a scale of 1 (easy problem resolution) to 3 (unresolved issue).

Table 2: Evaluation of "Trail Dimension"

Identification of the trail		Number and typology of problems				Magnitude of the problems			
Municipality	**Identif. (initials)/name**	**A**	**B**	**C**	**D**	**1**	**2**	**3**	**T**
Alcanena	PR1(ACN)/O.A. Alviela	0	0	0	0	0	0	0	**0**
Alcobaça	PR1(ACB)/V. Ventos	1	0	1	0	2	0	0	**2**
Porto Mós	PR1(PMS)/S. Lua	1	0	0	0	1	0	0	**1**
Porto Mós	PR2 (PMS)/A. Memória	0	1	0	0	1	0	0	**1**
Porto Mós	PR3(PMS)/L. Pocilgões	1	3	2	0	6	0	0	**6**
Porto Mós	PR4(PMS)/S. Bento	1	1	0	1	3	0	0	**3**
Porto Mós	PR5(PMS)/Castelejo	1	2	0	1	4	0	0	**4**
Porto Mós	PR6(PMS)/Fórnea	1	2	0	0	3	0	0	**3**
Porto Mós	PR7(PMS)/Corredoura	1	0	0	0	1	0	0	**1**
Porto Mós	PR8(PMS)/S. Galega	1	1	1	0	3	0	0	**3**
Porto Mós	PR9(PMS)/E. Romana	0	2	0	0	1	1	0	**2**
Rio Maior	PR1(RMR)/M. Sal	1	3	1	1	6	0	0	**6**
Rio Maior	PR2 (RMR)/C. Alcobertas	0	0	0	0	0	0	0	0
Santarém	PR1(STR)/A. Pena	0	0	2	0	2	0	0	**2**
Torres Novas	PR1(TNV)/G. Almonda	1	1	0	0	2	0	0	**2**
V. Nova Ourém	PR1(VNO)/B.C. Farto	0	0	3	0	3	0	0	**3**
	Totals	**10**	**16**	**10**	**3**	**38**	**1**	**0**	**39**
	%	*25.6*	*41*	*25.6*	*7.7*	*97.4*	*2.6*	*0*	

Legend: A= Ease of identification; B=Obstacles; C=Visibility; D=Crossings; 1= easy problem resolution; 2= hard problem resolution; 3= unresolved issue

The 4 dimensions in the study have a total of 248 problems. In the "Trail Dimension" we may identify a total of 39 problems, corresponding to 15.7% of the total problems. Regarding the type of problems encountered, the results differ slightly. The variable "Obstacles" showed the greatest number of problems (41%) and then the variables "Ease of identification" and "Visibility" with the same value for (25.6%). Finally, the problems are almost non-existent (7.7%) in the variable "Crossings". Regarding the magnitude of the problems encountered, it can be seen that the overwhelming majority (97.4%) is easy to solve.

Performing an analysis to each hiking trail, we can verify the trails with the greatest number of problems, which in this case were the PR1 (RMR) "Marinhas do Sal" and PR3 (PMS) "Lapa dos Pocilgões" with 6 occurrences, followed by PR5 (PMS) "Castelejo" with 4 occurrences. In the background, the other trails have between 1 and 3 occurrences. Regarding the magnitude of the problems encountered, the highlight is the PR9 (PMS) "Estrada Romana" as the only trail studied that has 1 resolution to the hard problem (level 2).

In Table 3, we can identify the amount and magnitude of the problems diagnosed in the "Marking Dimension" for each one of the hik-

ing trails. Therefore, to evaluate this dimension, we used the following variables: Wear in the markings and signs (A); Damage to the marks and signs (B); Lack of signage (C); Incorrect signage (D); Covered marks and signs (E). The magnitude of the problems encountered was evaluated on a scale of 1 (easy problem resolution) to 3 (unresolved issue).

