

NATURE TRAILS MANAGEMENT AND ENHANCEMENT: THE CASE OF HERCULES' TRAIL AT THE OITI MOUNTAIN (GREECE)

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Abstract

The natural environment and the mythology of certain areas are in some cases fascinating features and a pole of attraction. These areas are often enhanced through specific and predetermined nature trails. The area of north-east Oiti Mountain is a typical example, being traversed by the nature trail of Hercules (Hercules' Trail).

The purpose of the present research is to highlight the natural environment (flora, fauna), landscape, geology, geomorphology and mythology, of this area, and to propose improvements on the management of the trail (construction maintenance, cleaning, security, etc.).

Key words: environment, geomorphology, oiti mountain, mythology, nature trail management, hercules trail

1. INTRODUCTION

The organised outdoor walking routes, called “trails”, offer opportunities for exercise while facilitating getting in touch with nature, appreciating the special features of the area (flora, fauna, landforms, etc.), and enjoying the scenery and often the tradition, history and mythology. These trails are among the most important “tools” that experts use in order to illustrate the environmental features, but also historical data and traditions of certain areas.

In the past, most of the trails were opened to facilitate communication of mountain areas with the lowlands and larger towns, and between the villages. Many of the trails, especially those in rural areas, were also opened to serve the movement of people and animals, the local logistical needs and generally the agricultural and pastoral life of the residents.

The mountain of Oiti, crisscrossed by a dense network of trails, is one of the ten Mountainous National Parks of Greece (www.hellaspath.gr). In terms of vegetation, Mt Oiti is dominated by Greek fir forests (*Abies cephalonica*) and there is a small area in the northeast of the National Park in which the black pine (*Pinus nigra*) is encountered (www.oiti.gr). The deciduous oak forests (*Quercus sp.*) also occupy a small area alongside with the mixed oak and fir forests on the southern and western parts of Mt Oiti. Thermophile evergreen broadleaved species, like *Quercus ilex*, *Pistacia lentiscus* and *Arbutus sp.* as well as kermes oaks (*Quercus coccifera*) are also encountered in Mt Oiti. The local flora includes a large number of plant species endemic to Greece while two local endemic species have been recorded: *Veronica oetaea* and *Allium lagarophyllum*. Moreover, there are meadows with species of impressive beauty that visitors can enjoy: croci (*Crocus veluchensis*, *Crocus sieberi*), wild onions (e.g. *Allium phthioticum*), poet's Narcissus (*Narcissus poeticus*), lilies (*Lilium chalcidonicum*, *Lilium martagon*, *Lilium candidum*), etc (M.B.M.O.N.P. 2013, Karetsos, 2014). The mild relief, the natural beauty of the landscape, the amazing views, the distinct geomorphological features, the uninterrupted tradition but also the mythology, that ranks Oiti as one of the “Mythic Mountains”, attract the naturalist visitors, as much as the researchers, who wish to trek over the mountain.

The trails of the Mt Oiti, are of great ecological, scientific and research interest. The most important of them belong to the categories “Nature Trails”, “Geological trails”, “Botanical trails” and “Rural trails” being among the major infrastructure of the mountain regarding outdoor and forest recreation. Oiti trail network also includes “Hiking trails”, “Walking trails”, “Trekking trails” and “Running trails”. Oiti’s network of trails includes numerous hiking and mountaineering routes, with various thematic interests and degrees of difficulty, such as the “Farmakides trail”, “Trail of Railway workers’ (Sidirodromikon trail)”, etc. Several cyclists-visitors, cross Oiti, on their bikes, specially designed for mountain biking, following numerous mild routes in the forest road network.

Mt Oiti is, also, particularly interesting for experienced “canyoners”. Canyoning trips are systematically conducted, for instance at the impressive and imposing gorge of Gorgopotamos, which, having a high degree of difficulty, ranks among the top three in Europe, and at the gorges of Rodokalos, Kamariotis, Gerakaris, Kakavos and Asopos, but require special expertise, fitness and specialized equipment.

Nowadays, many of these trails, in the area of Mt Oiti, have been mapped, upgraded and maintained under the responsibility of the relevant Forest Services, the Management Body of Mt Oiti National Park, and the Hellenic Alpine Club of Lamia, leading to different degrees of alternation in their routes, so they can, now, be used both for outdoor recreation and for the promotion of environmental, traditional and mythological features. Two trails of Oiti’s network of trails, the Hercules’ Trail and the Shepherds’ Trail have recently joined the Mediterranean Network of Mountain Trails in Protected Areas MEDIMONT PARKS Project, which implements the Protection Commission mountainous Environment (Commissione Tutela Ambiente Montano) of the Italian Alpine Club (Club Alpino Italiano). The trails of this network are required to meet certain terms and conditions related to their features, such as duration and degree of difficulty of the route, etc (Casanova O. 2012). Alongside the approved program LIFE + NATGR 1014 (Action C.1), the maintenance and overhaul of the existing network of trails and the creation of camping sites are among the provisions, for the area of Mt Oiti and the nearby mountain, Kallidromos (www.foropenforests.org). Parts of the trail network of Mt Oiti, have been included in the route of various races, namely, Hercules Mountain Marathon (42,350 m), Helleborus Half Marathon (16,200 m), Farmakides Trail (6,410 m), Filoktitios dromos (14,900 m), as well as the two annual MTB (Mountain Bike) Marathons ITI EPIC (35 & 60 km).

Important common features of these actions are the proper management, maintenance, and overhaul of Oiti’s trails, the appropriate measures for the promotion of the surrounding area and overall, protection and treatment of the natural and built environment. Alternative forms of races are also important for the protection of the local environment. These races appear more and more the last few years, replacing the rally racing events that used to take place in the area, such as the Acropolis Rally and various off-road 4x4 and motocross races, that brought detrimental effects on the wildlife.

This paper includes: a. The description of the natural environment of Mt Oiti and the area of the Hercules’ Trail, focusing on the particular geomorphological features identified in the region, while taking the local mythology in account. b. Suggestions for the promotion and management of the trail, including the improvement of the route, new construction projects, maintenance of wooden and metal structures, signage, cleanliness, etc.

2. MATERIALS AND METHODS

2.1 Geographical location of the study area

Hercules’ Trail, the subject of this paper, is located in the north-eastern side of Mt Oiti in Central Greece (Figure 1). Mt Oiti, with Pyrgos (2,152 m) and Greveno (2,114 m) being the highest peaks, is one of most easily accessible mountains of Central Greece and it is part of the massif of eastern Central Greece that also includes the mountains Parnassos, Gkiona, Vardousia, Kallidromos and Tymfristos. Most of Hercules’ Trail goes around the Xerovouni Peak (1,804 m) in altitudes between 1,000 and 1,600 m. Just a small part is located with north-western to south eastern direction, in the

bottom of Katavothra Plateau, with 1,560 m altitude at the location of the cave. The main nearby villages are Pavliani (1,040 m), Pyra (1,160 m), Mavrolithari (1,140 m) and Oiti (680 m).



