



THE MIRBECK OAK

Source of an
inspiration

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“Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it’s the only thing that ever has.” Margaret Mead

ABSTRACT

Although the Mirbeck oak, *Quercus canariensis* Willd., is native to Portugal, widespread deforestation has decimated its numbers in the country. It is easier to see in some places in Spain but on both sides of the border this beautiful tree is barely known and rarely used for landscaping. As is typical within this genus, its taxonomy is complicated. The purpose of its marcescence and the mysteries of masting are similarly open to debate. There is also disagreement amongst experts concerning some conservation strategies. But the tree’s need for protection especially in the face of climate change is not in doubt and an ambitious initiative to ensure its future in Portugal is described. Comments and criticism are welcome.

Keywords: *Quercus canariensis* Willd., *Q. × marianica* C. Vicioso, *Q. × fagineomirbeckii* Villar, carvalho-de-Monchique, quejigo andaluz, conservation, climate change

Note. For convenience and for want of a common name, the Mirbeck oak referred to here applies to both *Q. canariensis* and the very similar and in Portugal much more common *Q. marianica*.

Introduction



1. Serra de Monchique, view from the northeast behind *Erica multiflora* L. and ever-present *Eucalyptus*

An observant wanderer in the woods on the north side of the Serra de Monchique range, two gentle bumps (Photo 1) that are just big enough (902 m/2,960 ft and 774 m/2,540 ft) to wring more rain from usually dry skies than anywhere else in southern Portugal, may, if lucky, spot a particularly attractive tree.

Its acorns identify it as one of some 500 species of oak (Govaerts and Frodin, 1998) yet its large leaves (Photo 2) are less stiff and without the prickles that characterize Iberia's usual Mediterranean oaks, the cork (*Q. suber* L.), holm oak (*Q. ilex* L.), *Q. rotundifolia* Lam. and kermes oak (*Q. coccifera* L.).



2. *Quercus canariensis* foliage (Seixe Valley)

Luck is required to see this tree partly because, the Mirbeck or Algerian oak, *Q. canariensis* Willd., or possibly *Q. marianica*, is usually small and frequently concealed by exotics such as *Eucalyptus globulus* Labill., Portugal's predominant tree, as well as by various prolific acacias. But the main reason is because the carvalho-de-Monchique, as it is known in Portugal, has become very scarce. Indeed, the Portuguese specimens found are remarkable survivors on a continent whose forests have endured climatic upheavals and great changes since early man entered Europe from Africa hundreds of thousands of years ago.

A changing landscape

Bands of hunter-gatherers used fire either for hunting or, perhaps more significantly, to create hunting habitats (as some speculate their predecessors did to increase the surface of African savannahs to the detriment of forest cover). For much of that time Europe was in the depths of our planet's most recent glacial period. What northern land wasn't under ice would have been tundra and taiga with no broadleaved trees. Conditions were not only colder but also drier and any dense woodland was probably confined to parts of the south where southern Iberia served as an important refugium.

Rising temperatures between 15,000 and 9,000 years ago heralded the onset of the Holocene interglacial period and a retreat of ice sheets that had become so massive they dented parts of the Earth's crust and locked up as much as 126 m/413 ft of sea level (Fairbanks, 1989). With warmer and wetter conditions a new mantle of forest spread northward rapidly - 300 to 500 m/984 to 1,640 ft per year across most of the continent in the case of *Quercus* (Brewer et al., 2002). In Iberia, perhaps only the arid southeast was not wooded. The flora that developed, especially in Southern Europe, became very diverse and this was particularly true of oaks. Alexis Ducousso writes in *International Oaks*, No. 24, that there are only two oak species in Northern Europe and five in mid latitudes; but no less than 29 species with 44 taxa, or perhaps more as we shall see, in the South (Ducousso, 2012).

Postglacial afforestation attained its maximum extent in Europe around 8,000 BCE (Colchester, 1998) but had already begun to decline dramatically in Mesopotamia following the development of agriculture in the Fertile Crescent about 10,000 years ago when more and more forest was converted to cropland. Neolithic farming with the accompanying felling of trees, reached Portugal about 3,000 BCE.