Table 3: Evaluation of "Marking Dimension"

Identification of the hiking trail		Number and typology of problems					Magnitude of the problems			
Municipality	**Identif. (initials)/name**	**A**	**B**	**C**	**D**	**E**	**1**	**2**	**3**	**T**
Alcanena	PR1(ACN)/O.A. Alviela	1	0	0	0	0	1	0	0	**1**
Alcobaça	PR1(ACB)/V. Ventos	1	1	0	0	0	2	0	0	**2**
Porto Mós	PR1(PMS)/S. Lua	10	0	7	6	0	23	0	0	**23**
Porto Mós	PR2 (PMS)/A. Memória	0	0	0	0	0	0	0	0	**0**
Porto Mós	PR3(PMS)/L. Pocilgões	5	1	1	0	1	8	0	0	**8**
Porto Mós	PR4(PMS)/S. Bento	0	0	1	0	0	1	0	0	**1**
Porto Mós	PR5(PMS)/Castelejo	49	1	6	10	2	68	0	0	**68**
Porto Mós	PR6(PMS)/Fórnea	1	2	1	0	0	4	0	0	**4**
Porto Mós	PR7(PMS)/Corredoura	3	0	5	0	0	5	3	0	**8**
Porto Mós	PR8(PMS)/S. Galega	8	2	1	1	2	14	0	0	**14**
Porto Mós	PR9(PMS)/E. Romana	2	1	0	0	4	7	0	0	**7**
Rio Maior	PR1(RMR)/M. Sal	0	1	0	0	1	2	0	0	**2**
Rio Maior	PR2 (RMR)/C. Alcobertas	0	0	0	1	0	1	0	0	**1**
Santarém	PR1(STR)/A. Pena	1	0	2	5	1	9	0	0	**9**
Torres Novas	PR1(TNV)/G. Almonda	0	0	0	0	0	0	0	0	**0**
V. Nova Ourém	PR1(VNO)/B.C. Farto	4	2	0	4	0	10	0	0	10
	Totals	**85**	**11**	**24**	**27**	**11**	**155**	**3**	**0**	**158**
	%	*53.8*	*7*	*15.2*	*17.1*	*7*	*98.1*	*1.9*	*0*	

Legend: A= Wear in the markings and signs; B= Damage to the marks and signs; C= Lack of signage; D= Incorrect signage; E= Covered marks and signs; 1= easy problem resolution; 2= hard problem resolution; 3= unresolved issue

In this dimension, we may identify a total of 158 issues, corresponding to 63.7% of the total problems (n = 248). The results differ significantly from the previous analysis, and reveal a more negative trend, since the number of the problems identified is about 4 times higher. Considering the typology of problems, the variable "Wear in the markings and signs" is the one that has the most problems (53.8%), followed by "Incorrect signage" (17.1%) and the "Lack of signage" (15.2%). Regarding the magnitude of the problems, also in this dimension, most are easy to solve (98.1%). In each trail, there is great disparity in the evaluation performed. The PR5 (PMS) "Castelejo" presented more problems (n = 68), followed PR1 (PMS) "Serra da Lua" with 23 problems and the PR8 (PMS) "Serra da Galega" with 14 problems. Noteworthy are the PR2 (PMS) "Arco da

Memória" and PR1 (TNV) "Gruta do Almonda" with no problems. Regarding the magnitude of the problems, only the route PR7 (PMS) "Corredoura" presented hard problems resolutions (level 2) with 3 occurrences.

In Table 4, we can found the quantity and magnitude of the problems identified in the "Conservation Dimension", for each one of the hiking trails in NPSAC. Therefore, to evaluate this dimension, we used the following variables: Litter in trails (A); Damage in the vegetation (B); Drainage (C); Waste dumps (D); Secondary trails (E). The magnitude of the problems encountered was evaluated on a scale of 1 (easy problem resolution) to 3 (unresolved issue).

