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Research article/Araştırma makalesi

Definition of *Fagus orientalis* Lipsky. dominated biotopes in Güzelcehisar, Mugada and Kızılkum region of Bartın province

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Abstract

Oriental beech makes its best spread and physical development on slopes of hills extending paralel to Black Sea shoreline in Turkey. Pure and mixed *Fagus orientalis* Lipsky. forests are particularly located northern slopes. Study area covers slopes facing to Black Sea within coastal areas of the settlements of Güzelcehisar, Mugada and Kızılkum, Bartın Province. The route formed by these settlements represents the part of Northwest Euxine Broadleaved forests of European-Siberian Region. The study area, at the same time, is located in the 'Eu-Euxine' part that is the most humid belt close to seaside. Euxine Beech forests intensely take part in this area and spread to the sea. This study was carried out in two stages. Initially abiotic and biotic components of study area were defined and data belong to them were collected and stored in a GIS geodatabase. Then, with help of the most recent satellite images and contemporary land use map, abiotic and biotic components of Beech dominated biotopes and land use properties evaluated together. In this way, spread of biotopes dominated by *Fagus orientalis* in and around Güzelcehisar, Mugada ve Kızılkum, habitat characteristics and structural changes due to land uses were determined. According to the result of study, the most intense spread of Beech communities takes place around hilly areas of Güzelcehisar where Yemişliçay formation consisting of sandstone, sheyl and limestone exists. Beech communities disappear in low elevated areas around Mugada and Kızılkum. It was determined that the most effective factors on spread of species are elevation, aspects and geologic characteristic of habitats. It was also determined that *Fagus orientalis* often forms mixed forests with *Carpinus betulus*, *Castanea sativa* and *Quercus petraea* ssp. *iberica*. And also, with field works it was determined that Beech biotopes were adversely affected by man based factors such as grazing, deforestation for agricultural use, road networks and rural settlements. Definition of Beech forests which take place in habitat classification of EU and contribute to biodiversity will be a preliminary assessment for protection and sustainable use of Euxine beech forests located in coastal areas of the Province of Bartın.

Key words: *Fagus orientalis* biotopes, habitat classification, Güzelcehisar, Mugada, Kızılkum

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Bartın ili Güzelcehisar, Mugada ve Kızılkum bölgesinde Doğu kayınının hakim olduğu biyotopların tanımlanması

Özet

Doğu kayını, Türkiye'de en geniş yayılışını ve en iyi gelişimini Karadeniz kıyısına paralel uzanan dağlık yamaçlarda yapmaktadır. Saf veya karışık *Fagus orientalis* Lipsky. (Doğu kayını) ormanları özellikle kuzey yamaçlarda konumlanmıştır. Çalışma alanı, Bartın ili kıyı kesiminin Güzelcehisar, Mugada ve Kızılkum bölümünde Karadeniz sahiline bakan yamaçları kapsamaktadır. Bu hat Avrupa-Sibirya Bölgesi'nin Kuzeybatı öksin yapraklı ormanlarının bulunduğu bölümü temsil etmektedir. Aynı zamanda alanın, Karadeniz'in denize yakın ve en nemli kuşağı olan 'Eu-Euxine' bölümünde yer aldığı görülmektedir. Öksin Kayın ormanları, bu kesimde yoğun olarak yer almakta ve denize kadar ulaşmaktadır. Çalışma iki aşamada yürütülmüştür. İlk aşamada alana ait abiyotik ve biyotik potansiyele ait sayısal harita katmanları, ArcGIS ortamında bir araya getirilmiştir. Daha sonra güncel uydu görüntüleri ve alan kullanım haritası aracılığıyla Kayın biyotoplarına ait abiyotik ve biyotik özellikler ile alan kullanımları bir arada değerlendirilmiştir. Bu şekilde *Fagus orientalis* Lipsky (Doğu kayını)'nın hakim olduğu biyotopların, Güzelcehisar,

