

# THE RESTORATION OF THE VEGETATION ON THE EAST SLOPES OF THE ROCK OF GIBRALTAR: BACKGROUND AND FIRST STEPS

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## INTRODUCTION

The Great Sand Slopes of Gibraltar cover an area of approximately 45 ha along the base of the eastern cliffs of the Rock. Before quarrying during the last few hundred years they were of greater extent, about 52 ha, and covered also a part of the base of the North Face (Figure 1).

The sands, named Catalan Sands (Rose & Rosenbaum, 1990) after Catalan Bay, consist mostly of quartz with subordinate microfossils and lithic fragments, the grains being generally well rounded. The sand is well sorted with grain size mainly medium but with 15 to 30% coarse (0.6 to 2.0mm) sand and only 5% fine (0.06 to 0.2mm) (Rose & Rosenbaum, 1990). The slopes, in effect stabilised dunes, dip at between 20 and 35 degrees.

The sands are windblown and typical of similar deposits found elsewhere in the western Mediterranean (Butzer & Cuerda, 1962). They probably originated in the sea floor east of the Rock, blown and accumulated at a time during glaciation when sea levels were lower.

The sands contain considerable amounts of breccias formed of limestone from the cliffs above which has been broken into fragments of a wide range of sizes from boulders several metres in diameter so small stones.

Most of the southern section of the sand slopes was smoothed out by removal and burial of breccia and covered with corrugated iron sheets around 1900 to form the water catchments. These supplied most of Gibraltar's potable water until the 1980s when desalination began to take over as the main source.

## VEGETATION OF THE SLOPES

About 14 ha of the slopes were left clear of the catchments. These were the Talus north of Catalan Bay and a stretch along the main road below (and east of) the main catchment area, as well as at the extreme south of the slopes. These areas retained some of the native vegetation, although also present are introduced species such as *Acacia cyclops*, *Aloe arborescens*, *Agave americana*, *Carpobrotus edulis*, *Nicotiana glauca* and *Phoenix canariensis*.

This surviving vegetated area of the Great Sand Slopes of Gibraltar remained a limited habitat for sand-loving species of plants (Linares 1994; Linares, Harper & Cortes, 1996). A list of species recorded on the east side of Gibraltar is given in Table 1. Table 2 shows sample data from 10 quadrats taken in the northernmost section, the Talus, which has never been converted to water catchment. The most important species from the point of view of cover are *Ononis natrix* and *Paronychia argentea*, with *Avena barbata* also having a high degree of presence. The vegetation is mostly low and open, and can best be described as garrigue and pseudosteppe.

The habitat in question, a *Malcolmietalia* (dune malcolmia annual-herb community) dune grassland (NATURA 2000 code: 2230; CORINE 91: 16.228) on a stabilised sand dune, is listed in the European Union's Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the "Habitats Directive"). It is regionally important as sandy littoral zones have been urbanised throughout coastal Andalusia, and provides a geological and landscape feature of great importance.

The slopes provide a habitat for two species of reptile of great interest, The Three-toed Skink *Chalcides chalcides*, and Bedriaga's Skink *Chalcides bedriagai*, a species listed on Annex IV of the Habitats Directive as being "in need of strict protection". Sardinian warblers *Sylvia melanocephala* nest there and occasional nesting of Spectacled warbler *Sylvia conspicillata* is suspected. Barbary Partridge *Alectoris barbara* occur and apparently nest along the higher levels of the slopes, particularly the Talus Slope. Black redstarts *Phoenicurus ochruros* and stonechat *Saxicola torquata* occur in winter.

During the construction of the water catchments all of the vegetation of the affected areas was removed. A number of species of plant, including *Otanthus maritimus* disappeared from the slopes (and from Gibraltar) altogether (Cortes 1994a). The black wheatear *Oenanthe leucura* which nested on these slopes at the time, disappeared from Gibraltar soon after (Cortes *et al.* 1980).