Figure 1: Geographical location of the study area

North-eastern Oiti and especially Hercules' trail, is accessible to the visitor that comes from Athens via Thermopylae and Pavliani Village, where the trail starts. A trip from Athens to Thermopylae is 195 km long (around 2h by car) and to Pavliani is 230 km (around 2h30 by car).

2.2 Study Methodology

This study used both secondary and primary data. Secondary data collection involved review of existing reports (unpublished, gray and published reports) from libraries and documentation centers in various institutions in Athens, Lamia, Ypati and Amfissa. Some reports were also made available through internet search. Secondary information were supplemented by primary data at "trail unit" level, whereby small meetings were made with the local non-government environmental organizations, and the relevant Forest Services, the Management Body of Mt Oiti National Park and the Hellenic Alpine Club of Lamia. The environmental situation of Mt. Oiti was evaluated by using the existing bibliographic data, such as the Management Plan of the National Park of Oiti (Karetsos et al. 1996, Karetsos G. 2002), Special Environmental Study (M.E.P.P.P.W., 2003a), Special Management Plan of Sperchios (Georgiou et al. 1996), NATURA 2000 database (M.E.P.P.P.W., 2003b), The Mountain Oiti - Hiking Routes in Nature, Tradition and Mythology (Syleounis et al. 2013), Oiti: A Mountain Full of Beauties and Myths, and the Geographic Information Systems data about the land ecosystems of Central and South Greece (Fasoulas et al. 2001).

For the depiction of the environmental situation (vegetation, flora, fauna, geology, geomorphology, water resources, landscape) and mythology, of Mt Oiti and of the Hercules' Trail, involved a series of different stages: the study of bibliographical references, systematic in situ observations (field-work), measurements using the Global Positioning System (GPS) satellite signals, observation and direct digitizing on the basis of different aged aerial photos and satellite images (Google Earth). Also, have been used contemporary and older topographical maps (Hellenic Military Geographical Service, scale 1:50.000 and 1:100.000), geological maps (Institute of Geology and Mineral Exploration, scale: 1:50.000), hydrological data and forest maps of vegetation and land uses (Ministry of Reconstruction

of Production, Environment & Energy, scale: 1:200.000). All primary data were imported in an apposite database and were transferred in topographical map and onto satellite images (Google Earth). Thus the database was developed and updated with data deriving from different sources. Data were analyzed quantitative and qualitative, while different thematic maps were created.

2.3 Institutional frame of the region - Mt Oiti Protection status

The law frame "About the protection of the environment" (L. 1650/1986) incorporates new management principals and is harmonised with the directives and regulations of the European Union. It introduces the obligation of Special Environmental Studies existence and Presidential Decrees passing about the protected areas. It also includes a special chapter "About the protection of Nature and Landscape", that proposes new categories of Protected Areas and introduces changes in the administration and management of protected areas by establishing Management Authorities. Mt Oiti includes areas that are covered by a protection status at a National and Community level. These are more specifically the following:

a. Sites of the Natura 2000 Network:

1. National Park of Mt Oiti-Asopos Valley (GR2440007) and two Special Areas of Conservation (SAC) for the conservation of natural habitats and of the wild fauna and flora according to Directive 92/43/EEC. 2. National Park of Mt Oiti (GR2440004) and 3. Gorgopotamos Gorge (GR2440003)

b. Wildlife Refuges: 1. Skasmeni Frantzi-Dyo Vouna (K325) & 2. Oiti-Pavliani (K625).

The "National Park of Oiti" is a protected nature reserve, in order to preserve and protect the rich fauna and flora, as well as the mountain's unique geomorphological features. Was established in 1966 by the Royal Decree 218/7-3-1966 "About the foundation of the National Park of Oiti " (Official Journal of the Hellenic Republic 56/12-3-1966 v.A'), according to the provisions of the Developmental Law 856/1937. The reasons that led to the declaration of a part of Oiti's mountainous massif to a National Park are: a. the impressive topographic configuration of the region and the protection of the formal fir forest (*Abies cephalonica*), b. the connection of Oiti with the mythology and the country's history, c. the existence of a wild goat species, the Balkan chamois (*Rupicapra rupicapra* ssp. *balcanica*) and d. the existence of impressive meadows and small temporary ponds at the upper forest zone (Figures 2 & 3). National Park of Oiti has an area of 7,000 hectares of which 3,370 are the "core" zone and the other 3,630 are the peripheral zone. According to the current legal framework, the "core" zone of Mt Oiti National Park is under an absolute protection regime for maintaining the flora and fauna intact. In 2002 the Management Body of Mt Oiti National Park was established, by the Law 3044/2002 under the supervision of the Ministry of the Environment, Energy & Climate Change, and is responsible for managing and protecting Mt Oiti. The region under its responsibility is an area of 19,835 hectares. Also, has under it's supervision two more areas that belong to the same mountainous massif: a. Gorgopotamos Gorge and b. Asopos Valley.

2.4 Climate conditions

The 68% of annual rainfalls takes place during the humid period and the 32%, the dry period. The height of rainfalls varies from 600 mm, in the low areas to 1800 mm, in the tops of Mt Oiti. The rain scale (rain transition every 100 m.), has been assessed at 62,8 mm. The hottest month is July and the coldest is January. The mean temperature varies from 7,6 °C the coldest month, up to 27,8 °C in the lower areas, while at 1800 m is assessed being ten degrees lower, during the whole year. The temperature scale is assessed at 0,6 degrees of Celsius respectively. The dry period lasts 4,5 months in lower areas and one month in the mountainous ones, respectively. Based on UNESCO-FAO (1963) climate classification, the low areas of Mt Oiti are included in the weak Thermo-Mediterranean level with mild winter, while the highest areas are included in the Oro-mediterranean level with harsh winter (Karetsos, 2002).

2.5 Vegetation – Flora - Fauna

The vegetation of Mt Oiti consists of evergreen broadleaved formations at lower altitudes, of deciduous oaks forests (*Quercus* sp.) at the Koumaritsi – Pauliani and Mesoxori - Pyrgos localities, of

Greek fir forests (*Abies cephalonica*) at the total of the mountainous massif over 600 m. and mountainous meadows in higher altitudes (Figures 2 & 3). Also the kermes oaks (*Quercus coccifera*), which have a broader altitude distribution, are encountered. In this broad distribution, 15 different types of ecotopes are formed, according to the NATURA 2000 recording, 13 of which are included in the Annex I of the Directive 92/43/EEC, while two are new for Greece (Fasoulas et al., 2001). According to recent researches in the wider region of Mt Oiti, 10 plant societies and 18 new plant communities exist that were described for the first time (Karetsos, 2002). The areas of the Mt Oiti National Park and the Gorgopotamos Gorge are characterized as Sites of Community Interest (SCI), while the area of Asopos Valley is characterized as Special Protection Area (SPA) (M.E.P.P.W, 2003b, Dimopoulos et al., 2005).



