THE SUCCESSION OF VEGETATION ON THE UPPER ROCK.

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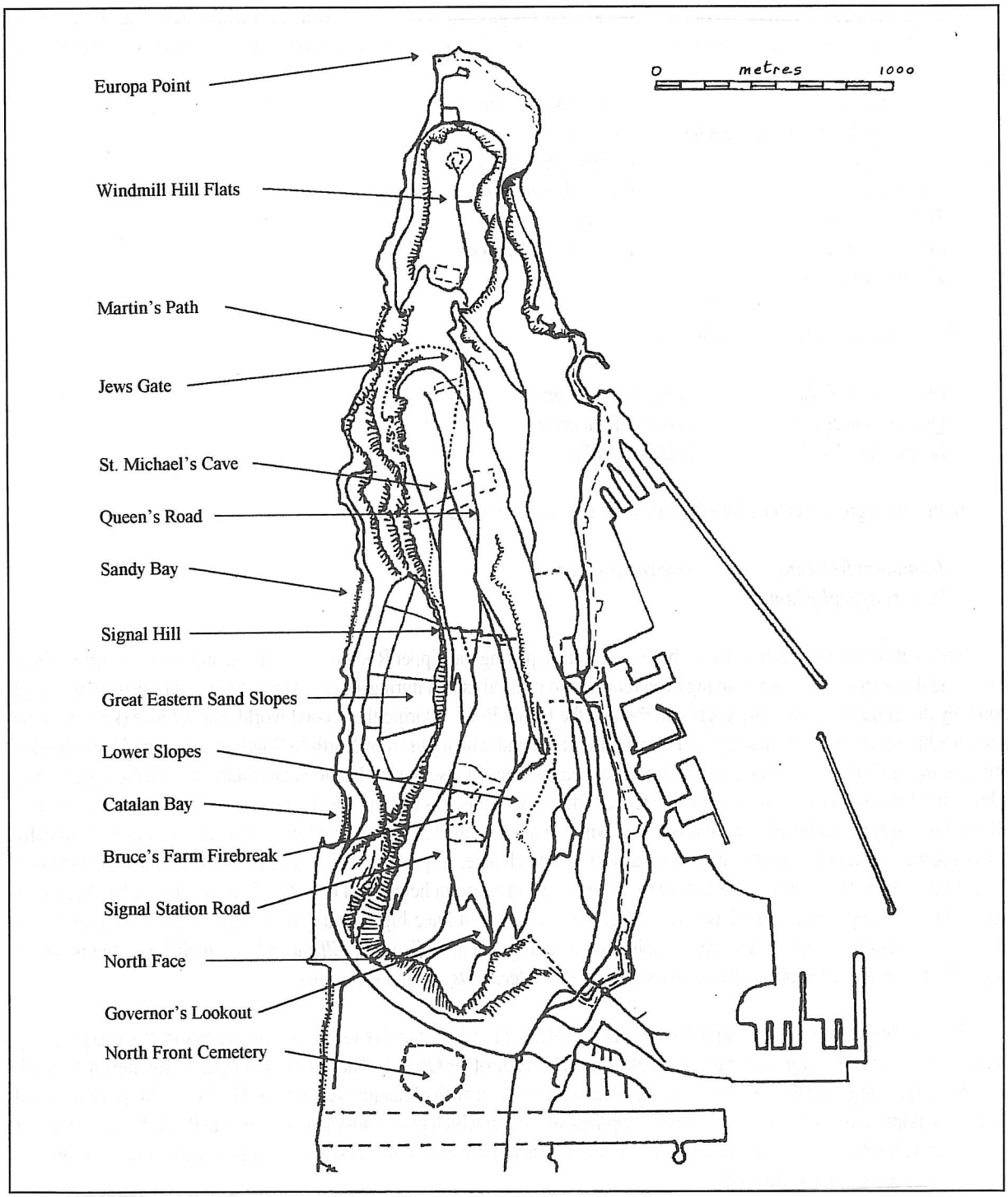
Resumen

La vegetación de la zona alta del Peñón ha sufrido muchos cambios durante los últimos tres siglos. Éstos han sido casi todos debidos a la interferencia humana. Como resultado, ha sido posible observar las etapas de desarrollo de esta vegetación. Esta contribución explica cómo se han desarrollado estos cambios. A la vez demostrará cómo hay que controlar la vegetación para mantener la presente variedad de especies.

