

Chapter 16

A hidden treasure in Turkey - old oaks with unique values

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Diversity of oaks and its role for species richness

The oaks (*Quercus* spp.) in Turkey have the widest distribution area among all deciduous trees and cover 6 million hectares of the land area or 23% of the forests (Çolak and Rotherham, 2006). Different oak species are distributed all over the country, with the highest diversity in Marmara region (Uslu et al., 2011).

Globally, oaks include a wide range of about 500 species of trees and shrubs in the northern hemisphere, exclusive of the Arctic and about half of these are in the New World. Oak is an interesting genus for phytogeographers, foresters and ecologists, but is also one of the most problematical groups in the Turkish flora since widespread hybridization and introgression have much obscured specific limits (Hedge and Yaltrık, 1982). Depending on what taxonomic concept used, there are about 26 species of oak known from all the countries north of the Mediterranean, 18 of these are known from Turkey, plus nine additional subspecies (Hedge and Yaltrık, 1982; Greuter et al., 1986). This makes Turkey the richest country in the western Palearctic in terms of oak biodiversity (Uğurlu et al., 2012). Various species of oak can tolerate a very wide range of climatic- and soil conditions, including hot or cold temperatures, highly saline or alkaline soils (Özcan and Baycu, 2005; Uğurlu and Oldeland, 2012). Some of the Turkish species have a very restricted distribution in the world and some are endemic to the country e.g. *Quercus aucheri* and *Q. vulcanica* (Photograph 1) (Uslu et al., 2011).

Oaks can become very large and old. There are examples of oaks nearly 1000 years old and with a circumference of 14 meter in breast height. Some of the older oaks we have seen in Turkey are for sure more than 500 years old. With dendrology analysis, the age can be calculated, but as the trees often are hollow and the central part of the trunk are missing (Photograph 2) the age must be an estimation.



Photograph 1: The leaves from the two rare and endemic oak species a) *Quercus vulcanica* and b) *Q. aucheri* (N. Jansson).



Photograph 2: Old hollow oaks from Gölhisar region of Turkey (N. Jansson).

Traditional use of Oak

Large parts of Turkey are intensively grazed since many centuries and old trees are very rare. As in most countries in Europe (Emanuelsson, 2009) the trees in Turkey have been very important for humans through history. Not only as producers of timber, but also for extracting leaf fodder for the animals and firewood for heating and cooking. This is the reason why most of the old oaks in Turkey have been regularly pollarded (Photograph 3).



Photograph 3: Thousands of pollarded oaks near Gülnar in Mersin region of Turkey (N. Jansson).



Photograph 4: Acorns from two of the Oak species, (a) *Quercus brantii* and (b) *Q. infectoria* ssp. *boissieri* in Turkey used as food for people in Turkey (N. Jansson).



Photograph 5: Plantations of (a) Lebanon cedar (*Cedrus libani*) and (b) Turkish pine (*Pinus brutia*) in Turkey (N. Jansson).

Acorns as fodder for animals are known from many countries, but use as food for humans is almost unknown. The practice have been around for thousands of years and can be found virtually everywhere oaks are found (Bainbridge, 1986; Lieutaghi, 1998). It occurs in the early town settlements in the Zagros Mountains in Iran and at Çatalhöyük in Turkey (6000 BC) and were a staple food for many people until after 1900 AD (Bainbridge, 1986). In Turkey two species has been commonly used for this purpose: *Quercus brantii* and *Q. infectoria* ssp. *boissieri* (Photograph 4) (Mason and Nesbitt, 2009).

The Turkish forest authorities have quite recently started to reforest the landscape. In this process, many of the last sites with old oaks are transformed to Turkish pine (*Pinus brutia*) or Lebanon cedar (*Cedrus libani*) plantations (Photograph 5).

The oak habitats in the Mediterranean region, including Turkey, is currently only a fragment of its original extent. Many remnants of forests that remained are now grazed, but differ in size as well as in structure and shape,

depending on the current land-use management (Grove and Rackham, 2003; Westphal et al., 2009). In Turkey the old oaks are cut mainly when transforming the oak habitats into plantations of mainly Turkish pine (*Pinus brutia*), but at higher altitudes also black pine (*Pinus nigra*) and Lebanon cedar (*Cedrus libani*) for timber production.

Old Oaks with high species richness

Old oaks are exceptionally species-rich in Europe, but in most countries the habitat has declined substantially. Saproxylic insects associated with old trees and dead wood is one of the most endangered invertebrate groups in Europe, as their habitat has severely decreased (McLean and Speight, 1993). These insects are living in fungal fruit bodies, dead wood outside the tree (in branches, twigs or parts of the trunk) or inside the tree in hollows (Palm, 1959; Speight, 1989; Dajoz, 2000). Many species dependent on large, old and hollow trees have survived in small remnant woodlands of ancient trees, often in the agricultural landscape (Speight 1989; Warren and Key, 1989). A large proportion of them are rare and red-listed saproxylic insect species (Jonsell et al., 1998; Gärdenfors, 2010; Ranius and Jansson, 2000). In general the knowledge of the Turkish beetle fauna is poor in comparison to other European countries. In comparison to others there are some beetle families i.e. longhorn beetles and jewel beetles (Cerambycidae and Buprestidae) (Photograph 6), with large amount of saproxylic species, with relatively good knowledge of what species existing in Turkey.