Our knowledge of the processes of deforestation is patchy. Best estimates indicate that over 70% remained in both Portugal and Spain in 1,000 CE (Kaplan et al., 2009). The worst, that little coastal forest survived in Portugal 4,000 years ago and by the early Middle Ages, 500-1,000 CE, the last vestiges of ancient forest in the country had disappeared (Canaveira et al., 1999). Today almost 40% of Portugal is forested (World Bank, 2013), one of the highest percentages in Europe, and, as with more prosperous countries worldwide, this level continues to rise. But the woodland is largely monotypic, exotic plantation. Not only is there no old growth in Portugal today but the felling of Mirbecks continued until recently. Few surviving trees are more than 30-40 years old and the author is aware of only two specimens, one moribund, the other magnificent, that are probably over a century old. Even Australia and New Zealand have more ancient and more outstanding examples that can exceed 30 m/98 ft in height and width (Photo 3).



3. *Quercus canariensis* in Cornwall Park, New Zealand. (Photographer Brad Cadwallader's father inserted for scale.)

Extrinsic mitigating factors

Forest losses would have occurred earlier and been more extensive without the Spanish *dehesas* or Portuguese *montados*. For hundreds of years large areas under these traditional stewardship methods involving cattle, limited agriculture and mainly non-timber harvesting of forest products did much to preserve biodiversity. Such management also produced a landscape reminiscent of Africa's savannahs in which oaks rather than acacias predominate and grazing rather than sporadic rainfall or fire was instrumental in shaping the landscape (Photo 4).



4. *Quercus rotundifolia* in Alentejo "savannah".

Among the oaks, the cork survived in large numbers thanks to its remarkable bark that is still being transformed into a growing array of products even as cost and cork taint have driven its replacement by plastic and screw top stoppers on many wine bottles. *Quercus rotundifolia* also possesses a redeeming feature that is valued to this day: the acorns are appreciably less bitter than most and thus favoured by pigs whose hams command handsome prices from carnivores worldwide.

Mirbeck oaks with their smaller range and lower tolerance of drought and cold as compared to their two cousins have no such saving graces. Although some in Spain were coppiced for charcoal, most were more valuable dead than alive and much of their timber went into the Portuguese and Spanish fleets when these countries were major naval powers. Until recent decades, surviving trees were felled at will while in Spain it was sometimes deliberately replaced by more lucrative cork oaks.

Survival advantages

That any Mirbecks remain under these circumstances can appear miraculous. But from the start the tree displays great determination to overcome natural and human challenges. The author is accustomed to waiting a year for palm seeds to germinate. Yet within days of planting a few hundred fresh acorns dozens can sprout. (Impressive as this *Lebenslust* may be though, it pales beside that of certain other oaks whose seeds can germinate while still on the tree.) Young specimens may not tolerate temperatures much below -5 °C/23 °F and in the absence of ground water Mirbecks languish where annual rainfall is inferior to 600 mm/23.6 in. But within these limits the taxon rapidly outpaces cork and holm oaks. Moreover, on his property (with annual rainfall of less than 500 mm/19.6 in) this tree's survival rate is the highest of the three species when all receive some irrigation.

Oaks as a whole display tremendous resilience in the face of natural and anthropomorphic challenges not only by hybridising amongst themselves with alacrity to adapt to changing conditions but then rapidly reverting to original type by crossing with parental species even with pollen from distant trees (Valbuena and Hampe, pers. comm.). Oaks have shown the same ability in North America (Dodd and Afzal-Rafii, 2003). How many genera can boast such a range of phenotype and behaviour, from scrubby groundcover to towering tree and from cool temperate woodland to equatorial montane forest? It is a testament to the tenacity and the adaptability of this exceptional genus that for millions of years it was and remains an important component in all of these environments.

Taxonomy

Predictably with plants as plastic as these (note the significant range of leaf size in Photo 5) trying to identify the genera's promiscuous members can test even taxonomists. Nomenclature can be as volatile as the trees' pollen; the Spanish Royal Botanic Garden lists 14 heterotypic synonyms for *Quercus canariensis* (Real Jardín Botánico, 2013), Kew no less than 31 (Kew, 2013) and new oak species continue to be added while others are renamed.