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Mugada ve Kızılkum Bölgesinde alan içindeki dağılımı, yetişme ortamı özellikleri ve alan kullanımları sonucu oluşan değişimleri tanımlanmıştır. Araştırma sonucunda Kayın toplumlarının büyük çoğunluğunun Güzelcehisar çevresindeki volkonajenik kumtaşı, şeyl, kireçtaşı içeren Yemişliçay formasyonu üzerindeki yüksek kesimlerde yayılış gösterdiği belirlenmiştir. Mugada ve Kızılkum çevresinde yükseltinin azaldığı mekanlarda ise Kayın toplumları ortadan kaybolmaktadır. Abiyotik özelliklerden en fazla yükseklik, bakı ve jeolojik özelliklerin türün dağılımına etki ettiği görülmektedir. Arazi çalışmaları sonucunda *Fagus orientalis*'in çoğunlukla *Carpinus betulus*, *Castanea sativa* ve *Quercus petraea* ssp. *iberica* ile karışık ormanlar oluşturduğu tespit edilmiştir. Ayrıca, Kayın biyotopunun otlatma ve tarım amaçlı açmalar, ulaşım bağlantıları ve kırsal yerleşim gibi insan etkileri sonucunda olumsuz etkilendiği arazi çalışmaları ile ortaya konulmuştur. Avrupa Birliği Habitat sınıflandırmasında yer alan, biyoçeşitliliğe katkı sağlayan Kayın ekosistemlerinin araştırma alanı içinde tanımlanması, Bartın ili kıyı kesimindeki öksin kayın ormanlarının korunması ve sürdürülebilir kullanımı açısından yararlı bir ön değerlendirmeyi oluşturacağı düşünülmektedir.

Anahtar kelimeler: *Fagus orientalis* biyotopları, habitat sınıflandırması, Güzelcehisar, Mugada, Kızılkum

1. Introduction

The protection of biological diversity for today and tomorrow requires the correct analysis and interpretation of the ecological and biological relations as well as processes that take place in the ecosphere. Data regarding these relationships and processes are acquired by defining ecotopes and/or biotopes which make up the smallest units in the ecosystem (Sarı Nayim, 2010).

Biotope can be described as a geographical area that has a uniform biological environment and a uniform distribution of organisms (Dahl, 1908; Ayaşlıgil, 1997; Ayaşlıgil, 2008). Biotopes provide habitats for living communities that come together characteristically. On the other hand, interference on biotopes threatens living environment and adversely influences biodiversity. This fact makes biotope mapping that has a fundamental role in nature conservation and landscape planning process, inevitable.

Black Sea Region is an important biogeographical region. This region which needs to be studied and which has a different biotope potential, incorporates such ecosystems as various forests, pseudomaquis, meadows, grasslands, rocky areas, sand dunes which lies parallel to the Black Sea and requires protection.

Black Sea forest biotopes have a significant place in various European habitat/biotope classification systems such as Natura 2000 and CORINE Biotopes. These forest types are mentioned in European potential natural vegetation map which forms the basis of habitat classification systems. Here they are included under '*F-Mesophytic deciduous broadleaved and mixed coniferous-broadleaved forests*' topic. In this vegetation map, *Fagus orientalis* Lipsky. forests are given under F5-Beech and mixed beech forests, F6-Oriental beech subgroups (Bohn et al., 2007).

Oriental beech makes its best spread and physical development slopes of hills extending parallel to Black Sea shoreline in Turkey. The routes formed by these settlements represent the part of Northwest Euxine Broadleaved forests of European-Siberian Region (Zohary, 1973; Mayer and Aksoy, 1998; Ertekin et. al., 2015). The study area, at the same time, is located in the 'Eu-Euxine' part that is the most humid belt close to seaside. Euxine Beech forests intensely take part in this area and spread to the sea (Zohary, 1973; Yaltırık and Efe, 1996).

Mayer and Aksoy (1998) name Western Black Sea *Fagus orientalis* Lipsky. forests as silicate *Fagus orientalis* mixed forests at coline-submountain level and *Rhododendron ponticum*. Unfortunately, North Anatolian/Black Sea coast ecosystems where important *Fagus orientalis* ecosystems exist, have been negatively effected from the change in the utilization of area in the last 50 years and continues to be effected. Black Sea coastal zone is under the intense impact of agriculture, industry, energy production, mining, maritime transportation, urban development and of course tourism (European Commission, 2009).

This study aims to identify biotopes in Güzelcehisar, Mugada and Kızılkum where natural and semi-natural important *Fagus orientalis* is dominant and to map them in ArcGIS and thus, to contribute to the protection of the species and ecosystem diversity in Bartın province coastal line.

2. Materials and methods

The study was carried out on the coastal line of Bartın province which is located in Western Black Sea Region in Turkey. Particularly, the study area was the slopes of Güzelcehisar, Mugada and Kızılkum areas overlooking the Black Sea coast (Figure 1).

When the 10-year forest management plan of Bartın province covering 2001-2010 years is examined, it is seen that such main species as *Fagus orientalis*, *Carpinus betulus*, *Quercus* spp., *Castanea sativa*, *Tilia argentea*, *Ostrya carpinifolia*, *Pinus brutia* are dominant ecosystems in the study area (Bartın Provincial Department of Forestry, 2001).