Figures 2 & 3: Fir forests and mountain meadows in the wider area of Katavothras' plateau.

Regarding to the flora, the total number of species that is evaluated as Important for Mt. Oiti, based on their integration and protection in National Lists (P.D. 67/81), the Red Data Book of Rare and Threatened Plants of Greece (Foitos et al., 1996, Foitos et al., 2009) as well as in Threatened Categories according to European and International Lists, reaches 99.

Oiti holds an invaluable wealth of flora. That is why it is also known as the mountain of flowers (Figures 4 & 5). Its geological history, the special climatic conditions and the diversity of the landscape have created an impressive variety of ecological conditions that are ideal for the occurrence of a wide variety of plants (M.B.M.O.N.P. 2013). Moreover, Mt Oiti hosts a relatively large number of plant species endemic to Greece, as well as the Balkans. By the 77 endemic species of Mt Oiti, 41 are included in one of the Lists mentioned before. Also 53,2% of Mt Oiti total endemic species is included in one of the Threatened Categories (Rare, Endangered, Threatened).

In relation to the exclusive endemic species of Mt Oiti, *Veronica oetaea*, that was located for the first time by Gustavsson (1978), it's biotopes are mentioned to be extremely small in extent. According to the Red Data Book of Rare and Threatened Plants in Greece (2009), it belongs to the critically endangered species that are threatened with extinction, which is mainly due to the very limited region where it is found. More specifically it is found in three small temporary ponds of high altitude (Livadies, Trapeza and Alykaina), when they dry up between late May and mid June. It appears for a short period (2–3 weeks) of time and is not easily identified, since it is small in size (up to ~ 5 cm high) with small white flowers (M.B.M.O.N.P. 2013). Gustavsson (1978) himself reports that it is threatened by the extent of forest road networks and bauxite mining. The second mention does not seem certain because the exploitations are enough distant from the biotopes of the specific species. Also a species of wild onion (*Allium lagarophyllum*) is endemic to Oiti.

Other worth mentioning species of impressive beauty that one can see on Oiti are: lilies (*Lilium chalcidonicum*, *Lilium martagon*, *Lilium candidum*), poet's Narcissus (*Narcissus poeticus*), croci (*Crocus veluchensis*, *Crocus sieberi*), orchids (e.g. *Dactylorhiza* sp., *Orchis* sp., *Himantoglossum*

caprinum, *Cephalanthera rubra*), violas (e.g. *Viola aetolica*, *Viola graeca*), wild onions (e.g. *Allium phthioticum*), bellflowers (e.g. *Campanula versicolor*), knapweeds (e.g. *Centaurea triumfettii*), cowslips (*Primula veris*), iris (*Iris pumila* ssp. *attica*) and many others (M.B.M.O.N.P. 2013, Karetsos, 2014).



Figures 4 & 5: Some species of flora of the Mt Oiti. Lilies (*Lilium chalcidonicum*) (Fig. 4). Poet's Narcissus (*Narcissus poeticus*) (Fig. 5).

Regarding to bird fauna, from the 166 species of birds that are found in the wider region of Mt Oiti (Karetsos et al., 1996), 40 of them are considered strictly protected, according to the Community Directive 409/79. Half of the protected species (22) use the biotopes that exist in the core and the wider region of Mt Oiti National Park. The Convention of Bern includes 129 bird species of the wider region, 83 of which are also found inside the Mt Oiti National Park. It also includes 24 species of mammals, 15 of which are also found inside the Park, mainly bats (chiroptera) and 17 species of amphibians and reptiles. Amongst the most significant mammals on Oiti, are the Balkan chamois (*Rupicapra rupicapra* ssp. *balcanica*), a Balkan sub-species that is included in the threatened species of Greece. The P.D. 67/1981 strictly protects 35 species of mammals, except for the Wolf and the otter (*Lutra lutra*), all the rest are chiroptera and 32 species of amphibians and reptiles.

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Among the birds, a species is characterized as "Threatened" (the lammergeier, *Gypaetus barbatus*, which however is not a permanent resident of Oiti), while 4 species as "Vulnerable" and 5 as "Rare". Among the mammals of the core, 13 species are characterized "Threatened", 5 species "Vulnerable" and 2 species "Rare".

2.6 Geological setting – Geomorphology

The morphology of the land relief, in the wider region of the Mt Oiti National Park, is defined by the mountainous massif of Oiti with mild to steep slopes and intense morphological contrasts. Mt Oiti is the fifth highest mountain in Central Greece (Sterea Ellada), after the mountains Gkiona (Pyramida 2,510 m), Vardousia (Korakas 2,495 m), Parnassos (Liakoura 2,457 m) and Tymfristos (Velouchi 2,315 m) (Figures 6 & 7). The dominant structural elements are it's limestone steep tops, with highest

peak Pyrgos (2,152 m) and Greveno (2,114 m), that are located in the core of the Park, as well as a line of lower peaks, in its southern part, that approach or exceed 1,500 m (Tourkos, Xerovouni, Petsalouda, etc).



Figures 6 & 7: Mt Gkiona. From left to right the peaks Platyvouna (2,317 m), Pyramida (2,510 m) & Botsikas (1,945 m) (Fig. 6). Mt Vardousia. The peak Korakas (2,495 m) (Fig. 7).

Looking up, Mt Oiti appears to be a rough mountain, especially from its eastern and northern side, yet once you arrive at its heart, you encounter a different image with meadows full of wildflowers, such as those located at Livadies, Amaliolaka, Zapantolaka and Katavothra plateaus, where small temporary ponds are formed (M.B.M.O.N.P. 2013). The natural sloping and particularly those in the north-northeast side, present strong morphologic inclinations, with deep gorges, that are alternated by round out and intense karstic crests. These forms of relief, are differentiated depending on the nature and location of geological shapings, converting from limestones, that maintain satisfactory geotechnical characteristics (inclination 60-85%), to flysch, that is characterized by decreased geotechnical characteristics and is prone to weathering, erosion and landslides (inclination 20-60%), as well the tertiary deposits. In places on these limestone sloping, at the Dyo Vouna and Mexiates localities, the total of bauxite mines is located, while the mining spoils are discarded in neighbouring places.

Northern and to the north-east, in lower altitudes, quaternary deposits of Spercheios river and its tributaries, Asopos, Gorgopotamos and Xeria Ypatis, are shaped. These deposit include the alluviums of the valley, the weathering and erosion products of the background shapings, the alluvial fan, that constitute dynamically evolving geomorphological features and compose in their total, the alluvial extents of the Lamia plain. An important element for the dynamic geomorphological evolution of the region, is constituted by the big size alluvial fan (r. Asopos, r. Gorgopotamos, r. Xerias Ypatis, r. Xerias Ano Vardaton and r. Vistriza), that have been created in the places of hydrographic systems unloading at the low deposit area of Spercheios river and that owe their creation in the production of important quantities of parent materials, upstream and in the transport and deposition, downstream, from the hydrographic systems that drain the wider region of the Mt Oiti.