Surviving Mirbecks in Portugal have become so hybridised, mainly with *Quercus broteroi* Cout.,* that until the summer of 2014 (Vila-Viçosa, 2014 - pers. comm.) pure *canariensis* were believed to be extinct here, having been replaced, in the view of most Portuguese botanists, by the hybrid *Q. × marianica* C. Vicioso** (Oliveira, 2006) which may ultimately be given species rank (Vila-Viçosa, 2012)

5. Mirbeck leaves collected from trees only a few metres apart in the Seixe valley.

At a distance *Q. canariensis* and *Q. × marianica* are indistinguishable. Even on closer inspection differences can be slight, especially considering the leaf variations on individual trees and the author's suspicion that, as with *Quercus ilex* and *rotundifolia*, a taxonomist's no-man's land lies within a subtle spectrum blending one species into the other. Examining abaxial (lower leaf surface) trichomes requires a magnifying glass but more easily observed characters include longer *Q. canariensis* petioles (15-25 mm/0.59-0.98 in) while *Q. × marianica* petioles do not exceed 15 mm/0.59 in; and more lateral veins (13-15) while *Q. × marianica* has 12 at most (Vila-Viçosa, 2012).

* Considered by some authors to be a synonym of *Q. faginea* subsp. *broteroi* (Cout.) A. Camus.

** Considered by some authors to be a synonym of *Q. × fagineomirbeckii* Villar. The name *Q. × marianica* comes

Marcescence

Most trees are either evergreen or deciduous. *Q. canariensis*, like a few other oaks, belongs to a marcescent minority whose foliage, in cooler areas at least, dries in the autumn or winter but remains attached to the tree (Photo 6), in defiance of winter according to Seneca Indian legend, until being shed when new growth emerges. And certainly in North America where ice storms are relatively common there is hubris in this habit. Leafy branches covered with ice or snow are much more vulnerable to breakage.



6. Marcescence on western approach to El Aljibe in Los Alcornocales Park with 'river' of *Echium plantagineum* beyond.

The benefits of marcescence are obvious for plants adapted to more extreme conditions. The "skirts" of *Washingtonia* palms might confer some protection against desert heat and desiccation and shelter possibly-beneficial tenants. Several striking tropical high-elevation rosetted species such as *Argyroxiphium* in Hawaii, *Lobelia* in Africa and, even more spectacular than these, *Puya* in the Andes, retain their long-dead and even detached foliage for the same purpose and against severe radiating night cooling.

The argument posited for temperate species protection from browsing deer in winter because dead, less digestible foliage protects more nutritious buds behind is more nuanced. European beech and hornbeam definitely benefit from dead-leaf protection but *Q. robur* does not (Svendsen, 2001). And *Q. subpyrenaica* Villar* sheds accessible lower foliage but retains it in more sun-exposed crowns (Abadía et al., 2006). There are similar examples in North America. So marcescence may reflect selection for increased photosynthetic potential over the lifetime of each leaf on a tree (Hipp, 2005).

* Considered by some authors to be a synonym of *Q. pubescens* subsp. *subpyrenaica* Villar (Rivas Mart. & C. Sáenz.).

Marcescence is considered a transitional feature in the ecotone between

temperate and Mediterranean biomes (Rivas-Martínez, 2007). But, as Abadía et al. note, it cannot occur without cold and in the Algarve the phenomenon appears infrequent. (The author's decade-old trees, most of which benefit from temperature inversion, have never retained desiccated leaves.) Moreover, it can be argued that in Mediterranean zones it makes more sense to synchronize marcescence to coincide with arid summer to shade the ground and

reduce transpiration instead of with wet winter (which for many plants is the main, even the only growing season). In fact the Mirbeck's timing recalls what one would expect in the Neotropical invierno (hot, wet "winter") and verano (hot, dry "summer" when the sun is less direct and produces little convectional rain). And so it is with Central American oaks that drop their leaves in the dry (northern winter) season (Rodríguez, pers. comm.).

Masting

While details of oaks' seemingly whimsical boom-or-bust acorn production remain uncertain, the strategy known as masting is clever and clear enough—keep granivore populations low and then overwhelm them with a bumper crop they cannot possibly devour completely. Thus many more acorns survive to start a new generation and the significant resources saved during low or no harvest years can go into permanent growth. Masting is most effective because oaks are wind-pollinated. Overwhelming predators is one thing; overwhelming pollinators quite another. So insect-dependent species of the beautiful *Miconia* genus in Trinidad, for example, synchronise flowering regularly throughout the year to accommodate their habitat's finite pollinating resources.

