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Kuyucak monumental cretan maple (*Acer sempervirens* L.) (Burhaniye – Balıkesir, Turkey)

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Abstract

There is a nearly 250 years old and 13 meters tall maple with a girth of 2.5 m on Gökırağı Hill, located in the northwest of Kuyucak Village which is situated in Burhaniye district of Balıkesir. This maple is a dimensionally, aesthetically, and floristically valuable natural asset which is also a monumental tree. This study was conducted in order to determine the features of this maple, reveal its regional and Turkey-wide value, and monumentalize and protect it.

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Keywords: Monumental trees; cretan maple; *Acer sempervirens* L.; Burhaniye; Turkey.

1. Introduction

Turkey has diverse vegetation thanks to the ecological conditions. There are about 11.000 plants in Turkey that have been identified and recorded so far. Around 500 of them are woody plants. The most common plant among the species constituting the forests around the Gulf of Edremit is Turkish pine (Atalay and Efe, 2010). Black pines, oaks, firs, and beeches are other trees that form forest stands. Three different maple species were identified in the area. They are mostly xerophytic species and grow under Mediterranean climatic conditions. Maple species individually stand among Turkish pines, black pines, and oak species.

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In Turkey, the monumental trees conservation status is within the scope of “Natural Monuments”. The term “Natural Monuments is used for “individual trees or groups of trees that were formed by humans or emerged spontaneously near mountains, hills, caves, rocky places, canyons, lime and lava deposits, corals, hot springs, water resources, waterfalls” (Anonymous, 1996a; 1996b; 1996c).

The term ‘monumental tree’ is first used in judicial records with the 25 and 597-numbered decision of the Ministry of Culture and the Supreme Council for the Preservation of Natural Assets. The term is defined as such: “Trees which are monumental in terms of natural structures, dimensions, and characteristics are called monumental trees” (Anonymous, 1998). Monumental trees have scientific, historical, touristic, aesthetic, and psychological functions (Asan, 1987; 1993; 1999). Trees with these functions are regarded as monumental trees. Various studies about monumental trees in different regions have been conducted in Turkey (Özdemir et al., 1986; Güner, 1994; Yaltrık, 1994; Genç and Güner, 1998; Özçelik et al., 1998; Yavuzşefik, 2001; Kavgacı, 2002; Satıl et al., 2002; Yavuzşefik and Çetin, 2002; Genç and Güner, 2003.; Sarıbaş and Yaman, 2007; Efe et al.; 2010).

2. Materials and Methods

A field study was carried out to identify the dimensional, physical, and ecological features of the maple. The physical features of the tree were determined with the help of tape measures, increment borers, tree height measuring tools, altimeters, compasses, GPS devices, calipers, and cameras. “Suunto Height Meter” and “Vorkampf-Laue” methods were implemented to measure the height of the tree. The girth of the tree was measured at a height of 130 cm. The tree was measured first by taking the bark into account, and then without it. Then, the diameter was calculated. The diameter of the tree was measured at a height of 130 cm above the ground level. This value was divided by π ($\pi=3.1416$), and the diameter at the height of the trunk was calculated (Uzun, 1997).

When the crown diameter of the tree was being measured, the radii of the east, west, north, and south corners of the area that is located within the projection of the crown was also measured, and a total was acquired. Later, the crown diameter was calculated by dividing the obtained value by two. The top diameter of the tree was calculated by measuring the projection of the tree and its east, west, north, and south radii, and by dividing the total by two

The basal area (cross-section) of the tree is the cross-sectional area of the girth of the trunk, which was measured at a height of 130 cm. The basal area was calculated according to the following formula:

Tree Basal Area:

$$TBA = [\text{Girth}/200]^2 \times \pi (3.1416)$$

The tree volume was calculated by multiplying the basal area by the height of the tree, and then by dividing the result by 3.

$$\text{Volume (m}^3\text{)} = \frac{\text{TBA} \times \text{Height}}{3}$$

The age of the tree was determined based on “the method of tree age estimation” and the samples collected with a “Pressler Increment Borer”. Annual tree rings in the at least 15 cm long increment core extracted from at a height of 130 cm were counted. The number of annual tree rings, which was determined based on the length of the increment core, was interpolated in the length of the tree radius that was measured without taking the bark into consideration.

When the physical geographical conditions of the area of the tree were scrutinized, a GPS device was used in order to determine the coordinates and altitude. 1/100.000 scaled geologic and soil maps and the findings of the fieldwork were taken into account to examine soils. A 1/25.000 scaled topographic map was used to examine the topography. Climatic data was obtained from observations conducted by Burhaniye Meteorological station.