## DECOMMISSIONING OF THE CATCHMENTS

The corrugated iron water catchments have always been subject to much damage due to the elements. Rock falls, which occur at least weekly, and freak winds which can rip up the iron sheets create the greatest short term damage but rust has also been a factor leading to a need to constantly replace the sheeting. The water from the catchments was becoming increasingly polluted by excrement from the resident yellow legged gull *Larus cachimans* population, leading to requirements for more treatment. With the advent of water desalination, particularly using reverse osmosis, and the use of energy produced by the new refuse incinerator and used also to desalinate sea water, the effective contribution of water from the east side fell to around 1% and the cost of maintaining the catchments and providing potable water from them became unjustifiable. By the late 1980s Government of Gibraltar was considering their removal.

At the time consideration was being given to quarrying the sand for use in the building industry, including exporting to Spain. However, due to the uniformity of the grains (Rose & Rosenbaum 1990), this sand is not ideal for construction purposes. A Government project to reclaim land from the sea on the east side of the Rock was also to rely on the use of the

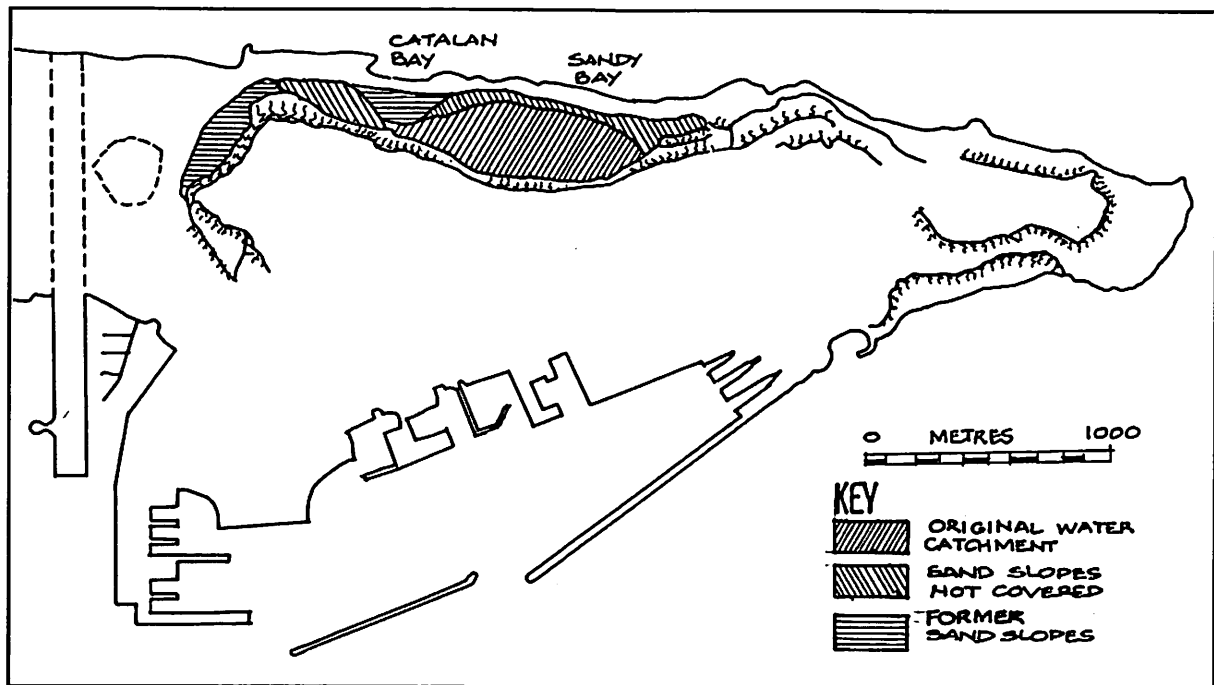


Figure 1. Location of water catchments on East Side of Gibraltar

sand from the Great Sand Slopes. For these reasons, in 1993 the company that provides Gibraltar's water supply, Lyonnaise des Eaux (Gibraltar) Ltd handed the catchments formally to the Government of Gibraltar.

Strong objections to quarrying were raised by the Gibraltar Ornithological & Natural History Society (GONHS). This was due to the dramatic effect the quarrying would have had on the landscape value of the Rock and because quarrying would have included the areas not under the water catchments and so would have meant the loss of the small extent of natural sand slope habitat remaining. The engineering problems were also considerable. Environmental and commercial factors played a part in the reversal of the decision to quarry the sand. Representations from GONHS led the Gibraltar Government to agree to vegetate the slopes in order to stabilise the exposed sand once the sheeting was removed.