Table 4: Evaluation of "Conservation Dimension"

Identification of the hiking trail		Number and typology of problems					Magnitude of the problems			
Municipality	**Identif. (initials)/name**	**A**	**B**	**C**	**D**	**E**	**1**	**2**	**3**	**T**
Alcanena	PR1(ACN)/O.A. Alviela	0	1	0	0	0	1	0	0	**1**
Alcobaça	PR1(ACB)/V. Ventos	1	0	0	0	0	1	0	0	**1**
Porto Mós	PR1(PMS)/S. Lua	2	0	0	0	0	2	0	0	**2**
Porto Mós	PR2 (PMS)/A. Memória	1	0	0	1	0	2	0	0	**2**
Porto Mós	PR3(PMS)/L. Pocilgões	1	0	3	0	0	4	0	0	**4**
Porto Mós	PR4(PMS)/S. Bento	0	0	0	0	0	0	0	0	**0**
Porto Mós	PR5(PMS)/Castelejo	1	1	13	0	1	11	5	0	**16**
Porto Mós	PR6(PMS)/Fórnea	0	0	0	2	0	2	0	0	**2**
Porto Mós	PR7(PMS)/Corredoura	0	0	0	0	0	0	0	0	**0**
Porto Mós	PR8(PMS)/S. Galega	2	1	1	0	0	4	0	0	**4**
Porto Mós	PR9(PMS)/E. Romana	0	0	0	0	0	0	0	0	**0**
Rio Maior	PR1(RMR)/M. Sal	1	1	0	1	1	4	0	0	**4**
Rio Maior	PR2 (RMR)/C. Alcobertas	0	0	0	0	0	0	0	0	**0**
Santarém	PR1(STR)/A. Pena	1	0	0	0	0	1	0	0	**1**
Torres Novas	PR1(TNV)/G. Almonda	0	0	0	0	0	0	0	0	**0**
V. Nova Ourém	PR1(VNO)/B.C. Farto	1	0	0	1	0	0	2	0	**2**
	Totals	**11**	**4**	**17**	**5**	**2**	**32**	**7**	**0**	**39**
	%	*28.2*	*10.3*	*43.6*	*12.8*	*5.1*	*82.1*	*17.9*	*0*	

Legend: A= Litter in trails; B= Damage in the vegetation; C= Drainage; D= Waste dumps; E= Secondary trails; 1= easy problem resolution; 2= hard problem resolution; 3= unresolved issue

In the "Conservation Dimension" we may identify a total of 39 problems, corresponding to 15.7% of the total problems (n = 248). This dimension has a smaller number of problems identified in comparison to the previous dimension. Anyway, we highlight the major problems in "Drainage" (43.6%) and in "Litter in trails" (28.2%). The remaining variables have lower relative values (between 5.1% and 12.8%).

Regarding the magnitude of the problems observed, the trend of the previous analyses maintains, because most of the problems are easier to solve (82.1%). However, it is worrying that there is a considerable number of problems difficult to solve (n = 7), whereby greater attention by the respective responsible will be required.

Regarding specific review, we highlight the PR5 (PMS) "Castelejo", as the trail that presents greater problems in terms of preservation of the environment because there is a total of 16 occurrences, with an index of considerable severity, since five of the identified problems are difficult to solve. In this case, the problems associated with "drainage" should be the main issue to be resolved in the near future.

In table 5, we can identify the quantity and magnitude of the problems identified in the "Safety Dimension" for each one of the hiking trails. Therefore, to evaluate this dimension, we used the following variables: Falling stones (A); Falling trees (B); Exposure to fall (C); Wildlife (D); Protection Works (E). The magnitude of the problems encountered was evaluated on a scale of 1 (easy problem resolution) to 3 (unresolved issue).