3. Geographical Features of the Immediate Vicinity

Burhaniye and its vicinity are rich in plant species as they have suitable climatic and soil conditions (Sönmez, 2006; 2007). The Mediterranean climate prevails on the north slopes of Mt. Madra and in the area which includes the coasts of the Gulf of Edremit. Here, plant species belonging to the Mediterranean Phytogeographical Region are commonly found (Efe and Sönmez, 2006; Efe, 2010). Olive groves are widely distributed on the lower areas. There are bushes near the slopes. Recently, however, new olive groves have been created on the slopes (Efe et al. 2008.)

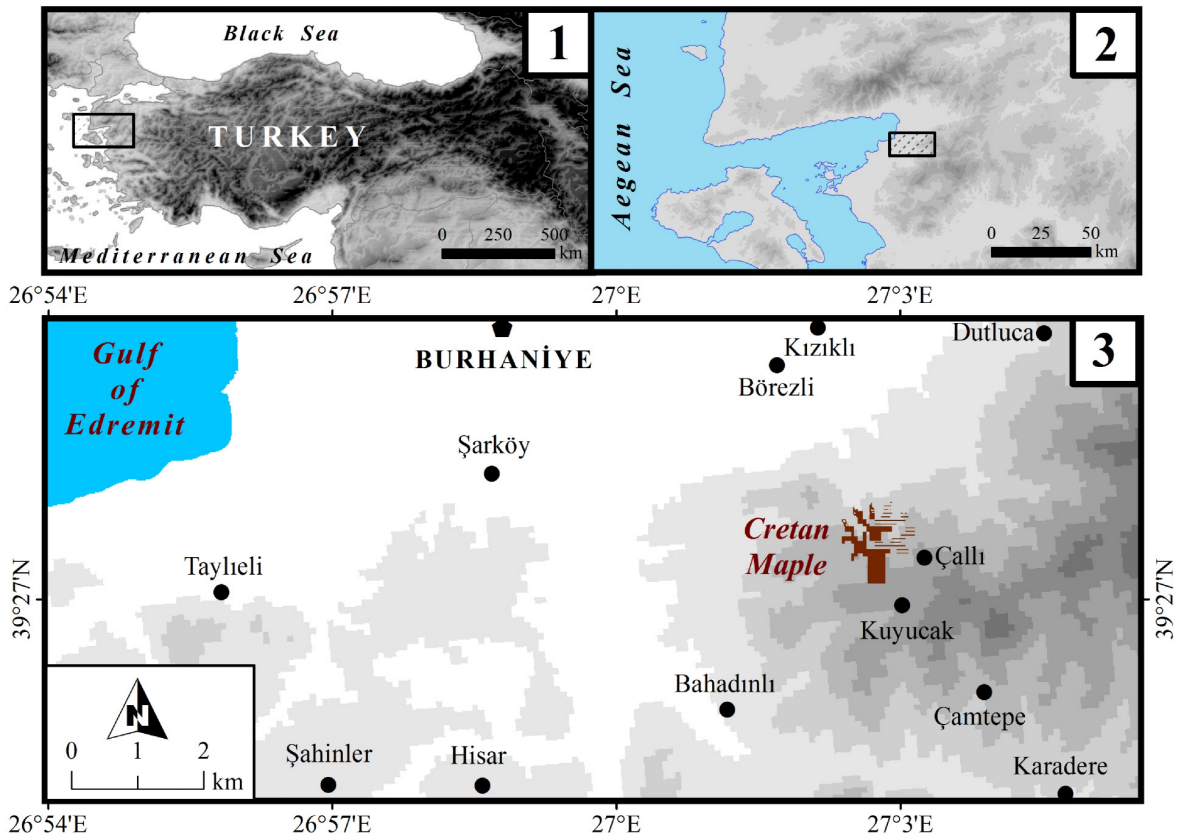


Fig.1. The Location of Kuyucak Cretan Maple

Kuyucak monumental Maple is located 1 km west of Kuyucak and Çallı, village settlements in the southeast of Burhaniye district center. The maple is situated at the elevation of 475 m and in the west of Gökırağı Hill, which has an elevation of 490 m above sea level. The tree is located on a generally north-sloping ridge where $27^{\circ}02'40''$ eastern longitude and $39^{\circ}27'13''$ northern latitude intersect.

