SOME RARE AND THREATENED HABITATS OF KAVAJA DISTRICT

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Abstract

Kavaja district lies on a relatively small area, with slight altitudinal differences, but, due to its geographical position and diversity of the terrain, it still distinguishes of high floristic and vegetation diversity. Especially, along the rocky and sandy coast very interesting terrestrial and marine habitats and plant communities are present. The main objective of this study is the identification and description of terrestrial vegetation groups with Pricky Burnet *(Sarcopoterium spinosum* (L.) Spach*)*, Laurel (*Laurus nobilis* L.), Phoenicean juniper (*Juniperus phoenicea* L.), Sea Grape (*Ephedra dystachia* L.), as well as marine communities with *Cystoseria* sp., *Posidonia oceanica* and *Fucus virsoides.* These taxa and their related communities, are quite rare and threatened, because of the limited geographic distributions and the high external pressures. As such, the majority of them are included in the Albanian Red List and International Conventions. For each of the habitats, data on location, floristic composition, actual status and proposals for their conservation are given. They are classified in the frame of the different habitat classification systems like EUNIS, Annex I of the Habitats Directive etc.

Key words: Kavaja, rare habitats, threatened, coastal.

Përmbledhje

Rrethi i Kavajës, ndonëse me sipërfaqe relativisht të vogël dhe diferenca jo të mëdha lartësie mbidetare, dallohet për një larmi të lartë flore dhe bimësie, kjo edhe falë pozicionit gjeografik dhe larmisë së terrenit. Veçanërisht përgjatë bregdetit, hasen habitate e grupime bimore mjaft interesante, si tokësore ashtu dhe detare. Diferencimi dhe përshkrimi i grupimeve tokësore me Dorëvatë (*Sarcopoterium spinosum* (L.) Spach), Dafinë (*Laurus nobilis* L.), Dëllinjë e Finiqisë (*Juniperus phoenicea* L.), Gjunjëzë dykallinjëshe (*Ephedra dystachia* L.), si dhe atyre detare me *Posidonia oceanica*, *Cystoseria* spp. Dhe *Fucus virsoides*, përbën objektivin kryesor të këtij punimi. Këto taksone, si dhe grupimet përkatëse, janë mjaft të rrallë e të kërcënuar, si për nga sipërfaqja e kufizuar ashtu dhe presioni i jashtëm mbi to. Si të tillë, shumica e tyre përfshihen në Listën e kuqe kombëtare apo në konventa ndërkombëtare. Për secilin prej habitateve ku ato hasen, jepen të dhëna të vendndodhjes, përbërjes floristike, përkatësisë në kuadrin e sistemeve të ndryshëm të klasifikimit (EUNIS, Annex I i Direktivës së Habitateve, etj), të dhëna për gjendjen aktuale, si dhe propozime për ruajtjen e tyre.

Fjalëkyçe: Kavaja, habitat, i rrallë, i kërcënuar, bregdetare.

Introduction

Kavaja District represents a high variety of flora and vegetation. The studied area extends to the coastal part of Central Albania, in a slightly triangular section, limited by the Qerret plain in the north and the Shkumbin River in the south. Its relief is plain and hilly, fragmented by the surface running waters or temporary streams. Therefore, from the botanical point of view, the most interesting parts are the hills of Kryevish/Bardhor and the coast. These

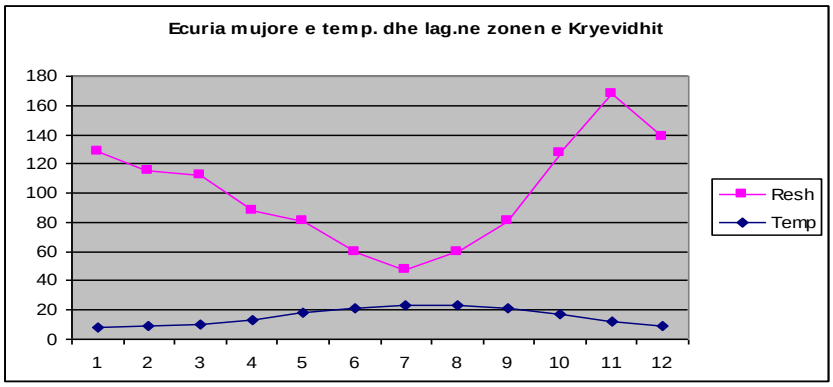

Figure 1. A pluvithermic diagram of Kryevidhi (Kavajë distrikt)

hills go up to 223 m a.s.l and are formed on an anticlinal structure, composed of terrestrial Miocene-Pliocenic and represented by conglomerate, sand, clay and sub-clay (Group of authors, 1991; Qiriazi., 2002).

