

INTRODUCED PLANTS AND THEIR EFFECTS ON THE FLORA OF MADEIRA

By J.R. PRESS¹

INTRODUCTION

In any flora, the introduction of foreign plant species may have considerable and far-reaching effects on native plants. These can be particularly noticeable in oceanic islands with their isolated and often unique floras, especially where introductions form a large percentage of the total species list. The number of vascular plant species currently recorded from the Madeiran archipelago is approximately 1150, of which some 380, or slightly more than 30%, are generally considered to be introduced and which are, or are becoming, fully naturalised.

The introduction of plants to Madeira began more or less with the discovery and settlement of the island in the 15th century, and has continued up to the present day. Plants from many families and most parts of the world are represented. Most of the introduced species are concentrated in the coastal and lowland regions of Madeira which are the most intensely cultivated, and where the effects of land clearance, terracing and agriculture are most marked. In the cloud forest of the higher regions, where the native vegetation is more widespread and less disturbed, there are fewer alien species although they are still present and sometimes widespread. Many of these introduced species have restricted distributions, others have become widespread. In a few cases the exact date of introduction of a given species is known and its subsequent spread can therefore be traced with some accuracy.

¹Natural History Museum, Cromwell Road, London SW7 5BD, UK

In terms of the Madeiran flora, introduced species can be divided into three simple categories.

CROPS

Various crop species are or have been cultivated on Madeira, on both a large scale, eg. wheat, sugar-cane and vines, and on a small scale, eg. medlar, pomegranate and tobacco. Fashions in crops, as in other things, come and go - currently a major crop is bananas - but in general crop plants do not long survive in great numbers once their particular agricultural regime ceases. However, a few have succeeded in firmly establishing themselves in the local vegetation. One example is *Opuntia tuna* (L.) Miller, originally grown for its edible fruits and later also to support the cochineal industry. This plant has become established everywhere on the south coast to the point where it squeezes out other shrubs and is locally dominant over small areas.

Trees can also be included in the crop category, and several species have been introduced on a plantation scale in Madeira. Trees can influence the local flora on several levels, by directly replacing native trees, by affecting the ground flora, and by affecting the epiphytes. An increasingly successful invader is *Acacia*. Several species are present on Madeira of which two, *A. mearnsii* Willd. and *A. dealbata* Link (the 'mimosa' of florists) are common. *Acacia dealbata*, in particular, is an aggressive invader which produces suckers from roots just below soil level. It seems particularly successful in areas where the ground flora has been cleared by fire. The speed with which suckers grow is most striking; they form a dense under-storey, with a predictably detrimental effect on the re-establishing ground flora.

Madeira has a relatively rich epiphytic flora composed mainly of bryophytes and lichens, but also with a few ferns, many of them substrate-specific in some degree. Introduced trees may not provide chemically or physically suitable substrates for epiphytes. Certainly this is true of eg. *Eucalyptus globulus* Labill., which is planted in Madeira and which regularly sheds its bark, along with any epiphytes that may have gained a foothold. Pines, such as *Pinus pinaster* Aiton, also widely planted on Madeira, have a very dry bark with a high pH and which sloughs off in small flakes, characteristics which conspire to produce a very inhospitable environment for epiphytes, which also have problems coping with the resin produced by these trees. *Cryptomeria japonica* (L. fil.) D. Don, which is also planted on Madeira though on a far smaller scale than on the Azores, is colonised by small lichens though large species seem unable to do so.

As plantations of such trees increase, so the opportunities for epiphytes diminish. Plantations are also periodically felled, and this too can have an unbalancing effect on the local flora, the abrupt opening of the canopy providing opportunities for invasive non-forest species, both native and introduced, to extend their ranges.

ORNAMENTALS

Like crops, ornamentals are sometimes planted on a large scale and it is these which are included here. Two examples familiar to everyone who has visited Madeira are *Agapanthus praecox* Willd. and *Hydrangea macrophylla* (Thunb.) Ser., both of which are planted profusely along many miles of Madeiran roadsides and levadas. Both species form dense colonies and, while they may be useful for binding roadside margins, they also exclude other plants. However *H. macrophylla*, at least, seems to require a minimal level of cultivation to succeed well and in Madeira it is not an especially aggressive invader. Contrast this with the situation in some parts of the Azores where this plant is very competitive and an undoubted pest. The biggest danger from these plants in Madeira seems to be the predilection of local people to introduce them to new sites, even very remote ones, at every opportunity.

Less dramatically obvious but perhaps more worrying are species such as *Brunsvigia rosea* (Lam.) Hannibal and *Crinum bulbispermum* (Burm.) Milne-Redh. & Schweick., both of which have colonised many areas along levadas and spread through adjacent woodland, becoming thoroughly naturalised and often abundant there. Both of these large-leaved colonial species may form a dense ground cover.

WEEDS AND GARDEN ESCAPES

The third category of introduced plants covers a wide range of species including ornamentals escaped from gardens and small-scale plantings, other anthropochorous species and common and pan-temperate weeds. This group contains both unintentionally and deliberately introduced species. Examples are numerous and three of the most spectacular ones are given here.

Ageratina adenophora (Sprengel) King & Robinson, from Mexico, is very widespread in Madeira. Supposedly originating here as a garden escape around 1840, according to Lowe (1857) this plant "had even in 1855 already spread in vast profusion over all the neighbourhood of Funchal and elsewhere, even in the North of the island, up to an elevation of 2000 or 3000 feet or more....in many

places as if perfectly indigenous". Appropriately named *Abundância*, this sprawling shrub is now dominant in many humid parts of Madeira, both in the lower regions and in parts of the cloud-forest; it is also relatively drought resistant and has spread to drier parts of the island too.