Initial ideas put forward by Government included vegetating with the traditional sand stabiliser, the exotic South African *Carpobrotus edulis*, already present in some of the habitat (Cortes 1994b). Because of the invasive nature of this plant, GONHS again objected and proposed instead a seeding programme to restore the original vegetation as closely as possible.

Habitat restoration is now an important principle in this type of work throughout Europe. In particular the loss of species of both plants and animals from Gibraltar when the catchments were built, as well as the importance of the habitat then removed, made this project an ideal candidate for regaining of lost habitat. GONHS stressed that in order to avoid genetic pollution the seeds had to be collected preferably in Gibraltar and in the case of species where not enough could be collected in the remaining vegetated sand slopes, in adjacent coastal habitats on beaches in Cadiz Province of Spain. This gave an opportunity too for re-introducing some of the species that had been lost during the construction of the catchments.

The Government of Gibraltar accepted this advice with one proviso, that in order to increase stability especially during the initial stages while the plants were gaining hold, a geo-textile material should be laid over the exposed areas.

The water catchments are divided into two according to land ownership. Approximately, the southern half belongs to the Government of Gibraltar while the northern half belongs to the United Kingdom Government Ministry of Defence. The agreement to seed corresponded initially only to Gibraltar Government land (Figure 2). GONHS was consulted on the geo-textile to be used and the Government contracted Wildlife (Gibraltar) Ltd, environmental consultants and managers of the Gibraltar Botanic Gardens, to collect and sow the seed over the initial 8 hectares from which sheets were to be removed.

## THE MATTING

The removal of the sheeting proceeded during most of 1996, partly funded by the European Union's Structural Funds. In January 1997 Mackley Tricon Ltd began work in laying sheets of MacMat, manufactured by Maccaferri, and described by the firm as "an anti-erosion geomat for permanent revegetation". According to the Maccaferri's publicity literature, "this product is a three-dimensional geomat consisting of entangled polypropylene monofilaments heat-bonded at the contact points to provide dimensionally stable matrix for soil erosion protection from wind, rainfall, run-off or flooding". GONHS particularly liked this product because it was brittle, and would become more so after prolonged exposure to sunlight,