The study area is included in the central part of Mediterranean climate zone, where the influence of the sea is well noticed. The summer is warm and almost dry and the winter is wet and mild. According to the pluriannual data from the meteorological station of Kryevidh (Cara, 2010) a diagram is built in fig. 1. It is evident that there is no period of genuine drought; so, the area has good climatic conditions for the normal growth of flora and vegetation, especially of various Mediterranean types. Meanwhile, the small amount of rainfall, as well as the relief morphology, is reflected to the hydrographic network, which is relatively poor, with few little streams, often pebbly, especially in areas with clay domination. The sunning is very high, with about 2600 hours of sun per year. Winds are generally wet and warm, which favors the rapid growth of natural vegetation.

These conditions enable the entire area, especially the almost virgin coastline, to offer big possibilities for exploitation, not only regarding farming and livestock, but also tourism, especially the green and historic ones. Hence, knowing and preserving the natural assets of this area, especially those of national value, is very important not only in a district level.

Materials and methods

Publications for the study area are very few, because it has been an almost isolated space, botanically not explored. This paper is mostly referred to the local (Cara, 2010; Qiriazi, 2002; Mullaj, 1989; Kashta, 1987, 1995-96, Group of authors, 2004-2009) and neighboring countries publications (Allegrezza et al., 2006; Tsiourlis et al., 2007; Gianguzzi et al., 2012; Gargano et al., 2007; Caniglia et al., 1974-75, etc.). The floristic and sometimes phytosociological data are carried out at different points during the years 2009-2015.

The taxonomic nomenclature was mainly based on Flora of Albania (Paparisto et al., 1988-2000) but also to the similar floras (Demiri, 1983; Pignatti, 1982; Vangjeli, 2003), whereas syntaxonomic units are based mainly on Rodwell et al. (2002) and Dring *et al.* (2002). Habitats are defined especially according to different European publications and conventions (European Commission, 2013; Council of Europe, 2010; EC, 1992; Davies *et al.*, 2004; Bellan-Santini *et al*., 2002).