Identification of *Fagus orientalis* biotopes in the study was carried out using the CORINE Biotope Project (European Communities, 1991). In identifying CORINE Biotopes, classification of vegetation was focused on, and those communities which could be distinguished as a result of the interaction between flora and abiotic environment were defined using ArcGIS tools ((European Communities, 1991; Oudheusden, 2005).

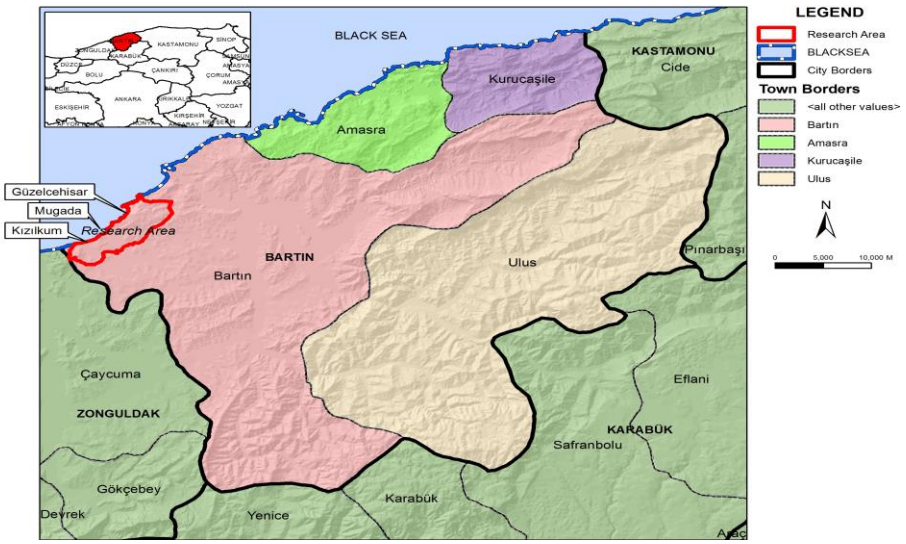

Figure 1. Location of the research area.

Initially abiotic and biotic components of study area were defined and data belong to them were collected and stored in a GIS geodatabase. Then, with help of the most recent satellite images and contemporary land use map, abiotic and biotic components of Beech dominated biotopes and land use properties evaluated together. In this way, spread of biotopes dominated by *Fagus orientalis* Lipsky. (Oriental beech) and around Güzelcehisar, Mugada and Kızılkum, habitat characteristics and structural changes due to land uses were determined..

3. Results

According to the results from digital maps of all the study area covering a 3665 ha area, 58% (2112 ha) is composed of forest biotopes. And of the forest communities, 55% (1160 ha) is composed of forest biotopes dominated by Beech trees. The overall expansion, floristic structure, human activities and effects are defined below.

1.1. Expansion

Fagus orientalis expands in the mid and high mountainside slopes of the area overlooking the Black Sea just purely or together with other deciduous trees such as Oak, Chestnut, Hornbeam and Lime. When their amounts of expansion are considered, it is seen that *Fagus orientalis* and *Quercus* spp. have the largest expansion with 254 ha. and these two are followed by *Fagus orientalis* and *Castanea sativa* covering an area of 185 ha, pure *Fagus orientalis* covering 177 ha, *Fagus orientalis* and *Carpinus betulus* covering an area of 171 ha. *Fagus orientalis* combines with *Tilia argentea* at a very small area of 1.6 ha (Figure 2, Figure 3).

It was determined that the most effective factors on spread of species are elevation, aspects and geologic characteristic of habitats. When the heights they expand are examined, it is found that *Fagus orientalis* biotopes are found at 91-348 meter height.

When geology and plant cover breakdown are examined together, it is seen that the largest amount of *Fagus orientalis* biotopes that is 71% are found on Yemişliçay formation which includes volcanogenic sandstone, tuff, andesite and basalt. And the remaining 12.5% are found in Yılanlı formation which includes sandstone and dolomite limestone; and other 12.5% are found in Akveren formation which includes sandstone, shale and conglomerate.

According to the result of study, the most intense spread of Beech communities takes place around hilly areas of Güzelcehisar where Yemişliçay formation consisting of sandstone, sheyl and limestone exists. The only pure *Fagus orientalis* community in the area is found at Güzelcehisar around 279-348 meter height and on Yemişliçay formation.