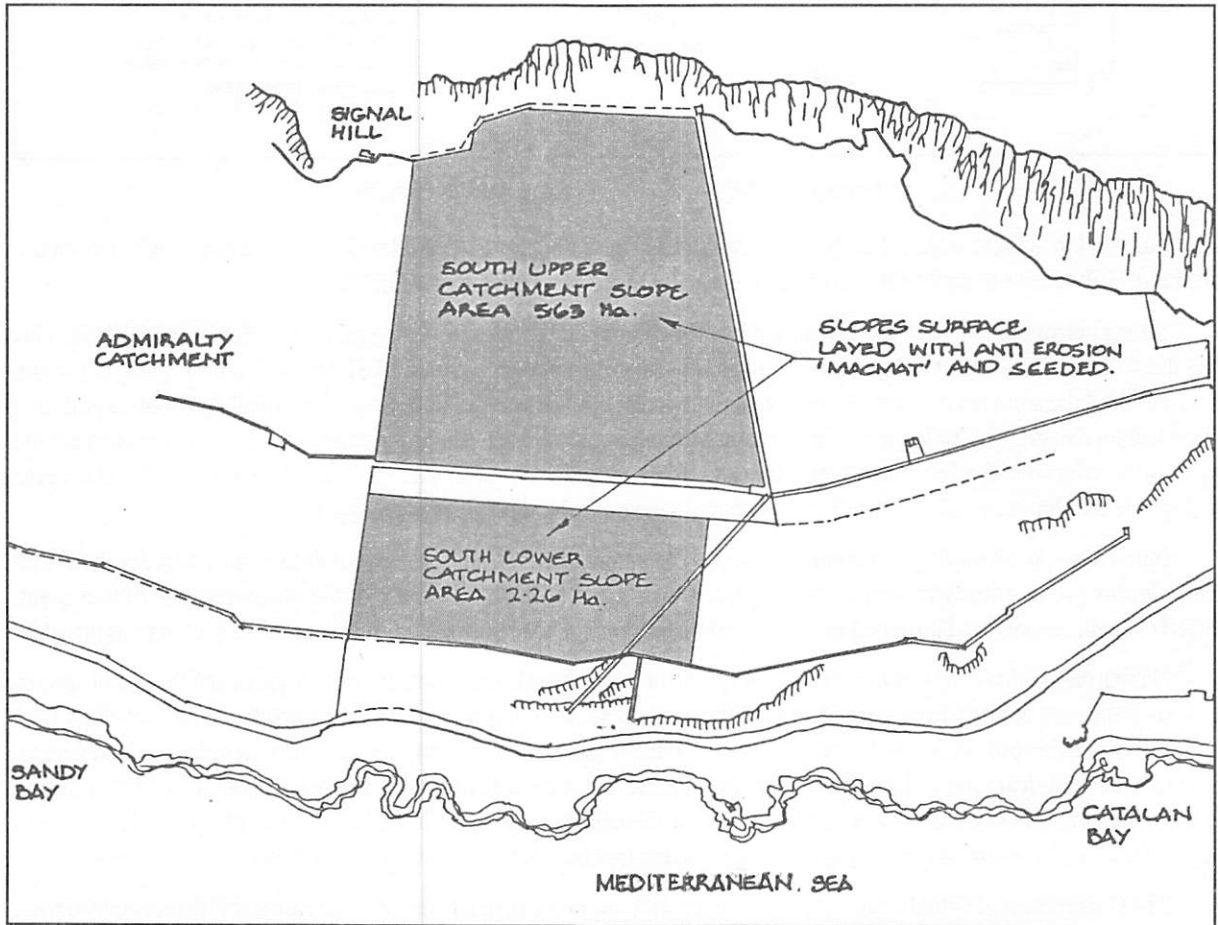


Figure 2. Seeded area on Great Sand Slopes.

allowing plants to mature, and eventually disintegrating, adding an inert material to the sand which would not greatly affect its nutrient properties and therefore its plant cover.

A total of 1675 rolls of MacMat, each 25m x 2m were laid and fixed into the sand with wooden stakes.

### THE SEEDING

From May to September 1996 staff contracted by Wildlife (Gibraltar) Ltd collected seed from plants on the east sand slopes of Gibraltar, other littoral habitats in Gibraltar and on the sandy beach areas north of La Atunara (La Linea) and at Alcaidesa (San Roque), both in Cadiz Province, Spain. A list of species from which seed was collected is given in Table 3.

The seeds were set out to dry in open trays in the Gibraltar Botanic Gardens laboratory. In most cases seed pods were opened to assist in the eventual dispersal of the seed once sown. Prior to sowing, the seeds were mixed as widely as possible and placed in cloth bags for transfer to the site.

The original idea was to sow seed from the beginning of the wet season, from about October. However, delay in the works removing sheets and in initiating the matting contract meant that seeding did not commence until February 1997. Seeds were sown in a dual operation. They were scattered by hand over the whole of the area, both before and after the geomat had been laid. The sowers would traverse the slope, spreading seed on both sides. Larger seed, like that of *Ferula tingitana* which would not pass easily through all the gaps in the mat, was spread under the matting, while smaller seed was spread both below and over the mat.

No further treatment was provided, and the seeds were allowed to germinate and seedlings to develop naturally. Despite the lateness of the sowing, late winter rains led to some germination, but cover was sparse during the first season and the site was not thoroughly surveyed until after the next growing season, in May 1998.

### RESULTS AND DISCUSSION

Table 4 lists the species present in May 1998, and Table 5 those present in April 1999. The development of cover over time will be the subject of further quantitative studies and publication in the future, but by April 1999 overall cover of the slopes was 60%, ranging from 80% in some areas to 10% in a small area where the geomat had not been thoroughly fixed and had been ripped up by wind after seeds had begun to germinate. Greater coverage has not been achieved due to the presence of the mesh which prevents the growth of some groundcover species which need to spread over the sand. Another problem is that as the fabric will not always be touching the surface of the ground below, plants will tend to spread under the fabric and not be able to push their way through. This gives the impression that cover is less than it is and may also have led to some species not having been seen during surveys. As the material deteriorates these should cease to be a problem.

