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COMMENTARY

The survival of the 'natural potential vegetation' concept (or the power of tradition)

The recent paper by de Nascimento *et al.* (2009) describing the late Quaternary pollen record from Tenerife (Canary Islands) has extraordinary implications for vegetation science and biogeography. The study includes fossil pollen and microcharcoal records for the last 4700 years; that is, it pre-dates human arrival on Tenerife. Interestingly, *Quercus–Carpinus* pollen, with *Pinus canariensis*, dominates the vegetation records of the site at La Laguna between *c.* 4700 and 2000 cal. yr BP, whereas laurel forest taxa become dominant at the site only during the last two millennia. These data are noteworthy, first because neither *Quercus* nor *Carpinus* was hitherto considered autochthonous to the Canary Islands, and second because the prevailing concepts of natural potential vegetation in the study region imply that the pre-anthropic (mature phase or climax) vegetation would be the *Lauro-Perseetum indicae* or 'monteverde' forest, a community characterized by *Laurus azorica*, *Persea indica*, *Viburnum rugosum*, *Erica arborea*, *Ilex canariensis* and *Prunus lusitanica*, accompanied by species such as *Myrica faya*, *Apollonias barbujana* and *Picconia excelsa* (Rivas-Martínez *et al.*, 1993). A crucial finding is that the onset of the depletion of the *Quercus*- and *Carpinus*-rich forests coincides in time with archaeological evidence of the first human settlement. In other words, the supposed natural potential vegetation is really a cultural construct, at least for some parts of the landscape.

This study adds to a growing body of work questioning the floristic-phytosociological approach of traditional vegetation science. Palynology is well suited to tracing vegetation histories and, combined with archaeological and sedimentary proxies, to allowing the reconstruction of shifts from 'natural' to anthropogenic landscapes. Figure 1 depicts a succinct comparison of the palynological and phytosociological inferences of 'natural' or pre-anthropic vegetation for a selection of well-dated, physiographically diverse, Late Quaternary pollen sites in the Iberian Peninsula and the Balearic and Canary Islands. The differences are noteworthy. In a number of cases, pre-anthropic vegetation includes more than one species in the arboreal stratum, whereas the phytosociological models give preference to a monospecific evergreen oak forest/scrub (mainly *Quercus ilex/rotundifolia*, but also *Quercus suber* and *Quercus coccifera*) as the natural potential vegetation type. Palaeoecological studies show that this formation is extremely rare in the mid-Holocene of Iberia and that *Q. rotundifolia* forests have often been favoured by burning and pastoralism at the expense of pine and mixed pine–oak forests (Carrión *et al.*, 2009).

Figure 1 also shows cases of agreement between the two forms of analysis, especially in the Euro-Siberian region of northern Spain, where deciduous *Quercus*-dominated forests prevailed. However, the allegedly 'potential natural' *Fagetum* (beech) forests are largely the result of recent invasions (López-Merino *et al.*, 2008). Other discrepancies occur in the Balearic Islands, where *Juniperus*, *Corylus*, often also *Buxus*, and only latterly *Quercus* occurred in mid-Holocene ecosystems prior to human interference. In the south-eastern coastal region of Spain, *Quercus faginea* and *Q. rotundifolia* were abundant before the Chalcolithic (*c.* 5000–4200 cal. yr BP) and Bronze Age (*c.* 4200–3600 cal. yr BP) human populations denudated the landscape (Carrión *et al.*, 2009). In addition, the current extension of the Ibero-North African xerothermic scrub of *Periploca angustifolia*, *Ziziphus lotus*, and *Maytenus senegalensis* (*Mayteno-Periplocetum*) is the result of anthropogenic degradation (Carrión *et al.*, 2009). If we also consider elevational gradients, many supposedly 'natural' thorny scrub communities (e.g. dominated by Genisteae) are the result of historical overgrazing above the tree line.

It could be argued that climatic changes are responsible for the differences observed between the palynological and the floristically determined databases of vegetation types. However, in a majority of the cases, the 'jumps' in the climatic parameters needed to change from one potential vegetation type to another are of such a magnitude that they clearly exceed the possible changes in the Holocene climates of the region (Carrión & Díez, 2004). Moreover, the pollen records also produce reconstructions without phytosociological counterparts: de Nascimento *et al.*'s (2009) case study is an example. Another is the pinewoods, which are almost ignored in the phytosociological assumptions, except in the oro-Mediterranean belt (forests of *Pinus nigra*, *Pinus sylvestris* and *Pinus uncinata)*. The *Pinus halepensis*, *Pinus pinaster* and *Pinus pinea* forests are considered incidental in the phytosociological analyses and are assumed to be derived mainly from afforestation.