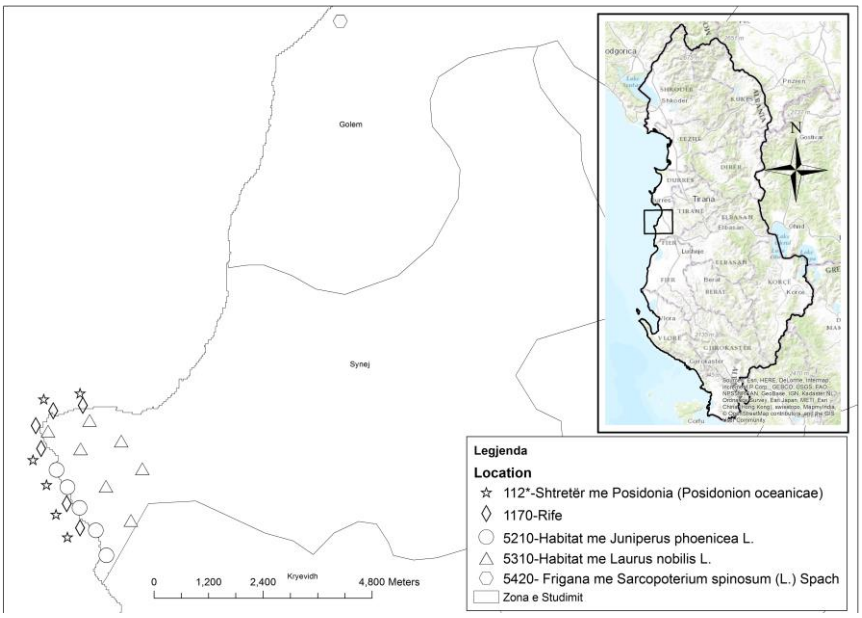

Figure 2: Distribution map of the habitats, in the study area

Regarding the marine communities, we are focused more on habitats that are considered rare and threatened on national level; as such, they present an interest for the country and the whole region (Ministry of Environment, 2013; Bellan-Santini et al., 2002; European Commission, 2013).

Results and Discussions

Although the study area is very small, interesting species and habitats occur there. However, in this paper only some of the most important habitats, the most threatened or rarest ones, are presented. The above map indicates the location of these habitats and plant populations, considering the biodiversity and conservation importance for the country. Summarizing, the main features of these habitats are as follows:

- ***5420- Sarcopoterium spinosum* phryganas**

Pricky Burnet (*Sarcopoterium spinosum* L. Spach.) is a very rare species in Albania. It forms a distinct population in the Qerret area, mainly near the Pumping station, up to 300 m southward, in not evolved substrates, free of phreatic waters. The most distinct populations occur generally on periodically flooded terrains, often clefty and slightly halophylic. According to the literature, *S. spinosum* grows in the shape of typical phryganas (Gargano et al., 2007; Tsiourlis, 2007) or as an element of maquis (Caniglia, 1974-75). It differs in our country, where *S. spinosum* grows as a short shrub or a bush of 30-80 cm high, in normal or even brackish terrains. Anyway, the populations growing in well drained terrains or at the top of the lumps, are quite dense and in better conditions.

Figure 2: Phryganas with *Sarcopoterium spinosum* L. Spach.

Floristic composition is very influenced by the surrounding environment and gives the impression that there is no preference. At brackish terrains, *Sarcopoterium spinosum*is accompanied by many other species, such as *Juncus acutus, J. maritimus, Arthrocnemum fruticosum, Salicornia europaea, Halimione portulacoides, Artemisia caurelescens, Linum maritimum, Lotus ornithopodioides, Plantago crassifolia, P. coronopus, Puccinellia festuciformis*. On saltless terrains the mos frequent species are *Anagallis arvensis, A. foemina, Parentucellia viscosa, Bellardia trixago, Bellis annua, Potentilla reptans, Phragmites australis, Briza minor, Carlina lanata, Centaurium maritimum, Sanguisorba minor, Cichorium intybus, Melilotus officinalis, Leucanthemum vulgare, Ornithogalum excapum, Blackstonia perfoliata, Dactylis glomerata, Dittrichia viscosa, Imperata cilindrica*. So, the strong and casual influence of the surrounding environments is quite evident.

It' s optimal distribution area is in the thermo-Mediterranean coast of Middle East, but it get very fragmented and sometime extincted by moving westward, mostly due to conditions deterioration (i.e. drought, fires, human

interventions etc.). In some cases (i.e. Croatia) this species is extincted (Gargano et al., 2007). Under these circumstances the syntaxonomical affiliation is unclear.It has no compliances with the communities occurring in normal locations. Thus, whether in the Aegean and Middle Eastern islands these types of phrygana are generally included in *Sarcopoterion spinosi* Zohary 1973 (Tsiourlis et al., 2007), in western borders, where these communities are more fragmented, they belong to Cisto-Micromerietea Oberd. 1954 (Bergmeier, 2002), as well as in degraded phases of Oleo-Ceratonion (Caniglia et al., 1974-75; Camatta et al., 1990). In the last one, the communities of *Sarcopoterium spinosum* are in continuous contact with maquis, on the periphery of which *Juniperus phoenicea* is also present (Gianguzzi et al., 2012). However, the situation is not clear in our country. It seems to be similar with the western part of *S. spinosum's* distribution area, but the fragmented populations appear somewhere in between the halophilic-hydrophilic gradient, i.e. between *Juncetalia maritimi* and *Phragmitetalia*, where the limiting factor is drought, both climatic and physiological one. Moreover, in this area the population is under the urban and touristic development pressure.