Table 5: Evaluation of "Safety Dimension"

Identification of the hiking trail		**Number and typology of problems**					**Magnitude of the problems**			
Municipality	**Identif. (initials) / name**	**A**	**B**	**C**	**D**	**E**	**1**	**2**	**3**	**T**
Alcanena	PR1(ACN) / O.A. Alviela	0	0	0	0	0	0	0	0	**0**
Alcobaça	PR1(ACB) / V. Ventos	0	0	0	0	0	0	0	0	**0**
Porto Mós	PR1(PMS) / S. Lua	0	0	0	1	1	2	0	0	**2**
Porto Mós	PR2 (PMS) / A. Memória	0	1	0	1	0	2	0	0	**2**
Porto Mós	PR3(PMS) / L. Pocilgões	0	0	0	0	0	0	0	0	**0**
Porto Mós	PR4(PMS)/ S. Bento	0	0	0	0	0	0	0	0	**0**
Porto Mós	PR5(PMS)/ Castelejo	0	0	3	0	0	3	0	0	**3**
Porto Mós	PR6(PMS) / Fórnea	0	0	2	0	1	3	0	0	**3**
Porto Mós	PR7(PMS) / Corredoura	0	0	0	0	0	0	0	0	**0**
Porto Mós	PR8(PMS) / S. Galega	0	0	1	0	0	1	0	0	**1**
Porto Mós	PR9(PMS)/ E. Romana	0	0	0	0	0	0	0	0	**0**
Rio Maior	PR1(RMR) / M. Sal	0	0	1	0	0	1	0	0	**1**
Rio Maior	PR2 (RMR) / C. Alcobertas	0	0	0	0	0	0	0	0	**0**
Santarém	PR1(STR) / A. Pena	0	0	0	0	0	0	0	0	**0**
Torres Novas	PR1(TNV) / G. Almonda	0	0	0	0	0	0	0	0	**0**
V. Nova Ourém	PR1(VNO) / B.C. Farto	0	0	0	0	0	0	0	0	**0**
	Totals	**0**	**1**	**7**	**2**	**2**	**12**	**0**	**0**	**12**
	%	*0*	*8.3*	*51.3*	*16.7*	*16.7*	*100*	*0*	*0*	

Legend: A= Falling stones; B= Falling trees; C= Exposure to fall; D= Wildlife; E= Protection Works; 1= easy problem resolution; 2= hard problem resolution; 3= unresolved issue

In the "Safety Dimension" we can identify issues in a total of 12 corresponding to 4.8% of the total problems (n = 248). This dimension has the lowest frequency of issues regarding all dimensions studied. The main problem encountered concerns the "Exposure to fall" (51.3%), relegating to the background, the presence of "Wildlife" and the "Protection Works" with similar figures for (16.7%).

As regards the magnitude of these problems it is found that they are entirely easy resolution (100%). Although the results take little relevance in this dimension, it identifies the PR5 (PMS) "Castelejo" and PR6 (PMS) "Fórnea" with 3 problems each, relating to "Exposure to fall", but easily resolved.

DISCUSSION

This study was evaluated according to four variable dimensions, in particular "Trail", "Marking", "Conservation" and "Safety". The results, if considered in an integrated manner, should enable not only their discussion, but also contribute to the quality of the practice of hiking in NPSAC.

In the "Trail Dimension", considering all the trails (n = 16) and all of the problems encountered (n = 39), there is a mean of 2.4 problems per trail. Moreover, from the perspective of the quality of trails, it appears that the problems are not yet very severe because the magnitude is low. The main results focus on the existence of "Obstacles" (e.g. trees, rocks), something that could be considered natural given that the practice develops in natural spaces. In this situation, it should be ensured the necessary means of maintenance and improvement as these obstacles can cause accidents (Neves, 2012). In relation to 'visibility' and to 'identification of the signage', two opposing possibilities arise, i.e., lack of monitoring / maintenance and the low search for these spaces. These may be the reasons for the existence of these facts, as the frequent use of these spaces for recreational purposes also contribute to the visibility of the routes, thus preventing the vegetation from covering areas and signs of the trails. On the other hand, we may be facing problems of an environmental nature (environmental impact). In this sense, noting the obvious need for technical monitoring, it will be possible to develop hiking as part of environmental education (Rosa & Carvalhinho, 2012) at schools and amongst local populations in order to promote the natural and cultural values of local societies and a greater awareness of the natural resources.