A particular geomorphological feature in the region is the Gorgopotamos gorge, the crest of which reaches 1,560 m. roughly, and its exit to the plain reaches 50 m, in length of about 6 kilometres. The presence of Katavothra cave, which is located in the eastern side of Mt Oiti, constitutes also a particular geomorphological feature, while more generally extensive is the presence of karstic cavities and karstic geomorphes of various sizes (dolines, poljes, sinkholes, etc.). Katavothra cave-sinkhole is also related to the plateau's natural underground drainage system. The surface water from the plateau enters the cave-sinkhole and penetrates through the limestone bedrock. The waters of the plateau, moving through a network of underground conduits and caves, enrich the underground aquifers and gush to the springs of Gorgopotamos.

Geologically, the region of study area is structured mainly, from sedimentary shapings, that are included geotectonically in the Parnassos- Ghiona and the Sub-Pelagonic series, while in the Koumaritsi locality a small appearance of Peridotitis is located. Specifically, regarding to the area Parnassos-Ghiona series, in which the bauxite horizons are located and the mining activities exploitation take place. In the wider region of Mt Oiti National Park, a neritic carbon sequence is constitutes (upper Triassic-upper Cretaceous era) and ends with the Flysch (Eocene era). This neritic sequence, is not continuous, but it is interrupted by a number of bauxite horizons, among which two are mainly used since nowadays for mining exploitation, and are defined stratigraphically as follows (I.G.S.R. 1960, I.G.S.R. 1967): a. Upper horizon and b. Lower horizon of bauxite.

2.7 Water resources

A large part of the wider region of the Mt Oiti National Park, is draining in the hydrologic basin of Spercheios river (M.E.P.P.W, 2003b). The main direction of the hydrographic network development, that drains at this region (tributaries Vistriza, Asopos, Gorgopotamos, Xerias Ypatis and the Xeria Ano Vardates, etc.) is north north-east and discharges in the bed of Spercheios river. These hydrographic systems present intense stream action during the rainy months. Also, important part of Oiti's mountainous massif (62.562 acres), falls into the basin of Mornos river and contributes to the homonymous tank (Mornos reservoir) that supplies Attica region, with water, while comparatively a small part (6.140 acres), belongs to the Viotikos Kifissos basin, which flows towards Copais plain and Yliki lake.

The surface water outflow, at the limestone area, is relatively low, about 40-60% of the total precipitations, while the hydrographic network that is developed, is of low density in the tops of mountainous elations, because of the intense karstic relief which increases in steep sloping. On the contrary at the area of geological formations of flysch and the tertiary depositions, the surface runoff water is increased and exceeds in percentage 70-80% of total precipitations, while the hydrographic network is dense dendritic type.

The diverse geological formations and the presence of limestone and flysch define the flow of the surface water as well as its subterranean movement, within the "labyrinthine" network of sinkholes and caves. As a result, one encounters many springs and traditional water fountains, such as Amaliovrisi, Perdikovrisi, Vrisi Kalogerou, etc. (M.B.M.O.N.P. 2013). The water penetration in the karstified limestone massifs, that present the bigger spread in the study area, is high and reaches 60-80%. For this reason, during the summer period permanent surface flowing waters are absent and are only located downwards the sources of Gorgopotamos river. In the wider region, limestone massifs host deep underground aquifers, which in it's bigger part, remains unexploited apart from few drillings of pumping, while significant quantities of water gush from sources (Ypati, Mexiates, Gorgopotamos, etc.). The Quaternary deposits of Spercheios valley, present satisfactory to rich aquifers particularly in their permeable geological formations (sand, sandstones, etc.), which are enriched directly by the existing hydrographic network.

The chemical composition of the surface water, at the limestone area, is mainly high in Ca^{2+} and HCO_3^- . The concentrations of main cations and anions and pH are medium to high and this water is characterized as hard, while it's content in heavy metals is low. The pH of karstic underground water varies from 7 to 8 while it's constitution is proportional to the corresponding surface ones and they are low in mineral (250-500 mg/l).

2.8 Mineral Resources – Excavation activity

Bauxite ore is a product of the decay-erosion of Al- rich carbon rocks, with simultaneous weathering of CaCO_3 , or laterite decay-erosion of igneous rocks, mainly serpentine or even metamorphic rocks. Bauxite is found in four types of deposit: blanket, pocket, interlayered and detrital.

Bauxite characteristics: It's mineralogical and chemical composition as well as its physical properties vary. The basic minerals of bauxite are: Boemite, Diasporo, Hidrargilite, all of which constitute the main paragenesis. The main oxides which form bauxite are: Al_2O_3 , Fe_2O_3 , SiO_2 and TiO_2 .

Methods used for bauxite mining exploitation: The main method that has been applied for the mining of bauxite ores, in the research area, is the underground one, using the method of “room and pillar mining”. Tunnels are opened up in order to reach and obtaining the ore. In the entries of the underground exploitations (tunnels), in certain excavation locations, as in the Dyo Vouna and Mexiates locality, vertical or graduated foreheads of excavation (quarry fronts) have been shaped, up to the surface of the layer, while the mining spoils are discarded in neighbouring places or are removed. The surface exploitation that shapes vertical or graduated quarry fronts, constitutes the main method of exploitation of the three small quarries that are located in the region and that today are out of function. About the mine in the area of Dyo Vouna, although not very visible, the restoration of the old mining spoils should immediately begin (Karetsos, 2014).

It must be marked out that the environmental legislation (L. 998/79 and L. 1650/86), imposes the environmental restoration of the mining areas, while among the criteria for the choice of the excavation method, increased in gravity criteria are included, related to the protection of the environment. Also, should be noted that the “core” zone of Mt Oiti National Park, is under an absolute protection regime for maintaining the flora and fauna intact, and for that reason is prohibited within the core zone, quarrying and mining activities.

2.9 Other man-made pressures in the natural environment of Mt Oiti

Grazing was practised in the region from ancient years and is continued until today with less intensity. This activity, in combination with fires, sealed the vegetation type of the area, degrading dramatically the type of ancient ecosystems, which form we do not know precisely. The last years, while the fauna has been considerably limited, the uncontrolled cattle-breeding is presented more detrimental to the environment, because it is practised clearly for speculative reasons.

At the same time, the poaching is found in elation and mostly of the wild goat. According to Karetsos et al. (1996), the poaching is supported by the defective control from the side of the Forest Inspection, the dense road network that has been opened for the cattle-breeders service and also the service of the mining activities (Karetsos, 2014). Finally, a serious problem of the region, are the illegal, small or bigger, tips that function without control in various points of Oiti. These tips supply, during the floods, the streams with litter, that are transported in bigger recipients.