A total of 59 species were recorded in 1998 and 83 in 1999. The grand total was 95 for both years. Thirteen were only recorded in 1998 and 38 were only recorded in 1999. Given the large expanse and the difficulty of access and surveying, this does not mean that the plants were not represented.

Species only recorded in 1998 were:

*Calendula suffruticosa* ssp. *lusitanica*; *Chamaerops humilis* ?; *Coronopus didymus*; *Delphinium nanum*; *Ephedra fragilis* ?; *Geranium purpureum*; *Hedypnois arenaria*; *Hippocrepis multisiliquosa*; *Phalaris canariensis*; *Polypogon monspeliensis*; *Rostraria cristata*; *Spergularia marina*; *Vulpia geniculata*.

Species only recorded in 1999 were:

*Amaranthus blitoides*; *Andryala integrifolia*; *Asteriscus maritimus*; *Avena barbata*; *Biscutella megacarpea*; *Brachypodium distachyon*; *Bromus madritensis*; *Carthamus arborescens*; *Centranthus calcitrapae*; *Chenopodium murale*; *Convulvulus althaeoides*; *Convulvulus siculus*; *Dactylis glomerata*; *Dittrichia viscosa*; *Erodium chium*; *Ferula tingitana*; *Helichrysum rupestre*; *Hordeum leporinum*; *Iberis gibraltaria*; *Lavatera cretica*; *Lotus edulis*; *Medicago littoralis*; *Mercurialis annua ambigua*; *Otanthus maritimus*; *Paronychia argentea*; *Phagnalon saxatile*; *Plantago lagopus*; *Psoralea bituminosa*; *Reichardia gaditana*; *reseda alba*; *Scabiosa atropurourea*; *Sedum sediforme*; *Senecio bicolor cineraria*; *Silene colorata*; *Succowia balearica*; *Triticum* sp.; *Uropersimum picroides*; *Verbascum giganteum martinezii*.

One species, *Otanthus maritimus*, had not been recorded in Gibraltar since 1914 and can probably be considered a re-introduction.

Figure 3 shows the extent of vegetation in May 1998 and Figure 4 in April 1999.

## DISCUSSION

The increase in the number of species recorded in 1999 over 1998 is not surprising. More time had elapsed both for sown seed to germinate (most of the seeds used can lie dormant for up to several years) and for natural seeding from adjacent habitats, especially by light, wind-borne seeds. An important consideration to be borne in mind is the fact that the sowing was carried out late in the rain season in 1997. This is likely to have meant a failure in germination in some of the seed until the 1997/98 rainy season.

The presence of species not in the original seed list could be due to contamination (*i.e.* seed of that species was in fact present in the seed mix and had been collected inadvertently or not been identified) or may again have been due to natural seeding from adjacent areas. Both probably occurred.

The dominant species by way of frequency and cover recorded in May 1998 were *Hirschfeldia incana*, *Antirrhinum majus* and *Silene nicaeensis*. These species featured prominently in the original seed mix used.

Rupicolous species such as *Iberis gibraltaria* and *Helichrysum rupestre* were only seen on or very close to areas with exposed limestone. These areas are few in the newly seeded slopes where the catchments had been, although stones feature prominently in the Talus (Table 2).

A number of exotic species have been recorded on the seeded slopes. These are mainly *Acacia cyclops*, *Phoenix canariensis*, *Nicotiana glauca* and *Arundo donax*. *Arundo donax* was deliberately planted along the base of the upper seeded area to add stability and as a break to falling stones. The authors believe that *Phoenix canariensis* was sown by workers on the slopes while removing the catchments, as the species is naturalised on an adjacent sand slope (Cortes 1994b). *Acacia cyclops* and *Nicotiana glauca* have in all likelihood entered naturally. They too also occur nearby. The *Acacia* was planted as a stabiliser apparently in the 1950s while *Nicotiana* is a common weed in many habitats in Gibraltar. The latter is extremely common on the seeded area, especially the lower section, which leads the authors to suspect that this species too was encouraged by unauthorised seeding in this latter section.