Beech communities disappear in low elevated areas around Mugada and Kızılkum. The *Fagus orientalis* community is the lowest height is found around Kızılkum and at 91 meters. Around the areas close to the coast between Kızılkum and Filyos valleys such deciduous trees as *Carpinus betulus*, *Quercus* spp. and *Castanea sativa* accompany *Fagus orientalis* (Figure 2).

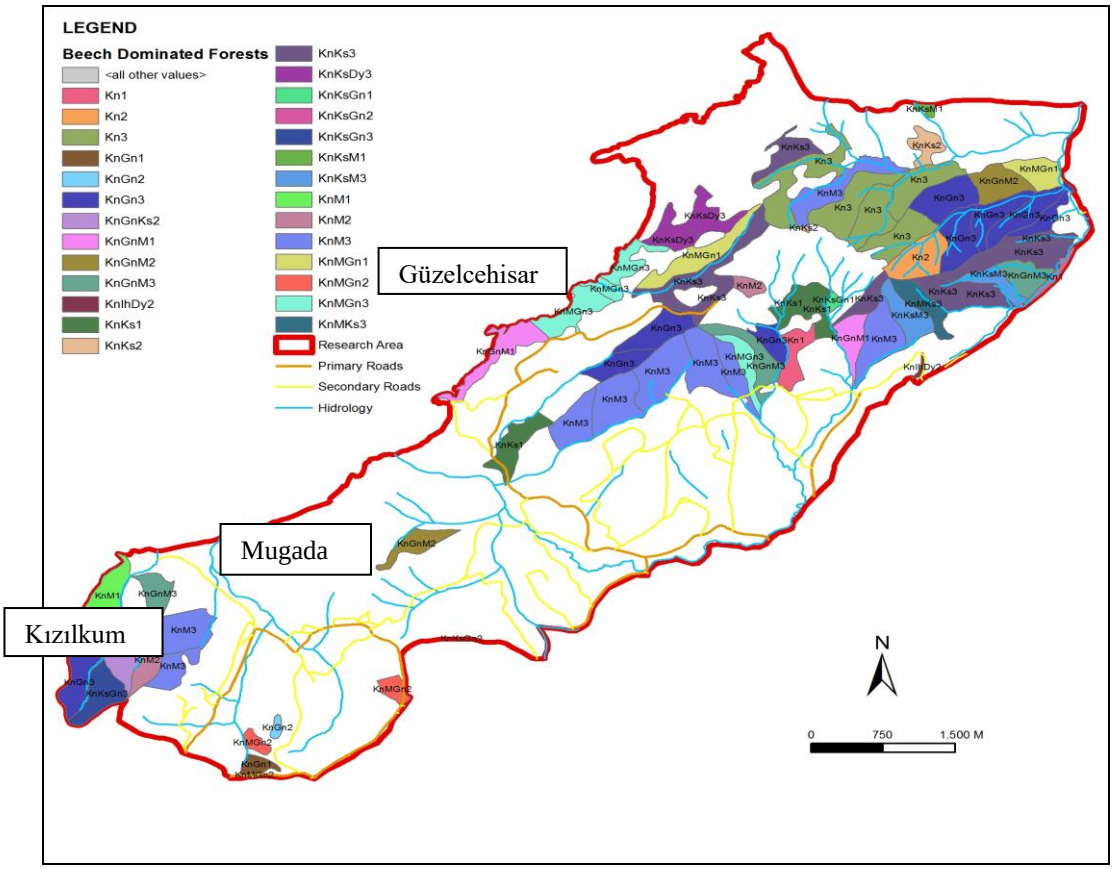

Figure 2. The distribution of the biotopes in the study area where *Fagus orientalis* is dominant.