The vegetation of Gibraltar is as diverse as the different habitats offered by the Rock's unique geological formation. The main types of habitat are shown on the table below :

HABITAT / VEGETATION	LOCATION AND COMMENT
Coastal sands; dunes	The Great Eastern Sand Slopes : includes the talus slopes North of Catalan Bay and South of Sandy Bay, as well as the sands at present partly covered by the corrugated iron sheets which form the water catchments. A harsh and unique environment but one which is well colonised by a large number of interesting species, which include : ***Ononis natrix* ssp. *ramosissima* var. *gibraltarica; Delphinium nanum; Pancratium maritimum; Euphorbia baetica; Linaria pedunculata; Malcolmia littorea; Eryngium maritimum; Verbascum giganteum; Silene nicaeensis; Silene littorea.***

HABITAT / VEGETATION	LOCATION AND COMMENT
Sandy soil close to the sea	The isthmus : not much left except North Front Cemetery. Many species are found here and rarely elsewhere in Gibraltar, ***e.g. Cachrys libanotis; Euphorbia terracina; Fumaria agraria; Tribulus terrestris; Papaver somniferum; Diplotaxis siifolia.***
Cliffs	The Eastern cliffs and the North Face, plus all sea cliffs around the Europa Point area. The vegetation here is scanty but includes many interesting species as well. Examples are: ***Limonium emarginatum; Echium boissieri; Iberis gibraltarica; Aeonium arboreum; Cerastium gibraltaricum; Chamaerops humilis.***
Steppe	Windmill Hill Flats. This is a harsh environment : the ground is stony and poor and the area very exposed to the elements. However the vegetation is rich and varied, and some species not found elsewhere on the Rock, e.g. ***Salvia verbenaca; Crocus serotinus*** **ssp.** ***salzmannii; Hedysarum coronarium; Plantago serraria; Echium parviflorum.***
Garigue	The Southern slopes around Martin's path, plus areas of Windmill Hill and Signal Hill, and on the Great Eastern Sand Slopes. Here the vegetation is about knee-high, and consists mainly of scattered shrubs with stony clearings in-between. Typical species found here are ***Sideritis arborescens; Iberis gibraltarica; Iris filifolia; Euphorbia squamigera; Asphodelus albus*** **ssp.** ***villarsii; Teucrium fruticans; Teline linifolia; Pistacia lentiscus; Stipa tenacissima..***
Maquis	Most of the Upper Rock. Consists of a compact mass of trees and shrubs. This paper deals largely with this habitat.
Clearings	Firebreaks, roadsides, footpaths and catchments. Most are man-made, and proved a habitat for plants of open ground. See below for typical specimens.
Waste ground and urban areas	The town area, including rooftops, walls; also including the reclaimed areas around the harbour. Here we include ***Antirrhinum majus; Trachelium caeruleum; Campanula mollis; Parietaria judaica; Urtica membranacea; Nicotiana glauca; Chenopodium ambrosioides.***



Map of Gibraltar

The main climactic vegetation of the Upper Rock is maquis. Most of this is low maquis where trees and shrubs grow up to around twice a man's height, and form a dense, impenetrable growth. The main constituents of this type of vegetation are:

Olea europea
Rhamnus lycioides ssp oleoides
Pistacia lentiscus
Calicotome villosa
Teline linifolia
Clematis cirrhosa
Tamus communis
Rhamnus alaternus
Osyris quadripartita
Pistacia terebinthus
Coronilla valentina ssp *glauca*
Smilax aspera
Aristolochia baetica

There are also scattered individuals of :

Phillyrea latifolia
Quercus coccifera
Laurus nobilis
Crataegus monogyna
Cercis siliquastrum
Celtis australis

In the undergrowth can be found smaller shrubby plants such as :

Jasminum fruticans
Ruscus hypophyllum
Asparagus albus

This state of affairs has not always been so. Prints depicting the Upper Rock from the 18th. and 19th. centuries, show very little if any tree cover, most having been removed to be used as fuel during sieges. Any subsequent re-growth was kept down by the grazing of the many goats that roamed the Upper Rock. During the second world war, a fence (known as the unclimbable fence) was constructed half way up the Rock and which ran from North to South, making the Upper Rock a military area and thus out of bounds to all unauthorised civilians. It also meant that no goats could graze in the upper areas, whilst still doing so in those areas below the fence. The result of this was that the vegetation of the area above the fence was allowed to re-grow and become what it is today, while that below the fence was kept low. When all goats were eventually removed, the vegetation of these lower areas also started to change. At present, this change is visible on the area known as the Lower Slopes. Here, during the last 10 to 15 years, the increase in height and density of the vegetation has been very noticeable. The vegetation started as garigue, i.e. low shrubs about knee-high separated by clear, open areas, and is now changing to maquis. Initially, there was a rapid growth and spread of ***Calicotome villosa*** and ***Teline linifoli***a, but these are gradually being squeezed out by the re-growth of ***Olea***, ***Pistacia***, ***Osyris*** and ***Rhamnus***.