3. RESULTS - DISCUSSION

3.1 The Hercules' Trail at the Mt Oiti - The route

Alongside the extensive fir forests, rare and impressive species of plants and rich fauna of Mt Oiti National Park, its special features are also an important element for the attraction of tourists and naturalist travellers. These include mainly: a. the karst landscape on Katavothra Plateau (Figures 11 & 12), b. the impressive gorges, c. the fragile environment of mountain meadows and small temporary ponds of high altitude with *Veronica oetaea* being Oiti's only endemic plant, d. the Balkan chamois (*Rupicapra rupicapra ssp. balcanica*), but also e. Hercules' Pyre, a place related, according to Greek mythology, the redemption and deification (apotheosis) of the mythical hero Hercules.

More specifically, the trail of Hercules is an interesting “circular” route that passes through a variety of changing sceneries, beautiful landscapes and amazing views. The ease and the relatively small altitude changes throughout the route, not exceeding 560m and the duration of about five hours, are the main features of the trail (Table 1, Figure 8). The view of the extensive fir forest, Katavothra Plateau, nearby mountains, Gkiona (Highest peak, Pyramida 2,510m) and Vardousia (Highest peak, Korakas 2,495m), as well as the ruins of the ancient temple at Hercules' Pyre are also interesting features of the trail.

Table 1. Main characteristics of Hercules' trail

Route length:	15,150 km.	Duration:	5 Hr.
Maximum elevation:	560 m.	Type:	Return
Trailhead:	Square of Pavliani	Degree of difficulty:	Easy to Moderate
Trail features:	Outstanding views, Meadows, Scenic views, Wildflowers, Geology, Greek mythology	Recommended visitor season:	April to November

Source: Observations of the study group and various literature sources and existing reports.

Following the Hercules' Trail, the visitor-traveller can have the chance to enjoy, and learn about, the characteristics that have given Mt Oiti the names "mountain of colours", "mountain of flowers", "mountain of Hercules", but also "Neromana", meaning the source of large quantities of water. Important stops during the route include the places where one can observe: a. the karst relief at Katavothra Plateau and at the entrance of the impressive cavern Katavothra (Figures 11 & 12). b. the mountain meadows with temporary ponds. c. Hercules' Pyre, namely the ruins of an ancient Doric temple dated from the 3rd century BC, dedicated to the mythical hero Hercules" (Figures 13 & 14).

The village of Pavliani, located in mountainous Phthiotis, is at 1,040 m altitude, on the eastern slope of Mt Oiti, and serves as the start of the trail. It is surrounded by a dense fir forest and is an attractive destination for eco-tourism in Sterea Hellas. It consists of two settlements, the Upper and Lower Pavliani, divided by Asopos River. It is an ideal place for exercise, recreation and relaxation throughout the year.

The mountain retreat Vrizes, at 1,240 m altitude, is one of the important meeting points. It is the starting point for many excursions that use not only Oiti's forest road network, but also the hiking and trekking trails. At this place the traveller can enjoy the extensive fir forest while viewing the highest peaks of Mt Gkiona.

The Hercules' Trail starts from the square of Upper Pavliani, at 1,004 m altitude (Figure 8). Following the signs to Katavothres one is led to a dirt road, leading to the neighbouring village of Koumaritsi. In about 500 m the forest road ends and the trail ascends through the fir forest (*Abies cephalonica*). In about 90 minutes, just after the crossroad to Agio Pnevma one leaves behind the fir forest and encounters the alpine landscape. The trail continues downhill, passing through the grasslands of Katavothra Plateau. The plateau is the bottom of a karst depression and it has the features of a karst polje. The bottom of the plateau is almost flat due to the soil produced by the weathering of limestone, the sediments and the alluvial deposits that are deposited there. Usually these sediments are fertile, consequently rich meadows are created.

Several of the many small temporary ponds of Mt Oiti are found at Katavothra Plateau. Research is conducted regarding these ponds and the extent that they have common features with the three main temporary ponds of Mt Oiti, found at Livadies, Trapeza and Alykaina, where Oiti's endemic plant *Veronica oetaea* can be found. In most of Katavothra's ponds, a small amphibian, the alpine newt is often observed (Figures 9 & 10). The traveller has the opportunity to observe the features of these ponds as well as the variety of plant species, especially the endemic plant of Oiti *Veronica oetaea*, if the visit in Mt Oiti, takes place in the right period.

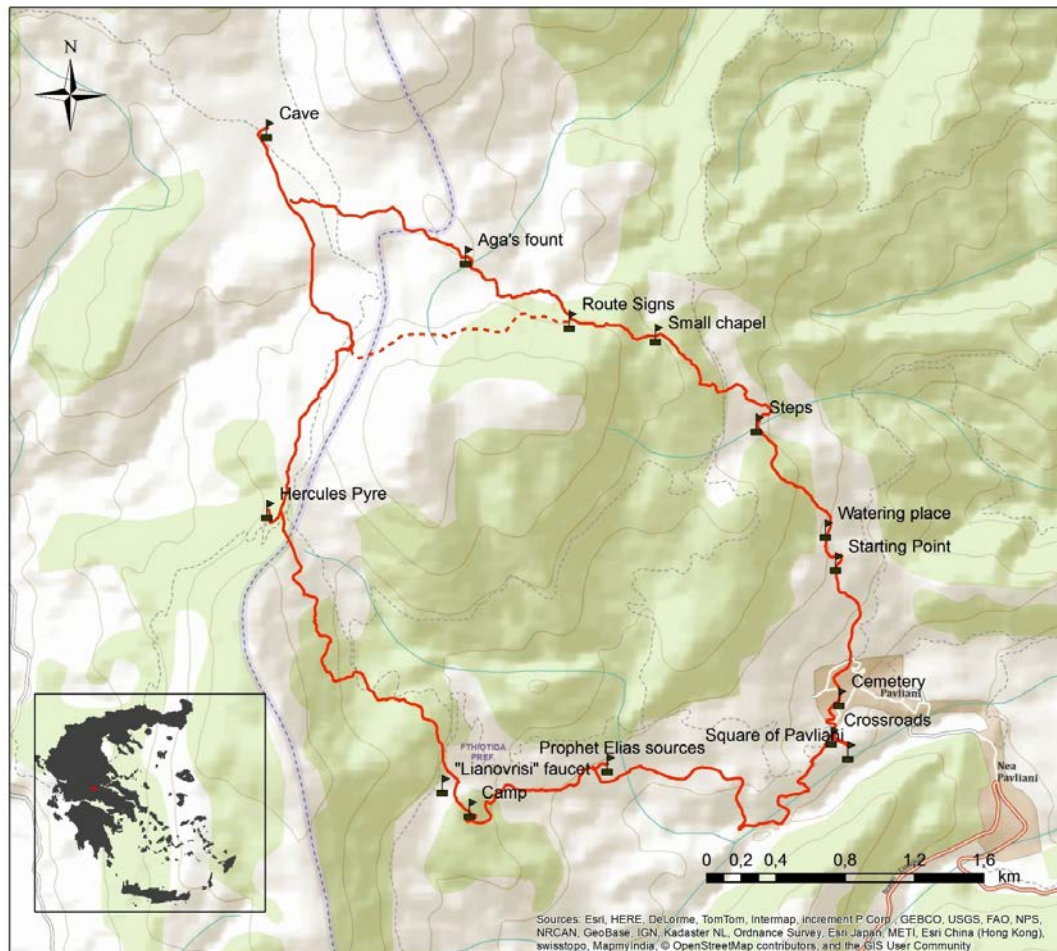


Figure 8: The Hercules' Trail at Mt Oiti (The route is shown in red. The dotted red line represent the old route).