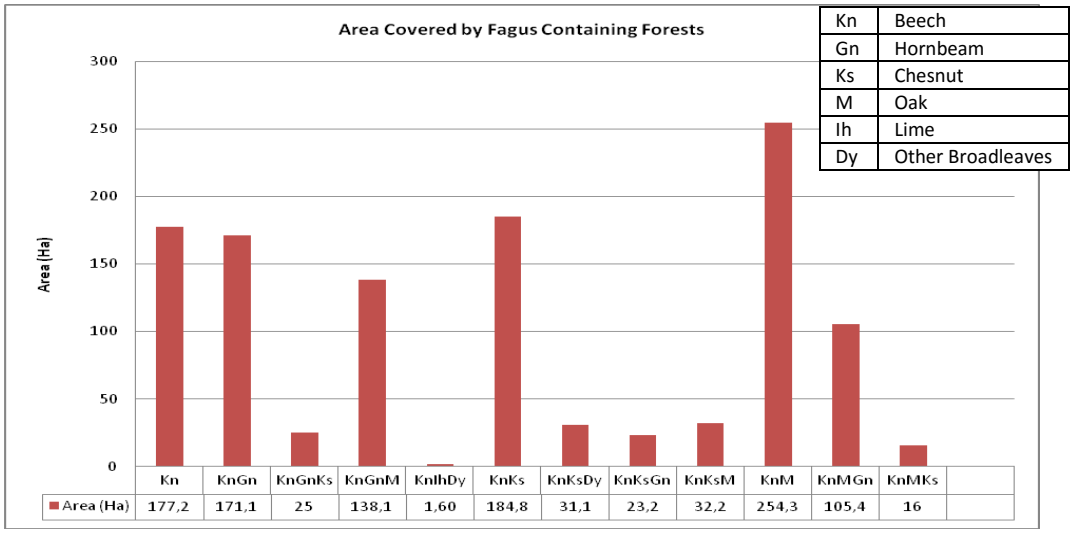

Figure 3. The distribution of the area that pure and mixed *Fagus orientalis* communities in the study area cover.

1.2. Floristic structure

It was also determined that *Fagus orientalis* often forms mixed forests with *Carpinus betulus*, *Castanea sativa* and *Quercus petraea* ssp. *iberica*.

In the shrub layer of the forest, high moisture resistant evergreen plants such as *Laurocerasus officinalis*, *Rhododendron ponticum* s.str., *Ilex colchica*, *Rubus ideaus*, *Corylus avellana* s.str., *Vaccinium arctostaphylos* and in the herbaceous species as *Hedera colchica*, *Primula vulgaris* ssp. *sibthorpii*, *Trachystemon orientalis*, *Polystichum setiferum*, *Astragalus glycyphyllos* s.str., *Fragaria vesca*, *Dryopteris filix-mas*, *Cardamine quinquefolia*, *Hypericum calycinum*, *Phyllitis scolopendrium* are dominantly located.

Table 1. The amount of the areas that *Fagus orientalis* communities expand

Wood Type	Area (m^2)	Area (ha)
Kn	1772541	177,2
KnGn	1711871	171,1
KnGnKs	249295	25
KnGnM	1381535	138,1
KnIhDy	15756	1,60
KnKs	1847827	184,8
KnKsDy	311504	31,1
KnKsGn	232777	23,2
KnKsM	321726	32,2
KnM	2543967	254,3
KnMGn	1053633	105,4
KnMKs	159645	16
Toplam	**11602077**	**1160**

1.3. Human activities and their impact

With field works it was determined that Beech biotopes were adversely affected by man based factors such as grazing, deforestation for agricultural use, road networks and rural settlements. Fertile hazelnut gardens and agriculture lands expands through the deep and slimy soil between Güzelcehisar-Kızılkum areas where there are *Fagus orientalis* forests.

4. Conclusions and discussion

Karabük-Yenice forests which is an important and protected area in Western Black Sea, Bolu-Yedigöller National Park and Kastamonu-Bartın Küre Mountains National Park forests are protected areas close to Bartın province and the study area. These three areas can be considered as important reserve areas best representing the Western Black Sea Euxine *Fagus orientalis* community character (Mayer and Aksoy, 1998; Ministry of Forestry and Water Affairs, 2016).

Fagus orientalis biotopes in Bartın province are delicate ecosystems and they should be protected. In the biotope map prepared by Sarı Nayim (2010) covering the area between İnkum and Amasra, *Fagus orientalis* ecosystems are determined as delicate biotopes in terms of the important species they consist.

The delicate *Fagus orientalis* biotopes between Güzelcehisar-Kızılkum together with other *Fagus orientalis* ecosystems in Bartın province should be connected with the aforementioned protected areas. At the same time, the main elements of landscape ecology which are almost natural corridors and step stones should be evaluated and biotope inventory towards forming new protected areas in existing empty spaces should be created.

In this study, it was seen that in steep slopes where the land is not convenient for use and in areas where transportation infrastructure is either weak or completely destroyed, natural *Fagus orientalis* ecosystems close to the coast are better protected. It can be said that the protection and management of the biological diversity in the region are related to accessibility and level of infrastructure. This should be considered as an opportunity in the coastal planning stated in the 1/25000 scale Bartın province Environmental Plan.

Defining *Fagus orientalis* ecosystems, which contribute to biodiversity and is included in the European Union Habitat Classification, within the study area will be a useful pre-assessment for the protection and sustainable use of Euxine *Fagus orientalis* forests in Bartın.

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