For the "Marking Dimension" we obtained the highest and the most troubling results in all analysis with the identification of 158 problems. Marks and other signage elements present in trails are easily perishable

with the influence of weather (sun, rain, humidity), with the natural development of the flora, with the lack of maintenance and probably also with some vandalism. Thus, the wear on the colouring, together with the absence and the difficulty in finding specific signage, are consequences of the aspects previously presented, but with a real disadvantage, which is the case of the lack of effective inspection and maintenance of the trails. Characteristics related to the marking and identification of recreational areas are basic aspects for the successful implementation of natural spaces for sport (FCMP, 2012). In concrete terms, the route PR5 (PMS) "Castelejo" presents 68 problems of this nature and this aspect alone will negatively influence the experience of any hikers that face this trail.

In addressing the "Conservation Dimension", two previous aspects need to be considered: i) the environmental impacts from the use, environment and management (Marion, 1998); ii) the aggressions on the environment performed by users contribute to the deterioration of the recreational experience (Dorwart, Moore, & Leung, 2010; Kyle, Graefe, Manning, & Bacon, 2004). In this case, the global results that were obtained do not seem very problematic, since almost all the studied HT have between 1 and 4 problems, except for PR5 (PMS) "Castelejo", which reveals a high level of incidents (n = 16). As a tendency, inappropriate actions of users can be a major cause of environmental impact. However, variables directly related to these, such as 'Damage to vegetation', 'Waste dumps' and 'Side trails', present values of relatively low frequency, except for the variable 'Litter in the trails' (n = 11). Interestingly, the highest value occurs at 'Drainage' (n = 17), this being related to soil deterioration. Furthermore, this type of problem can arise from environmental influences (e.g., periods of very heavy rainfall in sensitive soils) and from the direct use of the practice of hiking, or even other activities like mountain biking or the use of motor vehicles. In this case, we do not consider that problems result from the lack of maintenance, but rather from the need to include more appropriate and more responsible measures from the management. A reassessment of the carrying capacity and an increased monitoring of space may be some possible solutions for solving the problems derived from the use. If we consider environmental factors as sources of the problems, there may be a need to strengthen certain areas of the trails (e.g., footbridges) or opt for new trails that pass through tougher areas. Regular cleaning of these areas is also essential for a quality recreational experience, as the existence of trash and debris are two of the most easily perceived factors by the users of natural spaces for the development of their recreational activities (Dorwart et al., 2010; Hardiman & Burgin, 2010; White, Virden, & van Riper, 2008).

Regarding the last dimension, "Safety Dimension", all the problems have had a low impact throughout the study (n = 12), as all the variables present residual values. However, contrary to other dimensions in the study, the problems encountered for this dimension should not only have a quantitative perspective (observation of frequency and magnitude) but also qualitative. A single issue of this context can be constituted as an important risk factor and condition all benefit from the practice of Hiking (Carvalhinho, Frazão & Moutão, 2013). In this dimension, it was found that precisely this kind of problem exists in at least 4 trails of NPSAC, especially negative for PR5 (PMS) "Castelejo", where most cases were found and with more severity. It is in this scope that regular and effective monitoring of the trails — especially those which, by their natural characteristics, suggest a higher occurrence of these problems — should be a pressing reality, because the safety of people and the quality of the respective destinations are at stake.