The presence of these exotics is unfortunate. *Phoenix canariensis* and *Acacia cyclops* can probably be controlled with proper management. These have spread very little from the areas in which they were originally planted. But it is unlikely that *Nicotiana glauca* with its much lighter and thus more motile seed, could ever be eradicated. This is considered favourably

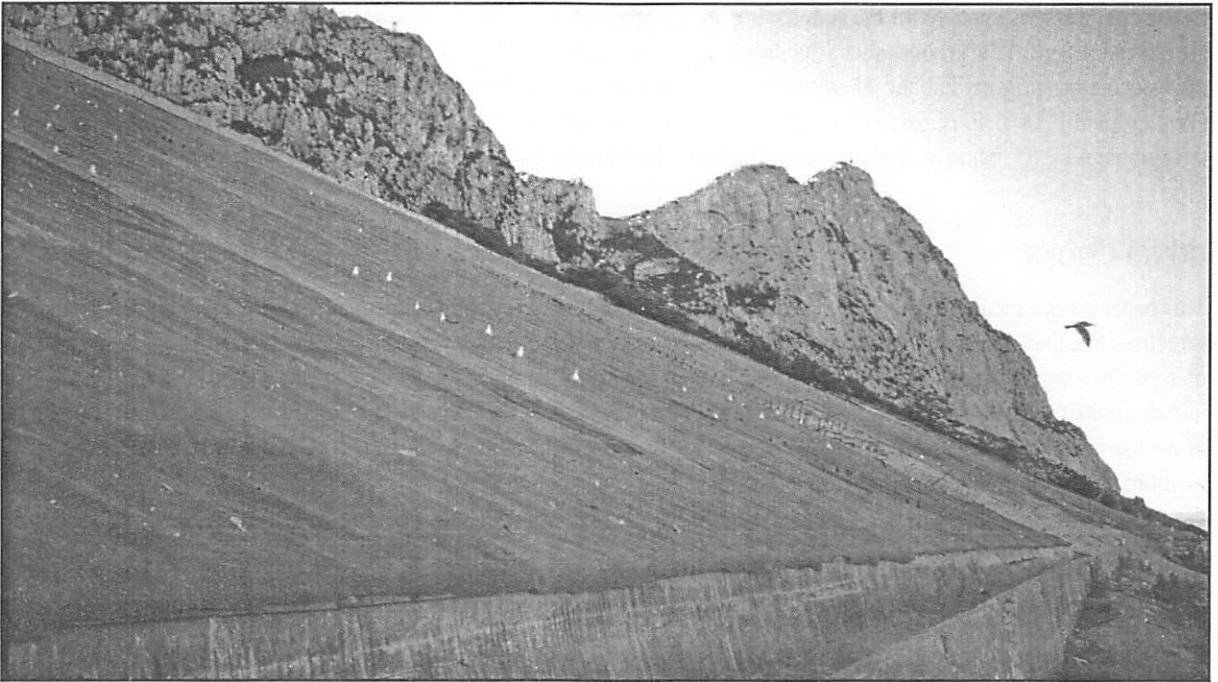


Figure 3. Reseeded sand slopes, May 1998 (15 months after initial seeding)