When oaks age, hollows in the trunks fills with wood mould, i.e. wood soften by decomposing fungi, often with remains from animal nests and insect fragments and droppings from insect larvae. Trunk hollows with wood mould harbor a specialized fauna, mainly consisting of beetles and flies (Dajoz, 1980). The beetle fauna in tree hollows has intrigued entomologists for a long time, but only recently quantitative methods have been used in the studies (Ranius and Jansson, 2000; Brustel, 2004; Jonsell, 2004; Buse et al., 2008).

In northern Europe the pedunculate oak (*Quercus robur*) is known to harbor the richest wood living beetle fauna compared to other tree species. In Sweden 540 species are known to use oak wood for their larval development (Palm, 1959). Saproxylic insects associated with old trees are one of the most endangered invertebrate groups in Europe, as their habitat has severely decreased (McLean and Speight, 1993) and a large proportion are rare and red-listed (Jonsell et al., 1998; Ranius and Jansson, 2000).

The largest beetle in Europe is the stag beetle (*Lucanus cervus*). The stag beetles in southeastern Turkey are larger than their European conspecifics, and the males can be up to 12 cm, including their mandibles (Photograph 7a). The larvae of this beetle are living in the ground eating dead roots of oaks. The development takes 3-5 years and



Photograph 6: Examples of Turkish species of flower chafers and longhorn beetles (Cetonidae and Cerambycidae) living on oaks: (a) *Protaetia aeariginosa*, (b) *Ergates gaillardoti* (Chevrolat) and (c) *Prinobius myardi* (N. Jansson).

the adults can be seen in May-July. Another large and interesting species living on oaks in Turkey is the large scarab beetle *Propomacrus bimaculatus*. The forelegs of the males are extended and bended creating an extreme shape (Photograph 7b). The species is dependent upon old trees as the larvae develops in the cavities eating the rotten wood produced by fungal activities.

Most of the beetles are small and have a cryptical life, most hidden for us. However, some are as imago, in sunny days, visiting flowers, feeding on nectar and pollen. Some of these are from the scarab family called chafers. The largest (20 mm) and most beautiful among those in Turkey are the multi-colored *Protaetia aeariginosa* (Photograph 6a). The species needs old hollow trees for its larval development. The beetle fauna associated with old oaks in Turkey is virtually unknown, but very threatened. A project started in Turkey in 2005, aiming to describe the diversity of beetles on old oaks in Turkey have found a fantastic diversity and many interesting species. Until now, 28 species new to science have been described (Schillhammer et al., 2007; Novak et al., 2011, 2013, 2014; Platia et al. 2011, 2014; Sama et al., 2011;

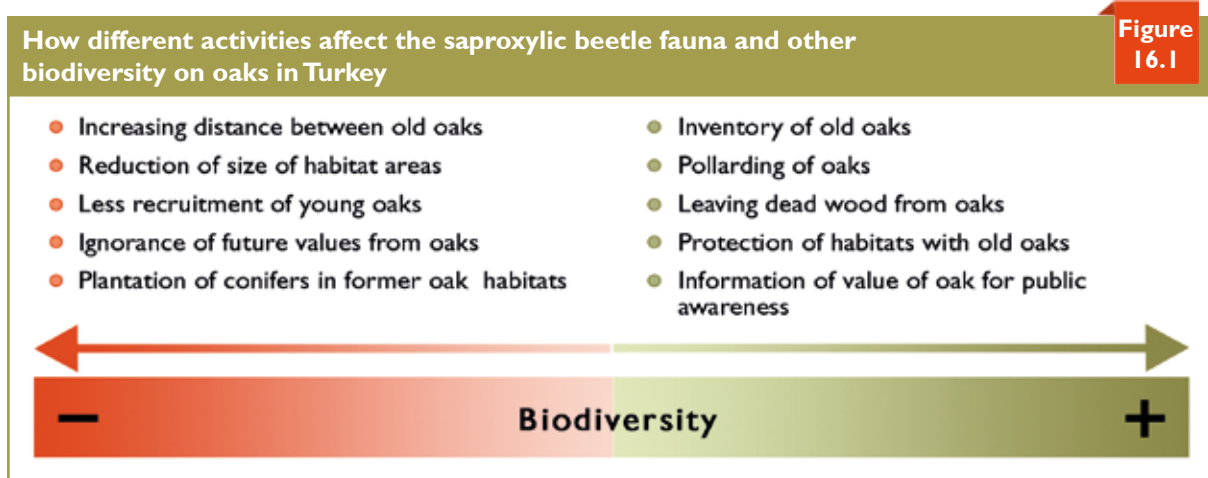


Photograph 7: (a) Two males of the Turkish stag beetle (*Lucanus cervus* ssp. *judaicus*) and (b) a male of the scarab beetle *Propomacrus bimaculatus* (N. Jansson and O.Ç. Türkiye).