Finally, we should also consider that the management of such a large number of trails and an equally vast protected area is no easy task for the management of NPSAC. If the difficulties in mobilizing resources (especially human) join the financial difficulties experienced in the public area, we face a situation difficult to solve or improve in the near future. In this perspective, not only are natural resources to be affected, but also the users (e.g., local people, tourists, hikers, users) and stakeholders (e.g., Business and associations related to sport, recreation, tourism, and schools) that promote this space, contributing to the responsible development of NPSAC. Thus, it is considered that the sharing of responsibilities concerning the monitoring and maintenance of trails may be shared among local stakeholders, depending on their skills or location in the NPSAC area. The financial resources (reduced) needed for some maintenance activities of the trails may be, in our opinion, the responsibility of specific agents, contributing to the territory in an integrated and responsible way, as well as to the improvement of the services they provide.

CONCLUSIONS

This study sought to assess the totality of 16 hiking trails marked and registered in the 'Nature-based Sports Map' (NBSM) of the Natural Park of Serras de Aire e Candeeiros (NPSAC). In this sense, the results showed the following:

In relation to the "Trail Dimension", the trails present some easy to solve problems, with emphasis on the existence of "Obstacles". Specifically, the PR1 (RMR) "Marinhas do Sal" and the PR3 (PMS) "Lapa dos Pocilgões" present the highest incidence.

The "Marking Dimension" is undoubtedly one that entails greater attention for having the largest number of problems which are also more severe. The 'Damage to the marks and signs' of the trails is the variable that has more problems, followed by 'Incorrect signage' and 'Lack of signage'. In general, most situations are easy to solve, however, PR5 (PMS) "Castelejo" stands out negatively by presenting a high number of occurrences, as well as the PR7 (PMS) "Corredoura" because it contains difficult problems to solve.

In relation to the "Conservation Dimension", 'Drainage' and 'Garbage in the trails' stand out as variables that deserve greater attention in terms of maintenance and future action, despite having a reduced number of occurrences. Most problems are easy to solve, however it is necessary to take into account the situation of PR5 (PMS) "Castelejo" as it is the trail which represents the most serious problem regarding the conservation of the environment.

The fourth and final dimension, "Safety Dimension", showed the best results among all the dimensions studied. However, it was found that the main problem is related to the 'Exposure to Fall'. Regarding the magnitude of these problems, it was found that they are entirely easy to solve. Nevertheless, the PR5 (PMS) "Castelejo" and PR6 (PMS) "Fórnea" trails have security problems that should be quickly and effectively solved.

Summing up, this study allowed to contribute effectively to the knowledge of the reality of the practice of hiking on the NPSAC, regarding the practice conditions and diversity available, as well as their constraints and potential. There is constant work to be carried out to ensure the quality of the practical conditions in these places, by also making these more attractive and capable of generating sustainable development as local spaces. Finally, it is recommended that the various entities, stakeholders and the general population consider the results of this work, so that they can also participate more actively and responsibly.

REFERENCES

Alencoão, A., Gomes, E., Quaresma, L., Sousa, L., & Gabriel, R. (2011). *Percursos Pedestres. O valor natural e a promoção da saúde*. Vila Real: Universidade de Trás-os-Montes e Alto Douro.

Barton, J., Hine, R., & Pretty, J. (2009). The health benefits of walking in greenspaces of high natural and heritage value. *Journal of Integrative Environmental Sciences, 6*(4), 261-278. doi: 10.1080/19438150903378425

Becker, P. (2010). *Encountering, Experiencing and Exploring Nature in Education*. Eslovénia: European Institute for Outdoor Adventure Education and Experiential Learning.

Beedie, P., & Hudson, S. (2003). Emergence of Mountain-Based Adventure Tourism *Annals of Tourism Research, 30*(3), 625-643. doi: 10.1016/S0160-7383(03)00043-4

Bell, S., Tyrväinen, L., Sievänen, T., Pröbstl, U., & Simpson, M. (2007). Outdoor Recreation and Nature Tourism: A European Perspective. *Living Reviews in Landscape Research, 1*(2).