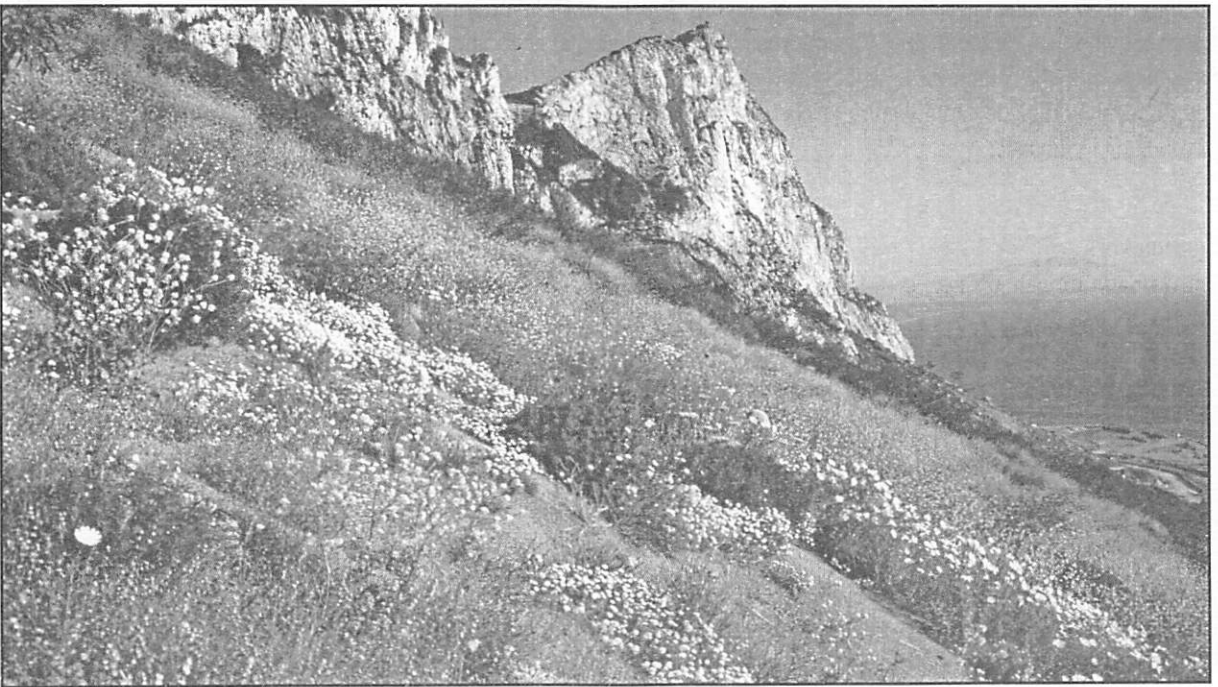


Figure 4. Reseeded sand slopes, April 1999 (26 months after initial seeding)

by the engineers responsible for the stabilisation as the presence of the roots of these woody plants, which can extend for several metres under the ground, adds structure to the surface of the slopes. However, it is unfortunate from the point of view of restoring the original habitat where the species did not feature (although it was naturalised at Catalan Bay by 1914 (Wolley-Dod 1914)). Fortunately mature specimens of the shrub do not cast much shade as this could seriously affect the development of the majority of plants of this habitat which favour exposed situations.

## CONCLUSIONS

This paper gives a qualitative account of the process of restoration of a sizeable area of an important habitat in Gibraltar. It is realised that the habitat will never be the same. The vegetation will take many years to stabilise and will be drawing initially on seed sown in proportions that basically reflect availability for collection more than the ultimate balance in the habitat. The introduction of matting also adds a new factor as does the presence of exotic plant species. However, the important principle of the use of locally collected native seed has been recognised by the authorities and preliminary results suggest that in the medium term an important habitat will be re-established.

The habitat is, not surprisingly, lacking in animal life, and it will be necessary to introduce invertebrates from coastal habitats in Spain as well as a number of vertebrates including the spiny-footed lizard *Acanthodactylus erythrurus* and, at a later stage, the black wheatear. It is possible that the area could become a feeding location for Gibraltar's dwindling population of lesser kestrels *Falco naumanni* which could compensate in some way for the loss of suitable habitat on the isthmus and other areas in the districts of La Linea and San Roque north of the border.

The experience gained in the years between 1996 and 1999 is being put to use as further areas of the catchments, belonging both to the Gibraltar Government and the Ministry of Defence, are removed and the plans to seed continue. The ongoing work has great potential for important research on habitat restoration and succession of vegetation. These studies are planned. In the meantime, both those parts of the sand slopes that have remained uncovered, and those that are now being exposed, should be declared Nature Protection Areas by the Government of Gibraltar under the provisions of the Nature Protection Ordinance.