We think that, the conservation and restoration of these populations in their natural locations as well as introducing them "ex situ" into places with similar ecological conditions is important. Actually, many individuals of such populations are preserved in the Botanical Garden of Tirana. According to the Albanian Red List (Ministry of Environment, 2013), the status of *Sarcopoterium spinosum* is CR A1 c. According to the Palearctic classification, the communities of *S. spinosum* belong to the 33.3 type (Devillers & Devillers-Terschuren, 1996) whereas according to EUNIS classification (Davies et al., 2004), they belong to F7.25 (for the central Mediterranean) and F7.3 (for the east Mediterranean). In addition, according to Annex I the communities of *S. spinosum* belong to the habitat code 5420 (European Commission, 2013).

- **5210- Arborescent matorral with Juniperus spp.**

This habitat is present along the coastline from Lagji Cape to the Gjeneral beach, in a narrow belt of 1.5-2 km, at a height of 30-40 m above sea level, generally in steepy slopes. This type of coast is composed of sand and gravel with chaotic conglomerate rocks, rolled down from the destructive waves (Qiriazi, 2002).

Based on the floristic composition, the habitat represents the peripheral rocky part of Mediterranean maquis with the presence of *Laurus nobilis* (see below). It is mostly composed of shrub~~'s~~ species, clearly influenced by the winds and rocky substrate. The interior fragments, far from the wind's impact, are often dense and their physiognomy is clear. The habitat is dominated by *Juniperus phoenicea,* accompanied by other species such as: *Pistacia lentiscus*, *Rubia peregrina*, *Prasium majus*, *Phillyrea latifolia*, *Myrtus communis*, *Lonicera implexa*, *Cistus salvifolius*, *Colutea*

arborescens, *Smilax aspera*, *Dorycnium hirsutum*, *Asparagus acutifolius*, *Brachypodium retusum*, *Viburnum tinus*, *Putoria calabrica*, *Ruscus aculeatus*, *Hippocrepis emerus*, *Spartium junceum*, etc, and rarely inside the habitat are present, *Arbutus unedo*, *Laurus nobilis*, *Quercus ilex*, *Erica arborea*, *Clematis flammula*, *Elymus farctus* etc. Meanwhile, near the rocks affected by the sea splash, this habitat is accompanied by the species of *Crithmo-Staticetea*, such as *Crithmum maritimum*, *Lotus cytisoides*, *Limonium anfractum*, *Capparis orientalis* etc.

Such communities could be interpreted as dynamic secondary phase of adjacent woodlands or even as a mature phase, in balance with edaphic factors, which doesn't allow the evolution toward woodland formations.

According to the Habitats Directive (Annex I), this habitat belongs to the ***5210*** type - Arborescent matorral with Juniperus spp., or in the subdivisions 32.132 of Corine Biotopes and in F5.1321 of EUNIS. From the syntaxonomical point of view, the J. phoenicea communities are included in the alliance *Oleo-Ceratonion* Br.-Bl. ex Guinochet & Drouineau 1944 em. Rivas-Martínez of the order of *Pistacio-Rhamnetalia alaterni* Rivas-Martinez 1975, (*Quercetea ilicis* Br.-Bl. (1936) 1947 (Rodwell *et al.*, 2002)).

In Albania, such communities usually occur in the Albanian Riviera (mainly in Karaburun, Triport) (Mitrushi, 1955). Taxonomically *J. phoenicea* includes 2 subspecies: *J. phoenicea* subsp. *phoenicea* and *J. phoenicea* subsp. *turbinata* (Gianguzzi et al., 2012), which correspond to the species grown in our study area. *J. phoenicea* sometimes is considered as an element of the habitat ***2250***** (Coastal dunes with Juniperus spp.), which is normally dominated by *J. oxycedrus ssp macrocarpa*. This species is also present in our country (Mullaj, 1989; Demiri, 1962; Macchia et al., 2003), and often forms a narrow belt along the coastline, which serves as a link between the dunes vegetation and the Mediterranean coniferous forests; this is very evident in the area of Divjaka National Park.