Roughly two hours after the start of the route, Katavothra cave-sinkhole (1,560 m altitude) is reached (Figures 2, 3, 11 & 12). The cave is located at the north-eastern edge of the plateau, at the bottom of a steep limestone slope. Katavothra is the most important karst feature of the area, formed from the dissolution of soluble rocks such as limestone. The entrance of the cave is open and it can be visited by an experienced and well equipped visitor that might get, on his/her own initiative, inside the cave. This cave is about 300 m wide and from 2 to 3 m high. It probably constitutes the outer part of an extensive and very deep karst cave. It is also known to host rare species of bats and, in the past, rock pigeons, too.

Katavothra cave-sinkhole is also related to the plateau's natural underground drainage system. The surface water from the plateau enters the cave-sinkhole and penetrates through the limestone bedrock. As in every karst environment, this water is rapidly transported to lower height, towards the karst aquifers and finally springs through karst springs. Karst aquifers are formed by flowing water which, containing CO₂, dissolves carbonate rocks, such as the limestone of Katavothra area. The water that supply karst aquifers flows through a network of fractures, karst conduits and underground cavities formed by chemical dissolution, on its way to the springs. This network of underground karst conduits is still largely unexplored. In the area of eastern Oiti, this water springs on the limestone slopes of Gorgopotamos Gorge and feed the springs of Gorgopotamos, 200 m altitude, in the valley of Spercheios river. This is the main water supply for the city of Lamia.



Figures 9 & 10: A small temporary pond of high altitude in Mt Oiti (Fig. 9). In most of Oiti's ponds, a small amphibian, the "alpine newt" is often observed (Fig. 10).

Most of the plateau's surface water is nowadays also passing through other surface drainage systems and hydrographic networks. These are being developed in the area, eroding parts of the plateau.

From this point at Katavothra, the south-eastern edge of the plateau, the two higher peaks of Mt Oiti (Pyrgos 2,152 m and Greveno 2,114 m altitude) rise in the background, in the north-northwest, above the alpine meadows. In the south two towering peaks can be seen, Pyramida of Mt Gkiona (2,510m) and Korakas of Mt Vardousia (2,495m).

Near Katavothra, a small detour is available in the north-northeast, near the Perdikovrisi source. An experienced traveller can visit the upper part of the valley of Agio Pnevma river that descends until its junction with Valorema stream, where Gorgopotamos Gorge is formed.



Figures 11 & 12: The impressive Katavothra cave-sinkhole, located on Katavothra plateau.

Some of the water coming from the sources of Agio Pnevma is feeding, though an aqueduct the town of Amfikleia. Gorgopotamos cuts through the bedrock sculpturing beautifully a narrow gorge that is known among the experts of canyoning for its extreme difficulty, the towering rocky slopes and the 22 spectacular waterfalls, one of which is 120 m high. It is considered one of the most difficult gorges in Europe starting from an altitude of 1,180 m and ending at 300 m. The total length is 3.5 km. The proper protection infrastructure is available, including nails, connectors, safety belts etc. in order to facilitate the descending, but it is still labelled as dangerous even for experienced canyoners, equipped with required climbing hardware such as static or semi-static ropes, helmets, wetsuits, special shoes, packs, rope bags, etc.

In the same area, around Katavothra, we propose a new, and easily accessible, alternative route, towards Livadies Plateau and Greveno Peak. This north-western trail would allow the traveller to enjoy the nature of Oiti in roughly 160 minutes, without extensive physical stress. The attractions of this route include the colours of the flowers and the landscape, the various species of plants, including the endemic plant of Oiti *Veronica oetaea*, that emerge from the ponds, when they dry up between late May and mid-June. It should be noted that Livadies Plateau is part of the nucleus of the Mt Oiti National Park and that the view from Greveno Peak (2,114m), towards the peaks of other mountains of Sterea Hellas including Othrys, Gkiona, and Vardousia, is amazing while the mouth of Spercheios, Maliakos gulf and the northern Evoikos gulf are also visible.

The Hercules' Trail goes on after Katavothra, following the dirt road southwards and crosses the plateau until it reaches a small hill that overlooks the area. This hill is called Hercules' Pyre (Figures 13 & 14). On the top of the hill the ruins of an ancient Doric temple, dated for the third century BC, lie currently unprotected. It was dedicated to, arguably, the greatest mythical hero, Hercules. According to Greek mythology, Hercules set himself ablaze on this hill in an attempt to relieve himself from the unbearable pain caused by the robe poisoned with the blood of Centaur Nessus, given to him by his wife Deianeira. Zeus intervened, enveloping him in a cloud, bringing him to Olympus making him a demi-god. There Hercules remarried the beautiful Hebe, the Goddess of youth. This mythological account, although fictional, makes the hike all the more thrilling stimulating ones spirit, thus rendering mythology key in appreciating the experience.



Figures 13 & 14: Hercules' Pyre: On the top of the hill the ruins of an ancient Doric temple, that was built in honour of Hercules, lie currently unprotected.

The last part of the route is mildly descending towards the southeast. The trail is well positioned through a stunning fir forest. It passes by the abandoned children's camp following the forest dirt road to the chapel of Profitis Ilias. There, around a fountain, the local community authority has constructed a recreational area. The Hercules' Trail, further descends from this point to Pavliani, where it ends.

3.2 Hercules' Trail management and enhancement.

The efficient management of a trail, the protection and enhancement of the landscape and the natural and built environment that surround it, need compliance to the relevant rules in to be maintained. These rules include proper signage, regular maintenance and, in some cases, monitoring and guarding as well as promotion (Figure 15). The appropriate signage and maintenance are prerequisites for the safe use of the trails (Table 2). Consequently, trails have to be managed systematically, namely to be maintained in a satisfactory level of cleanliness and safety conditions. This applies to the maintenance of constructions too. The proper design and construction of new trails or "improved" routes in the pre-existing trails can reduce the cost of maintenance and management while increasing the promotion of the surrounding area and the quality of information provided to the visitor. Combining the above can create favorable conditions for the attainment of the purposes the trail is created for.