There has been more masting research in the United States than in Spain (Carbonero, pers. comm.). But oak interest and knowledge has increased in many countries and the annual fluctuations are now better understood (Pearse and Koenig, 2012). It is a Spanish investigator who recommends planting acorns from these fruiting peaks because they will have greater genetic diversity (Gil, 2009). Still, questions remain. Mirbecks are masting in Monchique this autumn (2013) while just 20 km/12 mi away in the Seixe basin they are barren. Yet Seixe cork oaks are laden. Why, when both trees' acorns are eaten by the same predators, boar, rodents, pigeons and shrikes?

Mirbecks in Iberia

Today, while the carvalho-de-Monchique is scarce in Portugal with perhaps only a dozen very altered small pockets containing a few hundred *marianica* trees in damper parts of the Algarve and the southwest corner of the Alentejo region to its north, in Spain the quejigo andaluz or roble moruno (Andalusian or Moorish oak, as *Q. canariensis* is also known) is much more numerous, albeit again in only some places. Unlike in Portugal, they are found over a wide area from fairly close to the Algarve border in Andalucía's Aracena hills to the Sierra de Ojén near Western Europe's southernmost point. (From here one can see Morocco's serrated Rif Mountains where the forests not yet converted to Cannabis plantations provide part of the African habitat of *Q. canariensis*.) Unusually, there are also a few isolated populations almost 1,000 km/621 mi away in Catalonia but most of these are the variable hybrid *Q. canariensis* × *Q. humilis* Mill.* (Goicoechea, pers. comm.).

* Considered by some authors to be a synonym of *Q. pubescens* Willdenow.

For all the excesses of Spain's untrammelled tourist strips along the

Mediterranean coast, much beauty and wilderness can still be found sometimes only a kilometre inland. Indeed, Cádiz Province's rare gallery forests or *canutos*, privileged stream-fed gullies that capture vital mist or drizzle from Levantine winds even in summer, are continental Europe's only good surviving examples of Macaronesian Laurisilva forest. Further inland, many Mirbecks in the Sierra de Ojén and especially in the Parque Natural de Los Alcornocales, a magnificent wilderness which stretches from horizon to horizon, are centuries old. (Photo 7 below.)



7. Ancient *canariensis* on El Aljibe's damper east side.

A Canary *canariensis*?

The geographic herbarium notes jotted down by Carl Ludwig Willdenow who named the tree *Q. canariensis* in 1809 (“Teneriffa” and “Kanarische Inseln Herb. Willd. no. 17608, leg. Broussonet!”) (Eike Jablonski, pers. comm.) are remarkably imprecise. Tenerife covers some 2,000 km²/775 sq. mi. of widely varying habitat. But in defence of one of phytogeography's founders, the identification is based on material previously gathered by Pierre Marie Auguste Broussonet who collected in Morocco as well as in the Canary Islands. It now seems likely that the Moroccan and Canary samples were shuffled (Pascual and Lorenzo, 2000) at some point in the botanist's eventful and at times dangerous life.

But the *Quercus* in Canarias questions do not end here. Alexander von Humboldt listed an oak “similar to *Quercus* × *turneri* Willd. of the mountains of Tibet” during a brief stopover on Tenerife in 1799 devoted largely to an ascent of its 3,718 m/12,198 ft Teide Volcano (Pascual and Lorenzo, 2000). Today *Q.* × *turneri* is considered a hybrid between two largely European oaks, *Q. ilex* and *Q. robur* L. But, geography aside, *Q.* × *turneri* does bear a resemblance to *canariensis*.

Adding to the intrigue, for over six millennia and up until 6,000 years ago summer rains transformed the Sahara into a savanna and palynologists have identified *Quercus* pollen deposits which date from as recently as ca 2,000 years ago in a Tenerife lakebed (de Nascimento et al., 2009). Findings show that these deposits declined while microfossil charcoal remains simultaneously increased, coinciding with archaeological evidence of the first Guanche human settlement on the island. Sadly, it appears that with aggressive burning these people managed to exterminate all the trees in spite of the island's often rugged and inaccessible terrain. Still, one wonders why during this extended monsoon period North Africa's oaks did not, apparently, spread south as they did, to almost equatorial latitudes, in the Americas.