Mazur et al., 2013; Schulke et al., 2013) (Photograph 8). One could guess that these are very small species hard to recognize, but many belong to famous well-known families like the click beetles (Elateridae). The largest



Photograph 8: Some of the species found new to science: (a) *Elathous adiyamani* (Family-Elateridae), (b) *Hesperus gozukurai* (Family-Staphylinidae), (c) *Allecula turcica* (Family-Alleculidae), (d) *Hister arboricavus* (Family-Histeridae) (G. Platia, H. Schillhammer, O.Ç. Türkiye and S. Mazur).



species, given the name *Elater turcicus* is from this family and is 18 mm long. Probably the larvae, as most larger click beetles, is a predator living in the soft rotten wood inside hollow trunk of oaks.

High values are threatened

It has been suggested that beetles living in hollow trees have low dispersal capacity (McLean and Speight, 1993; Nilsson and Baranowski, 1997; Ranius and Hedin, 2001) and are sensitive to reductions of the number of suitable trees in the landscape. As the competition for land by agriculture, forest industry and urban development has intensified in Turkey, it is important to identify the remaining oak patches and estimate their conservation value to be able to make cost-efficient use of the limited resources allocated to conservation. To protect the unique endemic beetle fauna living on old trees, it would be of great value if the most important areas with old oaks could be identified and protected in Turkey. Patches with old oaks in the landscape are probably also positive for the surrounding productive forests. The predators in the oak forests such as woodpeckers, parasitic wasps and beetles like *Calosoma sycophanta* (Weber, 1881) can help in regulating the pest species in plantations of pine and cedar, for instance (Kanat and Özbolat, 2006) (Figure 16.1). But further studies in this field are needed.

Many birds need cavities for their nesting. Old trees can serve birds from small-sized ones like tits and nuthatch to large ones like owls. Recent studies of birds in oak forests in Turkey showed a higher number of secondary cavity nesters in older forest stands in comparison with young (Bergner et al., 2015) and woodpeckers prefer foraging and nesting in larger oaks with deeper bark furrows and a higher amount of dead wood (Bergner et al., 2016). Some of the insect species in the cavities also gain from the bird activities like different materials left by the birds. Old oaks are also important as foraging habitats for some of the birds as the insect density often are high and species like woodpeckers (Photograph 9) find food in the rotten wood and under dead bark etc.



Photograph 9: Middle spotted woodpecker (*Dendrocopos medius*) from Isparta region, Turkey (O.Ç. Turkey).

Although the Mediterranean region is considered to be a biodiversity hotspot (Medail and Quezel, 1999; Myers et al., 2000), only a few systematic studies report on the biodiversity of beetles in Mediterranean tree habitats (e.g. Brin and Brustel, 2006; Buse et al., 2008; Jansson and Coskun, 2008; Mico et al., 2013).

Many of the beetle species found (i.e. 12) are very rare and are listed in the European red-list (Nieto and Alexander, 2010). One good example of this from the Turkish material was the violet rose chafer (*Protaetia mirifica* Mulsant) which is a very rare species and only known from less than 15 sites in the entire Mediterranean region. Other examples of interesting beetles found were the click beetles *Limoniscus violaceus* (Müller), *Reitterelater dubius* (Platia and Cate) and *Ischnodes sanguinicollis* (Panzer) (Photograph 10). They are very rare beetles all over their European range and are considered to be so-called Urwald relict species with high conservation values (Whitehead, 2003; Müller et al., 2005). The violet click beetle (*Limoniscus violaceus*) is also listed in Annex II of the EC Habitats Directive. An important message to spread from the project is that all the beetles mentioned in this article are living on old or



Photograph 10: Some of the species on the European redlist: (a) *Protaetia mirifica*, (b) *Limoniscus violaceus* (c) *Ischnodes sanguinicollis* (N. Jansson).

dying trees and never attack younger trees. Actually this is true for all wood living beetles on oaks, except a very small number.

Conclusions

The results from the on going studies, first confirm the status of Turkey as being a major biodiversity hot spot, but also one of the less explored areas, in the western Palearctic. The findings of many species rare in Europe make the oak habitat in Turkey of high value for future scientific research. Thus, it is vital that some of the last areas are protected to prevent many of the unique and often endemic species from going extinct. The risk is high due to the small area left and the high speed of transformation from old oak habitats to other forest types or land uses.

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