Erigeron karwinskianus DC. also originates from Mexico and is established in many parts of the world. Although probably introduced earlier, it was first mentioned as naturalised on Madeira by Menezes (1914) who recorded it from Gorgulho and Monte. It flourishes in a wide range of conditions and by the 1960s had spread throughout the island up to altitudes of c. 1000m. This is a particularly worrying invasion as this plant is most successful and well-established on cliffs and rocky slopes - habitats which are normally among the least affected by habitat destruction and in which a number of endemic species occur.

A species which has managed to invade the cloud forest of the upper regions is a member of the Zingiberaceae, *Hedychium gardnerianum* Roscoe, a robust plant spreading by means of rhizomes and forming large, dense colonies. Invasion by this plant is linked with degradation of the laurisilva and especially with plantations. In the Azores it is reported (Sjogren 1984) as rapidly invading and becoming dominant when trees are felled (here one sees another effect of exotic trees on the local flora since, of course, plantations are subject to a regular cycle of planting and felling). *Hedychium gardnerianum* is still relatively infrequent on Madeira and the situation on the island is not as pronounced as in the Azores but the plant is an aggressive invader and is spreading. Early instigation of an eradication programme similar to that recently carried out for *Acer pseudoplatanus* L. seems to offer the best chance of controlling this plant.

Not all introduced species are successful in establishing themselves. *Urtica urens* L., for example, is a typical anthropochorous plant which is recorded for Madeira. It is most unlikely that a species so frequently and closely associated with man in most other parts of the world has not been introduced on at least several occasions, yet it has never established more than a toehold on the island, despite apparently suitable conditions. Possibly competition from other species of *Urtica*, including the similar endemic *U. portosanctana* J.R. Press plays a part here.

Invasions by exotic species continue to occur, as shown by three recent arrivals. *Polygonum capitatum* Buch.-Ham. ex D. Don. is an ornamental species from the Himalayas which first appeared as a naturalised plant near Monte in

1969 (Hansen 1970). It has creeping, rooting stems and has begun to appear on dry sites and sunny rock faces in places as far apart as Camacha, Funchal and Calheta in the south of the island, and Santa in the north. A primary coloniser, it can rapidly become dominant, smothering other small colonisers.

A parallel situation in damp, shady habitats is provided by *Soleirolia soleirolii* (Req.) Dandy, a small, mat-forming member of the Urticaceae sometimes planted in gardens. Like *Polygonum capitatum*, it spreads easily by vegetative means, the stems readily rooting. The first firm record of naturalised plants dates from 1967 (Hansen 1968) when it appeared at Ribeiro Frio. It grows in damp places and on moist rocks along levadas. These same levadas provide an ideal rapid dispersal system, portions of the plant being carried along by the water flow to new sites, and in just over twenty years the plant has spread to many parts of the island. Such a small, weak plant may seem unlikely to provide a threat to native species. However it does form thick mats over the surface on which it grows and species with similar habits and growth requirements such as bryophytes, small ferns such as *Selaginella*, and even *Hymenophyllum* species, may well face considerable competition.

The cosmopolitan weed *Aster squamatus* (Sprengel) Hieron. was first observed at Ponta do Sol in 1969 (Hansen 1970). By 1971 it had spread as far as Tabua to the east and by 1973 to Praia Formosa (Hansen 1974). In 1978 it had reached Funchal (Hansen 1978), a distance of little more than 20km as the crow flies but very much more along the roadsides which is the path this plant is apparently taking, and in only 21 years.

From even the few examples given above it is obvious that introduced plants have had, and will probably continue to have, a considerable influence on the flora of Madeira. Introductions have greatly increased the total list of taxa recorded from the island and the diversity of the flora. However, a large number of introductions are clearly competing very successfully against native species, mainly by compressing and diminishing available habitats. In addition to competing directly with native plants for space, light and water, introductions may also compete indirectly by vying for attention. Although not peculiar to the Madeiran flora, this aspect is certainly relevant here.

As a resort island, Madeira receives large numbers of visitors, many of them drawn by the island's advertised image as the 'island of flowers'. In part these visitors wish to see beautiful gardens and the cultivated plants they contain, but also the countryside and what they regard as 'wild flowers'. There is perhaps a danger that it is showy naturalised introductions which visitors not

only see, but come to expect to see rather than many of the less familiar and spectacular native plants. If aggressive invaders such as *Acacia* provide the type of scenery which financially reckonable groups such as tourists wish to see (and personal experience shows that this can indeed be the case) then conservation of native species already under pressure from other causes may be made that much harder.

REFERENCES

HANSEN, A.:

1968. Floristische Beobachtungen auf der Inseln Madeira. *Bocagiana* 15:1-11.

HANSEN, A.:

1970. Beiträge zur Flora der Inseln Madeira, Porto Santo und Ilhéu Chão (Desertas). *Ibid.* 25:1-11.

HANSEN, A.:

1974. Contributions to the flora of Madeira and Porto Santo. *Ibid.* 36:1-37.

HANSEN, A.:

1978. Contributions to the flora of the Archipelago of Madeira. *Ibid.* 45:1-18.

LOWE, R.T.:

1857. *A Manual Flora of Madeira*. Vol. 1. London.(1-618).

MENEZES, C.A.:

1914. *Flora do Archipelago da Madeira*. Funchal. (1-282).

SJØGREN, E.:

1984. *Açores Flores*. Horta Faial.