Climate change and a Quaternary quandary

Temperate and subtropical gardeners know that many plants tolerate far colder temperatures than their habitats suggest but their growth will slow. There are fine cork and holm oak specimens in parts of England, for example, and a medium-sized Mirbeck grows in Kew. Acclimation to rapidly rising temperatures is expected to present a greater obstacle.

Although oaks have overcome manifold challenges for millions of years experts now fear for the future of Europe's mid-latitude species. The Mediterranean Basin is expected to be more strongly affected by ongoing climate change than most other regions on Earth (IPCC, 2013). The magnitude of these projections warrants great concern for the particularly rich biodiversity found in this region (Petit et al., 2005). This is especially alarming because the predicted loss of the southern marginal populations in or close to glacial refugia would extinguish invaluable genetic resources which possess just the characteristics that would be essential to face the hotter and more arid conditions forecast (Ducouso, 2012).

Specific consequences have already been identified. The combined stress of rising temperature and falling water availability will mean lower acorn production in cork oaks (Pérez-Ramos et al., 2010). The thirstier Mirbeck is likely to be affected still more although there are promising intimations from Spain's Agriculture Ministry that the species is more xeric than previously thought (Benito-Matías, pers. comm.). Rising temperature and reduced water raises a third threat: fire. Only cork oaks are resistant (if their bark has not been harvested). Such conditions could end southern Iberia's peak summer tourism season as visitors stay away (Stern, 2006).

Optimists or global warming skeptics cite the Quaternary quandary in which fossil records over the last 2.5 million years show far fewer species went extinct in some areas than current models suggest. But several doubts must be raised. Those records are fragmentary and may misrepresent actual losses. Further, while only one tree is known to have become extinct in North America, Northern Europe suffered dramatic losses in which over two thirds of its tree genera disappeared (Svenning and Skov, 2004). Greenland and Antarctic ice core samples have revealed temperature rises actually more abrupt than predicted due to anthropogenic climate change (MacDougall, 2006).

But no species in the past has had to confront the challenges of precipitous weather changes compounded by landscape fragmentation, air pollution and biotic invasions (Hampe, pers. comm.).

Conservation concerns

True Mirbecks, *Q. canariensis*, surviving in Portugal may number less than a ten. *Q. marianica* totals only a few hundred mainly young individuals confined to perhaps a dozen vestigial populations in an area about 100 km/62 mi from east to west with roughly the same distance from the nearest Spanish trees. These small populations are vulnerable to fire or illegal destruction (which occurs regularly with the much more valued cork oak). Such low numbers and isolated populations also raise concern about inbreeding depression and genetic drift in which gene variants or alleles disappear from generation to generation and are not replenished because of isolation, rendering a population more homogeneous and thus more susceptible to environmental change. Most of these survivors became so hybridised that for years the *Q. canariensis* type was considered lost, having been replaced by *Q. × marianica*, as mentioned previously. As noted earlier almost no trees in the country are older than 30-40 years. Although numbers are modest, specimens appear healthy and self-sustaining. Moreover, reduced numbers do not necessarily mean a reduced genetic base or limited diversity. Nevertheless, *in extremis* one must recognize the danger of minimum population numbers below which a species becomes unviable in the wild (Schaffer, 1981).

In spite of these concerns, no public and almost no private nursery is propagating the tree in Portugal, unlike in Spain, and importing material from about 400-500 km/249-310 mi away (or further if African acorns were available) can be controversial. Exogenous introductions can generate outbreeding depression in which very maladapted alleles added to a small population could depress fitness enough to lead to extinction. Still, the long time oaks need before being capable of reproduction means that any unsuitable introduced genotypes are likely to succumb in the new environment or can be removed before they reproduce (Moran, pers. comm.).

On the other hand, reintroduction of exogenous material eventually to furnish wider genetic resources or replenish lost ones can enhance a depleted population (Godefroid et al., 2011). Doing so with material from further south that may confer greater resistance to the higher temperatures and or lower rainfall anticipated might even be imperative for its survival (Ducousso, 2012).