This gradual change in vegetation has been to the detriment of the ground cover plants which grow in this area precisely because of the lack of overgrowth. Special mention must be made of the Orchids. The number of Orchids growing on the Rock have been declining over the past 20 years in tandem with the re-growth of maquis vegetation. The Lower Slopes harboured the largest population of this family, including ***Ophrys speculum*** which grows no-where else on the Rock. But over the last 5 years, there has been a marked decrease in their number, again because of the increase of maquis vegetation. A number of other species are similarly affected.

In the Lower Slopes the change from open ground to maquis is taking place unchecked and unmanaged, but this change can also be observed repeatedly in firebreaks and, more drastically, in areas destroyed by fire.

Changes due to fire on the Upper Rock

After a large fire in the maquis, nothing survives not just because of the burning but also because of the salt water used to put out the flames. The latter is not of lasting damage since the salt washes out of the soil after the first rains. Among the first plants to make an appearance are ***Calicotome villosa, Teline linifolia***, and ***Smilax aspera***. These will spread and grow very well, creating quite a dense scrub. A large number of ground cover plants will also grow, among which will be numerous grasses, ***Narcissus papyraceus,*** and ***lusitanum Colchicum***. However this surge in species variety is short-lived as once again the trees and shrubs of the maquis re-grow and take over once again. Blackened and apparently dead stumps of ***Olea, Osyris, Pistacia*** and ***Rhamnus*** begin to sprout and in three or four years the maquis is virtually restored. The original colonisers will be squeezed out and will be greatly reduced in number.

Firebreaks and other clearings

The succession outlined above in burnt-out areas is mirrored in man-made clearings such as roadsides, footpaths and especially firebreaks. Concentrating on firebreaks, where these are maintained regularly, the repeated clearing prevents the vegetation reverting to maquis. Here there is a large diversity of plant species which take advantage of the absence of tree/ shrub cover. Some are only found in such areas, for example :

Nepeta tuberosa	*Hypericum perforatum*
Campanula rapunculus	*Sideritis arborescens*
Logfia gallica	*Parentucellia viscosa*
Daphne gnidium	

A number of orchids are also found there, as well as numerous grasses, legumes and composites, and large numbers of species which prefer open ground, such as :

Narcissus papyraceus	*Asphodelus aestivus*
Asphodelus albus ssp *villarsii*	*Allium roseum*
Carthamus arborescens	*Centaurea erythraea*
Freesia refracta	*Gladiolus communis* ssp *byzantinus*

Where these firebreaks are not maintained, the same pattern of succession occurs : ***Teline, Osyris, Olea, Pistacias*** and ***Rhamnus*** begin to re-grow and spread; the ground cover plants begin to reduce in frequency and number, until the maquis is restored.

Exactly the same pattern is repeated for other clearings such as roadsides and water catchment areas. Worthy of mention is the catchment area below Rock Gun. This area was stopped being cleared a number of years ago and the subsequent re-growth of ***Pistacias, Rhamnus, Osyris*** and in particular ***Olea***, is very evident. The re-growth in this area is less dense as large

parts were cemented over for the easier flow of rain water. The shadier, Northern parts of this area is home to an important community of plants which prefer a more open, rocky habitat. These species include :

Cerastium gibraltaricum	*Iberis gibraltarica*
Silene tomentosa	*Saxifraga globulifera* var. *gibraltarica*
Stachys circinata	*Scilla peruviana*

All these are threatened by the gradual change in vegetation from open, rocky terrain to maquis.

In all the areas mentioned so far, i.e. Lower Slopes, firebreaks and abandoned catchments, the same problem arises : the plants growing there are being threatened by the gradual change in the vegetation to maquis. Unless these areas are managed and cleared periodically, there is going to be an important decline in the diversity of species found on the Rock. One other threat which has to be mentioned is that due to the relentless spread of ***Acanthus mollis* ssp. *platyphyllos***. This robust, aggressive species is spreading unchecked in many parts of the Upper Rock. This spread is very evident along firebreaks, especially the ones by Bruce's Farm and St. Michael's Cave, and above Jew's Gate. Roadsides offer an effective route for the spread of this species as is evident along Signal Station Road and Queen's Road (South). It goes without saying that control of this species is essential if we are to preserve the diversity of species found in those areas which are being overtaken by it.

In conclusion, if left to its own devices, the vegetation of the Upper Rock will eventually revert generally to low maquis. In areas such as Governor's Lookout and in the South, there is a further development into high maquis, where trees such as ***Olea europea, Pinus pinea, Pinus halepensis*** and ***Celtis australis*** grow to over 5 metres, and the vegetation approaches woodland.

All these changes will end up in a decline in species diversity, as plants of more open ground are squeezed out. To prevent this, those areas which are generally clear at present should be so maintained by managed clearing. It could well be said that the diversity of Gibraltar's flora is being artificially maintained and controlled by man. But this has been the case over the centuries and there is no reason why it should not continue to be so.

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