Figura 3. *Juniperus phoenicea* L. at Plazhi i Gjeneralit.

Although this habitat is not included in the Resolute 4 of Bern Convention (1996), in our country it must be conserved carefully, because it is very rare and in a serious way of extinction, mostly due to the coastline erosion. Therefore, we think that *J. phoenicea* must have a status of conservation.

This concern was raised either from the local inhabitants and scientists (Qiriazi, 2002).

- **5310 - Laurus nobilis thickets**

Laurel communities are one of the most important natural treasures of Kavaja District. They grow on the hilly slopes, on sandy and conglomerate substrates, mainly in the triangle area: Bardhor-Turra Castle-Gjeneral Beach.

This species has a Mediterranean distribution (Mitrushi, 1955), but in our country it occurs in small and scattered populations. According to Annex I of Habitats Directive (European Commission, 2013) the *Laurus nobilis* communities are present in two habitat types: ***5230****-Arborescent matorral with Laurus nobilis, and ***5310*** Laurus nobilis thickets, whereas according to EUNIS (Davies et al., 2004), they are included respectively in F5.18 and F5.516, but this distinction is very thin and sometimes unclear in our country. Anyway, based on the floristic composition, we think that Laurus communities of Bardhor in Kavaja district belong mostly to the habitat 5310/F5.516, where Laurus is an integral part of maquis. In most cases, it grows as a shrub or a small tree, due to the competition with typical high shrubs of maquis as well as because of anthropogenic overexploitation in the area. The main species encountered during the relevees in this habitat are mostly part of the maquis, such as *Myrtus communis*, *Quercus ilex*, *Phillyrea latifolia*, *Arburtus unedo*, *Fraxinus ornus*, *Pistacia lentiscus*, *Colutea arborescens*, *Viburnum tinus*, *Hippocrepis emerus*, *Cercis siliquastrum*, *Crataegus monogyna*, *Erica arborea*, *Paliurus spina-christi*. The herbaceous flora is relatively poor, because of the shrub layer density. Anyway, we can often meet there: *Rubia peregrina*, *Dorycnium hirsutum*, *Ajuga chia*, *Arum maculatum*, *Asparagus acutifolius*, *Brachypodium retusum*, *Buglossoides purpurocaeruleum*, *Smilax aspera*, *Agrimonia eupatoria*, *Ruscus aculeatus*, as well as the lianas: *Hedera helix*, *Clematis flammula*, *Diocsorea communis* etc. In clearings or less dense areas, *Cistus incanus*, *Serapias vomeracea*, *Salvia triloba*, *Pteridium aquilinum* are also present.

Syntaxonomicaly, these Laurel communities belongs to *Quercion ilicis* Br.-Bl. ex Molinier 1934 em. Rivas Marl. 1975 (Rodwell et al., 2002; Dring *et al.*, 2002). Floristically, they are very similar to *Fraxino orni-Quercion ilicis* (Allegrezza *et al*., 2006), thus considered as a central – eastern vicariant of this alliance. This maquis with Laurus extends towards the coastline, in direct contact with the above mentioned habitat of *J. phoenicea* ***(5210)***.

Laurel communities in Bardhori area differ from the ones in Butrinti, (code ***5230****/F5.18), which grows in a less sunny and fresh environment. There, Laurel is almost dominant as a tree, up to 12m. It is accompanied by *Fraxinus angustifolia subsp. oxycarpa*, *Quercus calliprinos*, *Quercus robur*, *Q. frainetto*, *Pistacia terebinthus*, *Ulmus minor*, *Celtis australis*, *Carpinus orientalis*, *Cercis siliquastrum*, *Acer campestre*, *Smilax aspera*, etc. It is, thus, evident the presence of some *Carpinion orientalis* or *Fraxinion angustifolia* characteristics. Anyhow, there is some confusion in

classification of Laurel communities, which underlines the need for a deeper phytosociological study, in our country.