Kuyucak and Çallı are located in the southwest and east of the hill, respectively. Yağlıoba locality is situated in the northwest. Kocaçınar Stream valley is in the north of Gökırağı hill, and Alanbey stream valley is in the south of it.

Andesites and tuffs, volcanic rocks formed during the Neogene Period, prevail in the area. The area where the tree is found is geomorphologically a hilly area located in the south-southeast of Edremit plain. This hilly area consists of the western parts of Büyükyaren hill. The hill on which the tree grows has a wide perspective on north, west, and south. There are thin and non-calcareous brown soils covering volcanic rocks on and around Gökırağı hill. The tree is situated on the watershed between Havran stream and Karınca stream basins. The northern tributaries flow into Havran Stream, and the southern and western tributaries flow into Karınca stream. There are no water resources in the immediate vicinity of the maple.

The area has been intensely used during the historical periods. The natural vegetation has been destroyed and is now composed of bushes. Thus, bushlands, in which there are also Cretan maples, dominate the immediate vicinity of the monumental tree. Outside these bushlands there are mostly abandoned and narrow farmlands.

Based on the climatic conditions of the location of the maple, one can say that the natural vegetation of the area should be composed of oak and Turkish pine forests. As in the case of many other regions of Anatolia, people here

have lived in rural areas and fulfilled their needs for fuel and construction materials by exploiting nearby forests. Particularly forestlands have been largely destroyed, and anthropogenic biomes have emerged (Efe, 2000; 2005). Today, this area is dominated by bush communities mainly comprised of such as Aleppo oaks, phillyreas, and terebinths.



Fig. 2: General view of the Kuyucak Cretan Maple

4. The Place of Trees and Maples in History and Culture

Trees are materially and spiritually important in Turkish world and Anatolian culture. The most interesting features of trees are that they have long life spans, and that they are big. Trees, which reach the ground with their roots and the sky with their branches, function as a bridge between two unknown worlds. The “Tree Cult”, an element of the belief systems of old Turkish communities, is still important today (Ergun, 2004). Especially “solitary trees” have had an important place in mythological beliefs in that they often symbolize the unity of God (Çoruhlu, 2001).

In the old Turkish kavims, hakans (khakans) chose a tree and an animal as symbols for each of his sons. The trees Genghis Khan chose as symbols for his sons are:

Juniper for Katay Bey, beech for Ordaç Bey, populus for Tamyān Bey, fraxinus for Çormatı Bey, tilia for Kerait Bey, sorbus for Mutyan Bey, oak for Burçan Bey, maple for Barkıt Bey.

This is an excerpt from Genghis-name: ... “Then Genghis Khan said again. Hey Barkıt Bey! Let your tree be a maple, your bird be a hoopoe, your place be Burunç, your seal be a snowdrop” (Altınkaynak, 2007).

The daughter of Erlik, considered a superhuman entity by Ural-Altai peoples and Uyğurs and a monster by Shamans, is represented in the epic as such:

He was Abram-Moos Kara-taacı
 His hood made of owl feathers
 His fur an owl feathered sack
 His sack fur is swaying
 With his maple bark drum
 On his back.

5. The Features of Maple and Cretan Maple

Maples need sunlight, thus they like open areas that receive light. Some species grow under penumbral conditions. They prefer well-drained and organic matter-rich soils. There are ten different species of maples in

Turkey, which are *Acer campestre* L. (Field Maple), *Acer cappadocicum* Gleditsch (Cappadocian Maple), *Acer hyrcanum* Fisch. & Mey. (Balkan Maple), *Acer monspessulanum* L. (Montpellier Maple), *Acer platanoides* L. (Norway Maple), *Acer quinquelobium* (Five-lobed Maple), *Acer sempervirens* L. (Cretan Maple), *Acer tataricum* L. (Tatar Maple), *Acer trautvetteri* Medw. (Heldreich's Maple), and *Acer undulatum* Pojark. These are distributed all over our geographical regions depending on their climatic and ecological demands.

Maple wood is very light-colored and durable. The name of the tree derives from its light-colored wood. This tree is used to make spoons, combs, trinkets, musical instruments, and souvenirs. It has a durable structure and winged fruits looking like butterflies. Therefore, it is known as the 'butterfly tree' in some regions. The tree has lobed leaves the number of which depends on the species. It has an opposite leaf arrangement, and leaves are simple. The height of these trees can be up to 30 meters depending on their location and species.