How does one implement genetic rescue of rare plant populations that may have limited genetic variation? Which populations can suitably be mixed with other populations? Poor selection raises the potential for maladaptation and outbreeding depression unless unsuitable intruders simply die out long before any pollen is produced. In a world in which invasive species may, as the biologist Edward Wilson asserted, be the second greatest threat to biological diversity after habitat loss, concerns about intraspecific, let alone intrahybrid, differences can appear superfluous. Still, trying out a range of genotypes in a distant area without Mirbecks rather than in existing possibly vulnerable populations would appear prudent.

An ambitious project

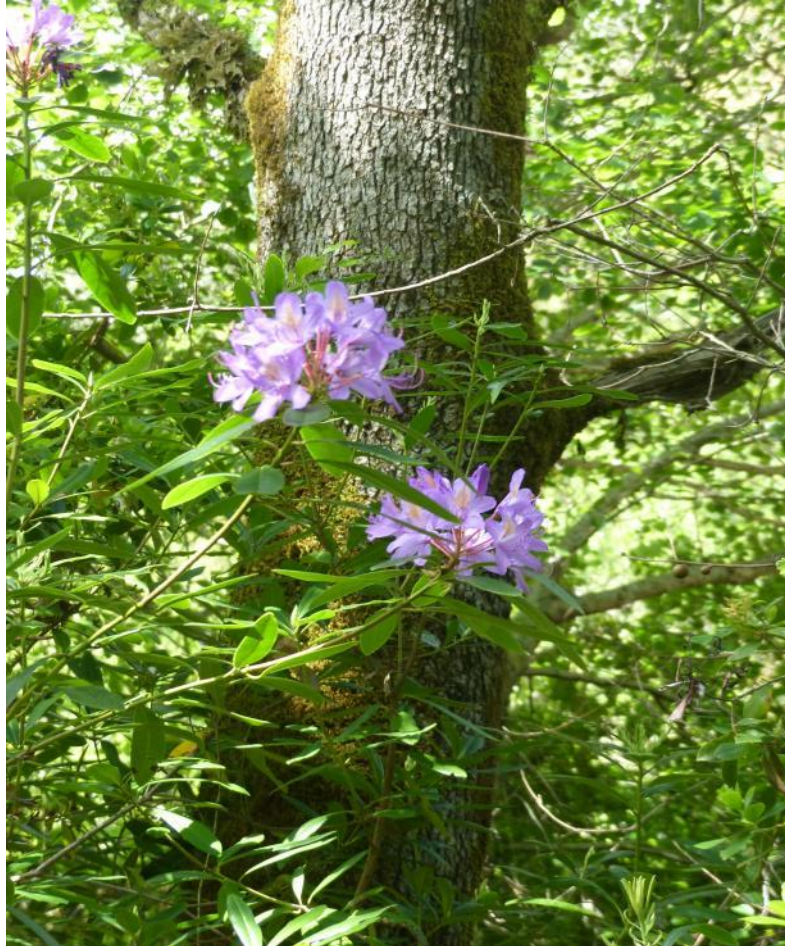
The Algarve is best known for the tourists it attracts—almost 10 million yearly. Because the masses mainly seek sun and sand much of the interior is peaceful and relatively unpopulated even in high summer. This is especially true of the Seixe Valley that meanders some 35 km/22 mi from Monchique's highlands through abandoned farms and regimented eucalyptus plantations down to the

Atlantic Ocean. From a conservation perspective the area is outstanding. It is fed by one of the few rivers in the region that flows constantly, even after months of summer drought. It contains more surviving Mirbecks than anywhere else in Portugal and could protect other rare Portuguese oaks such as *Q. faginea* subsp. *alpestris* (Boiss.) Maire that still survive in the Valley.