Bourdeau, P., Corneloup, J., & Mao, P. (2002). Adventure Sports and Tourism in the French Mountains: Dynamics of Change and Challenges for Sustainable Development. *Current Issues in Tourism, 5*(1), 22-32. doi: 10.1080/13683500208667905

Brandão, B. (2011). *Avaliação da qualidade dos percursos pedestres homologados em Portugal.* (MsD), ESHTE, Estoril.

Brymer, E., & Gray, T. (2010). Developing an intimate "relationship" with nature through extreme sports participation. *Leisure/Loisir, 34*(4), 361-374. doi: 10.1080/14927713.2010.542888

Carvalhinho, L. (2006). *Os Técnicos e as Actividades de Desporto de Natureza - Análise da formação, funções, e competências profissionais.* (PhD), Universidade de Trás-os-Montes e Alto Douro, Vila Real.

Carvalhinho, L., Frazão, H., & Moutão, J. (2013). The Safety of young adolescents in nature-based sports: Risk perception and prevention. *Atención Primaria, 45*(27).

Carvalhinho, L., & Rosa, P. (2012). *Avaliação de Espaços de Prática Desportiva: Contributo para a Revisão da Carta de Desporto de Natureza do PNSAC.* Paper presented at the 2º Congresso da Sociedade Científica de Pedagogia do Desporto, UTAD, Vila Real.

Correia, A. (1991). Desportos Náuticos - Rios, espaços de aventura. *Revista Horizonte, 3*(43), 3-8.

Cunha, L. (2007). *Os espaços do desporto* (1ª ed.). Lisboa: Edições FMH.

Dorwart, C., Moore, R., & Leung, Y. (2010). Visitors' Perceptions of a Trail Environment and Effects on Experiences: A Model for Nature-Based Recreation Experiences. *Leisure Sciences, 32*(1), 33-54. doi: 10.1080/01490400903430863

Ek, R., Larsen, J., Hornskov, S., & Ole, K. (2008). A Dynamic Framework of Tourist Experiences: Space-Time and Performances in the Experience Economy. *Scandinavian Journal of Hospitality and Tourism, 8*(2), 122-140. doi: 10.1080/15022250802110091

FCMP. (2012). www.fcmportugal.com. Retrieved Outubro, 2012

Ferreira, G. (1998). Environmental Education through Hiking: a qualitative investigation. *Environmental Education Research, 4*(2), 177-185. doi: 10.1080/1350462980040205

Hardiman, N., & Burgin, S. (2010). Visit impacts and canyon management in the Blue Mountains, Australia: Canyoners' perspectives and wilderness management. *Managing Leisure, 15*(4), 264-278. doi: 10.1080/13606719.2010.508667

ICN. (2004). *A,b,c das áreas protegidas – parques, reservas, paisagens protegidas e monumentos naturais de Portugal continental*. Lisboa: Instituto de Conservação da Natureza.

IUCN. (2002). *Sustainable Tourism in Protected Areas - Guidelines for Planning and Management*. IUCN,Gland,Switzerland and Cambridge,UK: World Tourism Organization.

Kastenholz, E., & Rodrigues, A. (2007). Discussing the Potential Benefits of Hiking Tourism in Portugal. *Anatolia, 18*(1), 5-21. doi: 10.1080/13032917.2007.9687033

Kyle, G., Graefe, A., Manning, R., & Bacon, J. (2004). Effects of place attachment on users' perceptions of social and environmental conditions in a natural setting. *Journal of Environmental Psychology, 24*, 213-225. doi: 10.1016/j.jenvp.2003.12.2006

Lee, T. (2011). How recreation involvement, place attachment and conservation commitment affect environmentally responsible behavior. *Journal of Sustainable Tourism, 19*(7), 895-915. doi: 10.1080/09669582.2011.570345

Leung, Y., & Marion, J. (2000). *Recreation Impacts and Management in Wilderness: A State-of-Knowledge Review*. Paper presented at the Wilderness science in a time of change conference, Missoula, MT.