Cretan Maples (*Acer sempervirens* L.) are either found individually or in small groups. Maples do not make up forests, and are sparsely distributed among other species. Some maple species are found in open areas and around farmlands. They sometimes even form small groups.

Cretan Maple is a tree species that is peculiar to Southeast Europe and Southwest Asia. Among the maple species, Cretan Maple is the most drought and heat-tolerant one. It is found in Turkey and Greece. Cretan Maples lose their leaves in winter (sometimes they do not), and they are found in the Aegean and Mediterranean regions of Turkey.

Cretan Maples, which occur in the west and southwest of Turkey, grow at altitudes between 100 and 1350 meters (Yaltrık, 1970). They do not grow in inland areas as their need for heat is high. They grow best in areas where the annual average temperature ranges between 14°C and 15°C, and they are drought-tolerant. The lowest and highest temperatures they can endure are -15°C and 40°C, respectively. In terms of monthly average optimum temperature, the lowest temperature is 5°C while the highest temperature is 24°C. Cretan Maple is a mesophytic tree species. They require a minimum amount of precipitation of 700 mm. They grow on low acidic, neutral or low alkaline soils, which are like non-calcareous brown forest soils. The pH levels of these soils range between 6.5 and

7.5.



Fig. 3-4: A leaf and a branch of a Cretan Maple

Flowers have very short pedicels. Flowers form upright inflorescences and most of the flowers on inflorescences are female. Flowers in the lower part of the inflorescence are male while those in the middle part are female. Flowering shows different characteristics depending on the region and species. It begins in March and lasts until the end of May. The colors of the flowers are yellow and green.

Leaves of *Acer sempervirens* are smaller than those of other maple species. Its leaves are leathery and tough. Their length ranges between 1 and 4 cm, and their width ranges between 1 and 5 cm. They sometimes lack lobes and sometimes have three lobes. Lobes are triangular-shaped. Their tips are sometimes elliptical and sometimes pointy. Lobes might be shallow and leaves may lack lobes. Leaf edges are smooth or slightly jagged. The color of leaves is light green. In fall, leaves turn from green to yellow, and then to orange and to red.

Maples have winged fruits, and they overhang in conjoint groups of two. Fruit wings first become red, and as they ripen, they turn russet and then yellow. Wings are either parallel or at a very acute angle to each other.

The color of the trunk is grey. When it is young, it is smooth and straight, yet it gets scaly and cracked. Suckers first become green, and they turn brown in the second year.



Fig. 5-6: A leaf (left) and seed (right) of Kuyucak Cretan Maple

5.1. Systematics of Cretan Maple

Kingdom	: Plantae
Sub-Kingdom	: Tracheobionta
Super-phylum	: Spermatophyta (Phanerogams)
Phylum	: Magnoliophyta (Angiosperms)
Class	: Magnoliopsida (Eudicotidae)
Order	: Sapindles
Family	: Sapindaceae
Genus	: <i>Acer</i> L.
Species	: <i>Acer sempervirens</i> L.

5.2. Features of Kuyucak Maple

The tree is located on a slightly north-sloping ridge, which is situated on an open that has a view of the Gulf of Edremit. It has an upright trunk. Branching begins at a height of 2 meters in northwest direction. There are four different main branches above 3.5 meters. Branches are attached to the truck at a “V-shaped” angle. There are wounds in the trunk which were inflicted with sharp objects. There are deep cracks and deformations in the truck. As the area suffers intense soil erosion, the tips of the roots have surfaced in the part where the trunk is attached to the soil.

The scientific name of the tree : *Acer sempervirens* L.

Turkish name : Doğu Akçağacı

Regional name : Maple

Attributed name : Kuyucak Cretan Maple

Location

City and District : Balıkesir, Burhaniye

Village/Neighbourhood : Northwest of Kuyucak Village

Position : Gökırağı Hill

GPS coordinates	: (Geographical coordinates): 27°02'40" eastern longitude and 39°27'13" northern latitude
Transportation	: It is possible to reach the tree, which is in the northwest of Kuyucak Village, via Burhaniye-Börezli-Kuyucak road. This maple is within the private property of Ali Adışen, who is from Kızıklı Village situated on Gökırağı Hill.

5.3. Habitat features

Environmental landscape and overall topography conditions: The tree is located on a hill surrounded by Kuyucak to the southeast, Çallı villages to the east, and Yağlıoba Neighbourhood to the northeast. Kocaçınar Stream runs through the northern part, and Alanbey Stream runs through the southern part of the hill. The forest ecosystem in the immediate vicinity of the tree is completely destroyed, so it stands as a solitary tree.