Other scarce taxa that would benefit from protection include *Q. robur* subsp. *estremadurensis* (O. Schwarz) A. Camus, *Q. × andegavensis* Hy nothosubsp. *henriquesii* (Franco & Vasc.) Rivas Mart. & Sáenz*, *Q. × andegavensis* Hy nothosubsp. *subandegavensis* (A. Camus) Vila-Viçosa, F.M. Vázquez, Meireles & Pinto-Gomes nom. ined., *Q. × coutinhoi* Samp., *Q. × coutinhoi* Samp. nothosubsp. *beturica* F.M. Vázquez, A. Coombes, M. Rodríguez-Coombes, S. Ramos & E. Doncel** and *Q. × neomairei* A. Camus (Vila-Viçosa, 2012).

* Considered by some authors to be a synonym of *Q. × andegavensis* Hy.

** Considered by some authors to be a synonym of *Q. × coutinhoi* Samp.



8 *Rhododendron ponticum* var. *baticum* next to a Mirbeck in the Seixe.

A ravine in the river's higher eastern end shelters what is probably the country's largest community of practically extinct *Rhododendron ponticum* var. *baticum* (Boiss. & Reut.) Hand.-Mazz. The threatened endemic spurge *Euphorbia monchiquensis* Franco & P. Silva* is almost

* Considered by some authors to be a synonym of *Euphorbia paniculata* subsp. *monchiquensis* (Franco & P. Silva) Vicens, Molero & C. Blanché.

certainly present at lower elevations and the western end joins the Costa Vicentina Natural Park along one of Europe's most beautiful oceanic coasts. From insects and fish to birds, like the Bonelli eagle, and mammals, such as the European lynx, the world's most threatened cat, southern Portugal has no shortage of creatures at risk and the Seixe Valley's varied terrain could provide a refuge for many of them.

It is this special place with vestiges of a remote past, as close to an Arcadia in the Algarve as one can hope to find today, that has inspired a dream: to create a national reserve like the outstanding forest of Los Alcornocales in neighboring Andalucía (Photo

8). Such a reserve for threatened flora and fauna would mean that in a century or two, if future changes are not too extreme, Portugal and its visitors may be able to sense what the Earth was like before we arrived.



9. Pico El Aljibe in the Parque Natural Los Alcornocales

The challenges

At a recent Spanish workshop, *Oak Forests Coping with Environmental Change*, one speaker spoke for many in declaring: “Great concern exists that ongoing rapid climate change is likely to overstrain the capacity of oaks and other forest tree species to track suitable climate spaces, potentially leading to widespread extinctions through the coming decades.” (Hampe, 2013).

Such concern is not evident in Portugal. To date there has been little effort to preserve a significant component of its natural heritage and probably the country’s largest native tree. Although Eucalyptus covers a higher proportion of Portugal than of any nation on Earth, legislation was issued in July allowing further plantations on 80% of forested land. This is likely to increase fire risk, will

lower water tables and restrict wildlife still further. It is no surprise, then, that Portugal’s 2012 forest Environmental Performance Ranking is 119 out of 132 countries (Yale, 2012; FAO, 2010).

With the rise of environmental issues on government and citizen agendas worldwide, the Portuguese authorities may eventually take substantive steps to promote this exceptional component of the nation’s natural heritage. Perhaps the country’s biggest environmental NGO, incidentally called Quercus, will do much more to raise awareness of the tree’s profile and uncertain prospects. To date the signs are not promising. But support may be forthcoming from European Union programmes. And businesses, which are already contributing to other conservation efforts, might be persuaded to extend their stewardship to this magnificent tree.

So the dream of creating one of the country's largest natural sanctuaries is challenging at best. At worst, attempting such a venture in the face of general indifference by replacing existing eucalyptus plantations which officials actually want *more* of in a country with scant environmental activism in the midst of deep recession and high unemployment is quixotic. Yet this may be Portugal's last and best chance to preserve an important part of its heritage, restore a unique valley and leave a precious legacy for future generations. It was in even more adverse economic times that a visionary Franklin Roosevelt employed hundreds of thousands of the Great Depression's unemployed to plant billions of trees. And in a cruel irony of Portugal's current financial anguish, only multimillionaires are prospering. Could a rare benefactor be found among them? A few individuals with reasonable funding and unreasonable determination and commitment could make such a difference. Those concerned about the future should remember: "*Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it's the only thing that ever has.*"



10. Mirbeck oak in Royal Botanical Garden Melbourne. (Sally Stewart) Could Portugal have something like this one day?

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