Up to 2-3 decades ago, the Laurel communitiy of Bardhor's hills was very well preserved, but later, due to the intensive and uncontrolled collection, it is reduced in size and structure, too. Even in a national level, the Laurel communities are threatened and very rare, which makes its protection more urgent. Especially, in areas of touristic attraction or developed agricultural activities, such as our study area. Actually, according to the Red List of Flora of Albania (Ministry of Environment, 2013), *Laurus nobilis* L. has the status EN A1b, while the area with Laurel nearby the Turra Castle is considered a "Nature Monument" (Qiriazi, 2002). The idea to give the status "Protected Landscape" to the whole area, based on a proposal of several years ago, seems to be very actual.

- **Habitats with *Ephedra distachya* L.**

Sea grape (*Ephedra distachya* L.) is a perennial and evergreen dwarf shrub, which is not very widespread in our country. Potentially, it grows in arid habitats, sandy dunes, rocky ledges, and gravelly slopes. In Kavaja, it has been present in the south of Golemi Beach, in a place called "Pishat e Buta" (Mullaj, 1989). It was very common up to 1996, regardless the reforestation and the modest tourist activities. Latter, its surface declined, due to the intensive and uncontrolled tourism as well as its use as a medicinal plant, rich in nutrient (Freitag & Maier-Stolte, 1994). Actually, it is considered an endangered species, EN A1b (Ministry of Environment, 2013).

Figura 4. *Ephedra distachya* at "Rana e Hedhur"

A second location of this species is found in 2005 (Mullaj *et al*., 2005), in "Rana e Hedhun", Renci mountain, north of Shengjin harbor. There, it has been more protected, due to the fact that the area was a military site, with no outside influence. The communities dominated by *Ephedra distachya* L., are found just behind the first psammophylous belt, in "Rana e Hedhun". Other companion species are *Erianthus ravenae, Pancratium maritimum, Ammophila arenaria, Cionura erecta, Cyperus capitatus* as well as *Satureja montana, Salvia officinalis* and *Teucrium pollium,* which normally represent the xerophytic elements of Mediterranean garrigue. In fact, this combination is a very rare case and almost unique for the Albanian coastline.

Initially, the communities of *E. distachya* were described as *Ephedretum distachyae* (Mullaj, 1989), but later, it was converted in *Scabioso argenteae-Ephedretum distachyae* ass. nova hoc loco (Mullaj, unpublished). This

association has a syndinamic correlation with the alliance *Ammophilion* (Mullaj, 1989, Dring *et al.*, 2002), although there are some ecological features or species, such as *Ephedra distachya, Vulpia membranacea* that align it with *Crucianellion.* Mullaj (1989) considers it as a vicariant of both west Mediterranean alliance of *Crucianelletum* and North Adriatic alliance of *Tortuleto-Scabietosum*, as well as very similar to the Greek alliance of *Ephedero distachyae-Silenetum subconicae*. It should be included in the habitat 2210. Anyway, further studies must be carried out to clearify the affiliation of this habitat in our country.

Marine habitats

These habitat types are numerous, but we are focussing to those of international importance:

- **1120 * Posidonia beds (Posidonion oceanicae)**

Posidonia oceanica is a marine phanerogam, endemic in Mediterranean and listed in Annex I of Bern Convention and in Annex II of Barcelona Convention. It forms underwater meadows usually in sandy substrates and rarely in rocky substrates, i.e in the Lagji Cape, where they are present in scattered patches.

Posidonia beds are considered as priority habitat of community interest, with the code 1120* (EC, 92). According to the Palearctic classification and Barcelona Convention (Bellan-Santini *et al.*, 2002) these communities are included respectively in the units 11.34 and III 5.1.

Posidonia meadows are considered to be among the most important marine communities of Mediterranean; their high complexity provides a habitat for food, shelter and nursery for many species, especially for fish, crustaceans, and marine turtles. Recent studies on the distribution of *Posidonia oceanica* along the Albanian coast indicate that habitats of this sensitive sea grass are seriously disturbed, particularly along the Adriatic coast of Albania, and are reducing in extent and condition (Pititto et al., 2009; Maiorano *et al.*, 2011).