Elevation, aspect, and slope: It is located on a hill with an elevation of 475 above sea level. The tree is situated on a slightly north-sloping area.

Bedrock, soil type and structure: Entisols and inceptisols occur on the andesite bedrock.

Climatic data of the location: The average annual amount of precipitation is 890 mm, and the average annual temperature is 13.5°C.

5.4. Physical dimensions and distinctive visual features

Height of the tree	: 13 m
Girth	: 2.50 m
Diameter	: 0.80 m
Estimated age	: 250 years
Length of the trunk	: 1.7 m
Crown diameter	: 16 m
Crown width	: North-south 20 m, east-west 12 m
Crown radius	: North: 10 m, south: 10 m, east: 8 m, west: 4 m

5.5. Appearance of the trunk and branches of the tree

The height at which branching begins in the trunk: 1.7 m

Tilt of trunk and its direction: The trunk is upright.

Furcation branch number: Four branches developed as a result of furcation.

Branch growth direction: "V-shaped" furcation is observed on most of the branches. A lower branch developed laterally towards south.

Branch conditions and pruning: Branches are smooth as they were not pruned.

5.6. The state of health of the tree

Decay/Cavity: No decay or cavities

Leaf condition: Leaves are in bad condition compared to those of the same species.

The state of branch and sucker growth: No symptoms of slowdown have been observed.

Tumor or swelling: No

Insects or fungus: Not observed.

Ownership status of the tree (natural or legal person, or state): The tree is located in a field belonging to Ali Adışen who is from Kızıklı Village.

Human intervention: There are axe marks in the trunk and the root.

The threats the tree faces: This maple, which is above the standard measures of those of the same species in terms of age and diameter, is in a highly vulnerable environment. It is a matter. It is only a matter of time before it is cut or pruned.

Long-term or immediate measures that have to be taken: It is necessary to take preventive measures, to immediately prepare and put notification signs emphasizing the importance of the tree, and to have experts take care of it.



Fig.7. Trunk details of Kuyucak Cretan Maple

5.7. The monumental value and protection of the tree

As a solitary tree, this very old maple, which has extraordinary trunk, crown, and height sizes, adds tremendous beauty to the environment. In addition, it has a life span long enough to bridge the gap between past and future. In terms of its dimensions, the tree falls into the category of monumental trees. It is proper to register the tree and put it under protection since it is not possible to find another maple with these dimensions within the boundaries of Burhaniye district and Edremit Region.

5.8. Importance of the Tree

Kuyucak Cretan Maple is very important in two aspects. One is that it is floristically significant because it is located on the farthest northern border of the distribution area of Cretan maple (*Acer orientale – Acer sempervirens*), which is only found in the Western Mediterranean and Aegean regions of Turkey. According to Yaltrık, this tree species does not grow in the further west beyond Dilek Peninsula (Mount Samsun) (Yaltrık, 1970), and the newly detected location where these trees grow indicates that their distribution area includes the vicinity of the Gulf of Edremit.

The other aspect is that Cretan maples are usually shrub-form and bush-form, and that they are very rare examples of their species. The view on the horizontal background to the west created by the tree particularly thanks to its location is extraordinarily visual and aesthetic.

Therefore, it is absolutely necessary to protect and register this maple as a monumental tree which developed differently and extremely compared to trees of the same kind, and contributed greatly to the texture of the settlement area in terms of physical dimensions, visual distinctiveness, and environmental aesthetics.

6. Conclusion and Suggestions

This monumental tree is a magnificent natural monument bridging the gap between past and future. Old and wise people have an influence on young generations. This tree has a similar influence on them and reminds them of history, patriotism, and the need to pay respect to ancestors. The fact that this maple is superior to those of the same kinds in terms of its age and diameter, and that it has life span long enough to bridge the gap between past and future must be emphasized. Its location is like a view terrace that has a view of the impressive landscape of the Gulf of Edremit.

When this is combined with its imposing and aesthetic appearance and its centuries-old age, the need to take this tree into the scope of 2863 numbered “Conservation of Cultural and Natural Property Law” arises.

It is necessary to take some measures for this tree to live longer. Preventing people from touching the tree is crucial for the protection. It is essential to prevent people from building a fire under or near the tree, from driving nails into the trunk and branches, and from putting up swings. An information sign should be put near the tree in order to inform people. Additionally, a direction sign should be put on the road between İzmir and Çanakkale with the purpose of enabling people to see the tree.

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