Light, R. (2006). Situated learning in an Australian surf club. *Sport, Education and Society, 11*(2), 155-172. doi: 10.1080/13573320600640686

Lynn, N., & Brown, R. (2003). Effects of recreational use impacts on hiking experiences in natural areas. *Landscape and Urban Planning, 63*(1-2), 77-87. doi: http://dx.doi.org/10.1016/S0169-2046(02)00202-5

Manfredo, M., Driver, B., & Brown, P. (1983). A test of concepts inherent in experience based setting management for outdoor recreation areas. *Journal of Leisure Research, 15*(3), 263-283.

Manning, R. (2007). *Parks and Carrying Capacity: Commons Without Tragedy*. USA: Island Press.

Marion, J. (1998). *Recreation Ecology Research Findings: Implications for Wilderness and Park Managers*. Paper presented at the National Outdoor Ethics Conference, St. Louis, MO. Gaithersburg, MD.

McCool, S. F. (2006). Managing for visitor experiences in protected areas: promising opportunities and fundamental challenges. *PARKS, 16*(2), 3-9.

Neves, D. (2012). *Segurança e Gestão do Risco em Turismo de Natureza e Aventura*. Paper presented at the International Conference on Tourism Recreation: Building Bridges over Tourism Recreation Practices, Peniche, Portugal.

Pröbstl, U. (2010). *Natura 2000: Outdoor Recreation and Tourism: A Guideline for the application of the habitats directive and the birds directive*. Germany: Natura 2000.

Ramthun, R. (1995). Factors in User Group Conflict Between Hikers and Mountain Bikers. *Leisure Sciences, 17*(3), 159-169. doi: 10.1080/01490409509513254

Rodrigues, A., Kastenholz, E., & Rodrigues, A. (2010). Hiking as a wellness activity – an exploratory study of hiking tourists in Portugal. *Journal of Vacation Marketing, 16*(4), 331-343. doi: 10.1177/1356766710380886

Rosa, P., Almeida, M., & Carvalhinho, L. (2011). *Gestão da recreação em áreas protegidas: relevância dos aspectos sociais* Paper presented at the Congresso Internacional de Montanha-CIM2011, Estoril.

Rosa, P., Almeida, M., & Carvalhinho, L. (2013). The importance of data triangulation in nature-based sport management in protected areas: The study of the Natural Parks of Serras de Aire e Candeeiros. *European Journal of Tourism, Hospitality and Recreation, 4*(3), 147-180.

Rosa, P., & Carvalhinho, L. (2012). A educação ambiental e o desporto na natureza: Uma reflexão crítica sobre os novos paradigmas da educação ambiental e o potencial do desporto como metodologia de ensino. *Movimento, 18*(3), 259-280.

Torbidoni, E. (2010). Managing for Recreational Experience Opportunities: The Case of Hikers in Protected Areas in Catalonia, Spain. *Journal of Environmental Management, 47*(1), 482-496. doi: DOI 10.1007/s00267-010-9606-z

Tumes, K. (2007). Out of my way: Using qualitative methods to understand recreation conflict between bushwalkers and mountain bike riders. *ANTHROPOLOGICAL NOTEBOOKS, 13*(1), 45-55.

Watson, A., Niccolucci, M., & Williams, D. (1994). The Nature of Conflict Between Hikers and Recreational Stock Users in the John Muir Wilderness. *Journal of Leisure Research, 26*(4), 372-385.

White, D., Virden, R., & van Riper, C. (2008). Effects of Place Identity, Place Dependence, and Experience-Use History on Perceptions of Recreation Impacts in a Natural Setting. *Environmental Managemet, 42*(4), 647-657. doi: 10.1007/s00267-008-9143-1.

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