- **1170 Reefs**

Reefs are hard compact substrata on solid and soft bottoms, which arise from the sea floor in the sublittoral and littoral zone. On the rocky reefs that emerge in the littoral of the study area, with particular interest is the association of *Fucus virsoides* (*Fucetum virsoidis* Pignatti). According to Habitats Directive this community is included in the unit 1170, while according to the Barcelona Convention it belongs to the *biocenosis of lower mediolitoral rock*, with reference code II.4.2.

This association is exclusively linked to the eastern (from Albania to Slovenia) and northern coasts of the Adriatic Sea. Being a pre-Messinian

relict, this association is extremely important from the natural heritage point of view (Giaccone *et al*., 2009).

Figura 5: *Fucus virsoides* J. Agardh. near Kalaja e Turrës (Foto A. Mara)

Fucus virsoides J. Agardh is a species of brown alga endemic to the Adriatic Sea. It is very common in the northern Adriatic intertidal zone, while the southern limit of its range is the Albanian coast (Kashta, 1987; 1995-1996). Four populations are reported in Albania, in Rodoni Cape, Kallm, Lagji Cape and Treport Cape (Kashta, 1987; 1995-1996). In this last site, only few individuals 15-17 cm tall, are reported until the year 1994; thereafter, the species is extinct from this site.

In the past decades a decline of *F. virsoides* populations has been observed in several areas of the North Adriatic coast (Munda, 1982; Fallace & Bresan, 2003), while recently it is reported the disappernce from the Slovenian coast (Battelli, 2016). The status of this species in Albania is CR (critically endangered).

In rocky submerged reefs of the study area, different species of *Cystoseira* could cover wide areas, where they form high productive communities with a large biological variety, known as “fucal forests”. Such forests are well developed along the Ionian coast and especially in Sazan-Karaburun-Himara area. In the study area this habitat is composed by *Cystoseira barbata*, *C. foeniculacea* and *C. compressa*.

Communities with Cystoseira spp. are among the most important habitats in the Mediterranean Sea, providing refuge and subsistence for many organisms, including commercial species. According to the Habitats Directive, this community is included in *Reefs*, with the code 1170, while according to the Barcelona Convention it is included in the Biocenosis of infralittoral algae with the code III.6.1.

Conclusions

The study area is quite interesting in flora and habitats, especially the coastlines, sandy beaches and the rocks along the sea. One species (*Sarcopoterium spinosum* (L.) Spach) is exclusive only for this area, whereas some others (*Laurus nobilis* L. and *Ephedra dystachia* L., *Juniperus phoenicea* L.) are rarely found elsewhere in Albania, but not in big and well structured populations. The main threats are the uncontrolled tourism,

collection for medicinal and ornamental use, erosion, chaotic waste management etc. All these factors endanger the species distribution not only in Kavaja District, but all over the country. The most evident example is the extinction of *Ephedra dystachia* L., population in Kavaja region. These scattered and fragmented habitats of these species need an urgent and strict protection, *especially for Sarcopoterium spinosum*, which is under a very strong pressure of a touristic resort construction, nearby it. The same situation is for *Laurus nobilis*, which continues to be collected spontaneously as well as for *Posidonia oceanica* (L.) Delile and *Fucus virsoides* J. Agardh, which are under the pressure of marine tourism, especially in the area of Karpen-Gjeneral Beach. If the pressure continues, it will lead to the habitat's disappearance.

Some of these plants are listed in national and international Conventions and Classifications, such as Annex I of Habitats Directive, Barcelona Conventions and Albanian Red List. Some other have a national conservation status, but they normally need a stronger conservation level. On the other hand, giving to the area the status of "Protected Landscape", requested mainly for the *Laurus nobilis* communities, should improve the situation in this area. The same status must be apply for *E. distachya* in Rana e Hedhun zone. Various measures must be undertaken, such as periodic and accurate monitoring, controlling the human activities (i.e tourism, controlled sewage discharges, etc.) and the ex-situ conservation where possible. Hence, deeper studies must be undertaken, especially focusing on the dynamics of these threatened populations, not only in this study area but all over the country, especially, for the species of National Red List and those of international conventions.

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