According to N.C.N.S.T. (1996), signs are probably the quickest and easiest way to leave the trail user with a positive impression. If the signs are high quality, well maintained, and properly located, other trail problems which are harder to solve are often over-looked (e.g., wet areas). Consistent signs are the quickest way to increase the trail's identity and the public's support for the trail. Other objectives are to: 1. Provide positive exposure of the trail to attract more users, 2. Educate the user about the trail through trailhead kiosks, 3. Reassure the user that he/she is on the right trail and will not get lost, and 4. Control trail usage and create a safer, more enjoyable, environmentally friendly experience. These objectives are to be balanced with aesthetic considerations to avoid "sign pollution".

The right timing and frequency of the maintenance checks are some more of the needed actions. According to M.A.R.D. & E -Department of Forests (2011), the only way to maintain appropriate service levels is developing an annual program of inspection, maintenance and cleaning for each trail. Otherwise, the decisions related to maintenance will be made by the staff and they will, consequently, be depended on their availability. The frequency of checks and maintenance depend on the season and the intensity of the use of each trail.

Sign maintenance is critical to the operation of a quality trail system. Well maintained signs that are repaired promptly convey a sense of pride and reduce further vandalism. Signs are a highly visible representation of the quality of the trail. Their maintenance or lack of maintenance leaves the visitor with a positive or negative impression about the trail. Signs convey many kinds of information and it is critical that they be in good shape (N.C.N.S.T., 1996). The maintenance cost of various constructions, signs etc., as well as the cost of cleaning can be reduced if the visitors are prompted to avoid vandalism and misuse of the constructions (boardwalks, wooden steps, information signs, kiosks, destination signs, etc.). The visitors should also be encouraged, via proper signage, to reduce the volume of waste the deposition or to deposit it in the appropriate bins that are located in Pavliani Village.



Figure 15: Identification signs-Reassurance markers/blazes of the Hercules' Trail (Official Trail Emblem)

The condition and resulting maintenance demands of a trail is affected by the amount and type of use the trail receives. Each trail has a usage limit. The usage limit however, is determined by more than just the amount of use. The usage limit is influenced by the following factors: environmental conditions impacting the trail, quality of site selection, ground cover and terrain, trail construction, adherence to maintenance requirements, and the volume and types of trail use (V.T.A.-V.D.C.R., 2011).

It is important to determining the carrying capacity, namely the maximum number of visitors the trail, and the fragile area of Mt Oiti, can accommodate without degrading the environment and the protected ecosystems. Furthermore, it is considered necessary to inform the visitors about the "Rules & Regulations" of the trail. At the same time a visitor monitoring & management program should be developed by the competent body.

Table 2. Inventory and Assessment of Hercules' Trail. Problems - Suggestions about the Trail Management

			Assessment of Trail Problems & Proposals about the Trail Management (Works Needed - Operations - Maintenance - Management)							
Geographical coordinates of the point / position	Place name	Point distance from the starting point of the trail (in meters)	-Trailhead information signs, kiosks or Information/Interpretive signs	-Destination signs, Reassurance markers/blazes	-You-Are-Here signs, Identification signs	-Route Improvement (Construction of trail structures, boardwalks & wooden steps)	-Route Improvement (Trail widening & clearing, new improved route, tree & shrub trimming)	-Trail maintenance (User safety, access, protect adjacent resources, preserve trail investment, garbage, litter bins)	-Promotion & marketing (publicity), visitor monitoring & management	Remarks
38°44'24.06" B 22°20'16.36" A	Square of Pavliani	0	•	•	•			•		1,2,3,4,5
38°44'26.83" B 22°20'12.35" A	Crossroads	150		•				•		3,4,6
38°44'34.05" B 22°20'14.08" A	Cemetery	550		•	•			•		3,4,7,8
38°44'59.28" B 22°20'12.64" A	Starting Point	1,500		•	•	•		•		3,4,5,9
38°45'5.43" B 22°20'10.03" A	Watering place	1,700		•	•			•		3,4,8,10
38°45'24.92" B 22°19'53.14" A	Steps	2,600		•		•	•	•		3,4,9
38°45'41.41" B 22°19'28.57" A	Small chapel	3,700		•	•			•		3,4,8
38°45'45.33" B 22°19'6.51" A	Route Signs	4,350		•			•	•		3,4,5,11
38°45'55.39" B 22°18'42.85" A	Aga's fount	5,150		•	•		•	•		3,4,8,12
38°46'18.33" B 22°17'54.77" A	Katavothra Cave	6,850	•	•	•	•		•	•	2,3,4,5,13, 14,15,16

38°45'2.09"B 22°17'54.42" A	Hercules Pyre	9,850	●	●	●			●	●	2,3,4,5,16 , 17
38°44'16.31" B 22°18'39.65" A	Lianovrisi faucet	12,30 0		●	●			●		3,4,8,18
38°44'12.02" B 22°18'46.17" A	Camp	12,50 0		●				●		3,4,19
38°44'21.70" B 22°19'15.47" A	Prophet Elias	13,25 0		●	●			●		3,4,8
38°44'24.06" B 22°20'16.36" A	Square of Pavliani	15,15 0								Trail Starting Point/End

Source: Observations of the study group and various literature sources and existing reports.

Note: The dots (●) found at Table 2 indicate a problem/shortcoming in the infrastructure or maintenance of the corresponding point of the route. The dot also indicates that the management, promotion and marketing of the trail has been insufficient (or non-existent) and consequently there are measures that need to be taken both for the proper management and promotion of the trail but also for the protection and promotion of the natural environment of the area.

Remarks:

1: Uphill trail on paved road heading to Koumaritsi.

2: "Trailhead information sign/kiosk". This structure should include a double or triple bulletin board structure. The left display panel should contain general information about the trail (trail map/description). It should depict the general location of the trail in relation to other major landmarks (N.C.N.S.T., 1996). The right display panel should contain specific information about the trail segment, such as the natural environment and the fragile environment of mountain meadows, the small temporary ponds of high altitude, Oiti's endemic plants, the Balkan chamois, as well the geology of Katavothra Cave and mythology of Hercules' Pyre. The "trailhead information signs" should contain information on the kinds of use allowed on the trail, and which show acceptable and unacceptable uses (N.C.N.S.T., 1996).

3: "Destination signs", show direction and distances to various spots along the trail. Appropriate places for these signs are: trailheads, major roads, shelters, trail junctions, and spur trail junctions (to indicate distance to water or shelter) (N.C.N.S.T., 1996).

4: "Reassurance Markers", are the paint or nail-on "blazes" that mark the trail. According to N.C.N.S.T. (1996), blazes are placed on trees or posts, slightly above eye level so that hikers can see them easily when traveling in either direction. In areas where the trail receives winter use, blazes are placed higher so they are visible above the snow. Blazes should be within "line of sight" - when standing at a blaze marker, the hiker should be able to see the next one. Blazes should be continuous - even along road segments and other unmistakable parts of the trail. Blazes should be placed immediately beyond any trail junction or road crossing-even if there is a directional sign.