From this discussion, two points are worth highlighting: an understandable error in the discrimination of the autochthonous flora of the Canary Islands, and a less comprehensible error in the conceptualization of the vegetational dynamics of the Iberian Peninsula and adjacent islands. However, phytosociological notions of potential vegetation permeate well beyond scholarly articles, deeply penetrating the philosophies that underlie many of our policies on landscape and environmental management. A conspicuous example is the Habitats Directive and accompanying Natura 2000 interpretation manual of EU habitats (Council of the European Communities, 2003). Notions of what 'pristine vegetation' was like have direct effects on both policies and funding for environmental protection and habitat regeneration schemes by conservation and wildlife protection associations, tourist agencies, developers, local authorities, councils, central government, civil protection directives, etc. In Spain, it is common for encyclopaedias, popular books and magazines to perpetuate a fantastic idea of an Iberian Peninsula completely covered by oak woods before mankind arrived to upset this 'balance of nature'. It is significant that Spain's most popular environmentally based magazine is entitled '*Quercus*'. Finally, we must not

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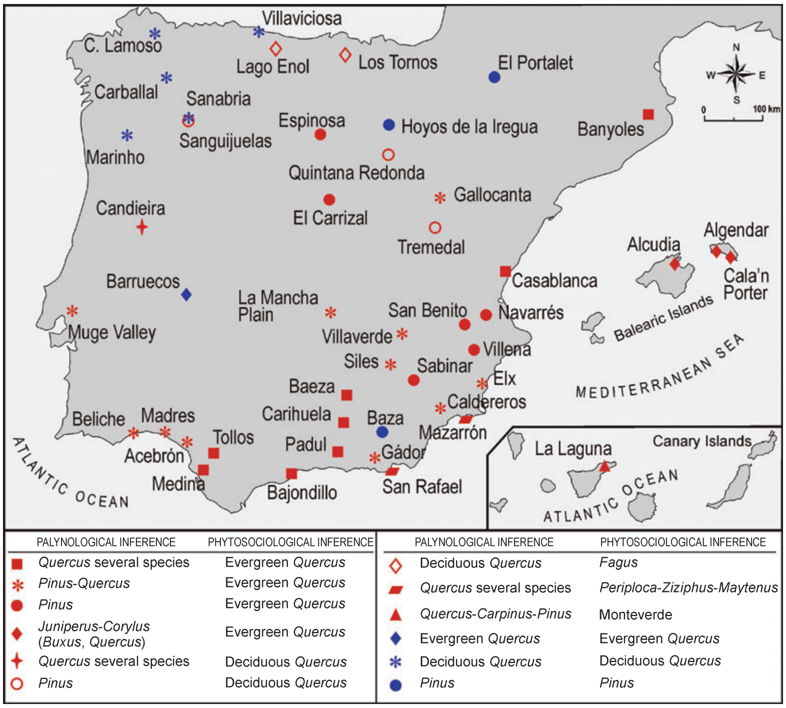

Figure 1 Comparison of the palynological and floristic-phytosociological inferences for the forest dominants in the pre-anthropic or 'natural potential vegetation' of the Iberian Peninsula, Balearic and Canary Islands. Blue symbols denote agreements; red, disagreements. Further information on pollen records can be found in de Nascimento *et al.* (2009), Carrión *et al.* (2000) and Palaeodiversitas, http://paleodiversitas.org/proyecto/mapas.htm. Natural potential vegetation types are according to Rivas-Martínez *et al.* (1993, 2002, 2005).

forget that in Spanish universities the vast majority of didactic materials and courses in geobotany, phytosociology and vegetational ecology are still dominated by floristic-phytosociological models of vegetation dynamics. This same situation, albeit to a lesser extent, is also the case in the universities of nearby countries, for example Italy, and further afield, for example in South Africa. However, no country can compete with Spain as the last 'academic refuge' of floristic phytosociology (Carrión & Díez, 2004). The palaeoecological literature is full of overwhelmingly convincing evidence against these notions of vegetational dynamics (Willis & Birks, 2006), but Iberian resistance to change probably has little to do with scientific evidence. Rather, it appears to hinge upon issues of tradition and authority.

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