5: "You-Are-Here signs", may supplement maps at trailhead kiosks and other key locations, such as at trail intersections, along the route (N.C.N.S.T., 1996).

6: Cement-paved road.

7: End of Cement-paved road. Start of dirt road.

8: "Identification signs". They are simple, routed wood, identification signs which allow the hiker to find their location on a map in relation to what they are seeing. They are short and concise. Generally, an identification sign is appropriate for all sites listed on destination signs (N.C.N.S.T., 1996).

9: Uphill trail. Requires the construction of steps (about 5-10).

10: Sludge surrounding the watering place, because of the use from cows. Requires the construction of conduit for carrying away the water or placement of slabs or grates.

11: At this point/position is proposed a new improved route heading to the Katavothra cave.

12: Reconstruction of the source infrastructure.

13: Requires the construction of boardwalks & steps.

14: The entrance of the Katavothra cave is "open" and it can be visited by an experienced and well equipped visitor that might get, on his/her own initiative, inside the cave. This cave is about 300 m wide and from 2 to 3 m high. It probably constitutes the outer part of an extensive and very deep karst cave. It is also know to host rare species of bats and, in the past, rock pigeons, too.

15: "Information/Interpretive sign", which should contain specific information about Katavothra cave: a. What is a sinkhole (Katavothra in Greek) geologically. b. What waters accepted c. The legend of the creation of the spring. d. Topographic map with the outputs for the sinkhole on the north and eastern side of the Xerovouni from where river Gorgopotamos supplied.

16: Dirt road between Katavothra cave and the archeological site (Hercules' Pyre).

17: "Information/Interpretive sign", which should contain specific information about Hercules' Pyre: a. Description and the importance of the space, creation of the diagram of the Temple of Hercules' Pyre and the position of the altar. b. Representation of the temple.

18: Downhill trail.

19: Abandoned children's camp "ta psila vouna".

The results of this monitoring & management program alongside the findings concerning the effects caused by the presence of visitors in the protected areas, can give its managers the possibility to systematically improve and apply a constantly rejuvenated "Rules & Regulations". As a consequence, this process contributes positively to the reduction of the environmental impact of the presence of visitors and use of the trail. Meanwhile, the "revolving monitoring program" of visitors and its systematic updating will help to the accurate identification of the target group of visitors. This will enable the competent bodies in creating the appropriate conditions and infrastructure to meet the needs and requirements of visitors (eg. handicapped, cyclists, etc.).

Additional actions can contribute positively to the enhancement of the landscape and generally to the rational management of a trail. These actions include the active promotion and attraction of publicity among others.

The identification, recording and evaluation of the problems that have been encountered as of now in Hercules' Trail, are summarized in Table 2. This table serves as a tool for the trail manager, offering an overall mapping/visualization of problems and deficiencies.

To facilitate the visualization and interpretation of the problems identified in the path, mainly related to the lack of constructions such as boardwalks and wooden steps, the insufficient signage, the proper maintenance (trail widening & clearing, tree & shrub trimming, etc.), one can find the geographical coordinates of the corresponding position below (Table 2). The trail manager can transfer the relevant data (geographical coordinates) on a topographic map, or cartographic basis of his/her choice in order to use it in a more convenient way.

4. CONCLUSIONS

A dense network of paths can be found at Mt Oiti. Following their route, the traveler can enjoy many of the special features. These include, among others: 1. the extensive fir forests, 2. rare and impressive species of plants and rich fauna, 3. the fragile environment of mountain meadows and small temporary ponds of high altitude with *Veronica oetaea* being Oiti's only endemic plant, 4. the karst landscape on Katavothra Plateau, 5. the impressive gorges, 6. the Balkan chamois (*Rupicapra rupicapra ssp. balcanica*), but also 7. Hercules' Pyre, a place related, according to Greek mythology, the redemption and deification (apotheosis) of the mythical hero Hercules.

The management of Hercules' Trail, and the protection and promotion of the environment, namely of the vegetation, flora, fauna, landscape, geology, geomorphology and mythology, of this area, constitute the main subject of this paper. Hercules' Trail, is an interesting "circular" route that passes through a variety of changing sceneries, beautiful landscapes and amazing views. The trail is free of strong signs of human intervention. It is one of the most interesting trails of Mt Oiti. A hiker can learn a lot about archaeology, mythology, speleology and the mountain meadows. An important feature of this route is the possibility for the hiker to both enjoy the scenery and learn without excessive physical strain.

According to both recent and older recordings that took place in Hercules' Trail, there are no systematic interventions competent authorities to date. This is also admitted by the reports of travelers. These interventions are suggested for the efficient management of the trail and include: a. Appropriate infrastructure (construction of trail structures, boardwalks & wooden steps, litter bins, etc.), b. Signage (Trailhead information signs, kiosks or Information/Interpretive signs, Destination signs, Reassurance markers/blazes, You-Are-Here signs, Identification signs, etc.), c. Improvement of the trail (trail widening & clearing, tree & shrub trimming, etc.), d. Trail maintenance (user safety, access, protect adjacent resources, preserve trail investment, cleaning, etc.), e. Visitor monitoring & management and f. Promotion & marketing (publicity).

The intention of the competent bodies to manage Hercules' trail efficiently has been verified. As a first step, the installation of proper signage, according to the required standards, has been programmed. The construction and procurement of the signs/blazes has already been done and the installation has been programmed for the immediate future.

The following proposals are also included in the proposed measures to efficiently manage Hercules' Trail and to protect and enhance the environment of the wider area:

- Assessment of the trail's carrying capacity.
- Development of an annual program regarding the monitoring, maintenance and cleaning of the trail. The time and frequency of this monitoring have to be specified in the program.
- Prompting the visitors to avoid acts of vandalism and mismanagement of the infrastructure (boardwalks, wooden steps, information signs, kiosks, destination signs, etc.). This information can be disseminated via adequate signage.
- Raising awareness among the visitors regarding the volume of waste and its proper disposal in specially designed bins that are currently located in Pavliani. This information can be disseminated via adequate signage.
- Raising awareness among the visitors about the "Rules & Regulations" and developing a program to monitor and control the trail (designations, closures, permit requirements and other restriction imposed under the discretionary authority of the superintendent, etc.).
- Development and systematic implementation and improvement of an frequently updated of "Rules & Regulations". This is expected to contribute to the containment of the negative effects caused by the presence of tourists and the use of the trail.
- Determination of the target group of visitor, in order to accommodate their needs and demands (e.g. people with disabilities, cyclists, etc.).

- Improvement and possible rerouting of the old route, between Route Signs and Katavothra cave. The goal of this suggestion is making Katavothra cave easily accessible and avoiding the repetition a large part of the route.

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