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## TABLES

Table 1. PLANTS FOUND ALONG THE EAST SIDE OF GIBRALTAR

Key : †: Plant protected under Schedule 3 of Nature Protection Ordinance 1991

\* : Plant listed in Schedule 2 of Nature Protection Ordinance 1991; i.e. not a protected species

§ : Plant not listed in Schedule 2 of Nature Protection Ordinance 1991; i.e. a protected species

SPECIES	COMMON NAME (Spanish in italics)	STATUS	LOCATION
§ <i>Acacia cyclops</i>		Common	From above Catalan Bay to southern end of Both Worlds
* <i>Achyranthes sicula</i>	<i>Achyranthes</i>	Common	Widespread throughout Gibraltar
* <i>Aetheorhiza bulbosa</i> ssp. <i>bulbosa</i>		Common	Most of East Side and parts of Upper Rock
§ <i>Agave americana</i>	Century Plant ( <i>Pita</i> )	Common	All along East Side and Europa Point
§ <i>Agave ghibsbreghtii</i>		Not common	Above Catalan Bay and Europa Point
* <i>Allium ampeloprasum</i>	Great Round-Headed Leek ( <i>Ajo bravo</i> ; <i>Puerro silvestre</i> )	Common	All along East Side and southern parts of the Rock
* <i>Allium sphaerocephalon</i>	Round-Headed Leek	Common	Minly above Boths
sp. <i>sphaerocephalon</i> ( <i>Ajo de cigüeña</i> )		Common	Worlds and few along Martin's Path
* <i>Aloe arborescens</i>	Tree Aloe	Common	Around Catalan Bay and southern parts of the Rock
§ <i>Amaranthus lividus</i>		Common	Widespread throughout Gibraltar.
§ <i>Anacyclus radiatus</i>	Yellow Anacyclus ( <i>Albajar</i> )	Common	Widespread throughout Gibraltar
* <i>Anagallis arvensis</i> (blue)	Blue Pimpernel ( <i>Murajas</i> )	Common	Widespread throughout Gibraltar
* <i>Andryala integrifolia</i>	<i>Andryala</i>	Common	Widespread throughout Gibraltar
§ <i>Anthyllis hamosa</i>		Very rare	Southern sand slopes
* <i>Antirrhinum majus</i>	Snapdragon; ( <i>Boca de dragon</i> ;	Common	Widespread throughout Gibraltar
sp. <i>cirrhigerum</i>	<i>dragoncillo</i> ; <i>conejitos</i> ; <i>hierba becerra</i> )		
* <i>Antirrhinum majus</i>	Snapdragon; ( <i>Boca de dragon</i> ;	Common	Widespread throughout Gibraltar
ssp. <i>tortuosum</i>	<i>dragoncillo</i> ; <i>conejitos</i> ; <i>hierba becerra</i> )		
* <i>Arisarum simorrrhinum</i>	Friar's Cowl ( <i>Candiles</i> ; <i>Candilejos</i> ;	Common	Widespread throughout Gibraltar
	<i>Frailillos</i> ; <i>Rabicana</i> )		
* <i>Arundo donax</i>	Giant Reed; Cane	Common	East Side, North Front and Europa Point

§ <i>Asparagus aphyllus</i>	( <i>Espárrago triguero; Espárrago negro</i> )	Not common	Widespread throughout Gibraltar
* <i>Asphodelus albus</i>	White Asphodel ( <i>Gamón</i> )	Common	Widespread throughout Gibraltar
§ <i>Asphodelus fistulosus</i>	Hollow-Stemmed Asphodel ( <i>Gamoncillo; Gamonita</i> )	Rare	Above Both Worlds, Windmill Hill and Europa Point
* <i>Asteriscus maritimus</i>	Sea Daisy ( <i>Chuchera</i> )	Common	Widespread throughout Gibraltar
§ <i>Atriplex patula</i>	Common Orache ( <i>Arnuelle silvestre</i> )	Rare	East Side and Europa Point
§ <i>Atriplex prostrata</i>	Hastate or Spear-Leaved Orache	Rare	North of Both Worlds only
* <i>Avena barbata</i> ssp. <i>barbata</i>	Bearded Wild Oat ( <i>Avena morisca</i> )	Common	Widespread throughout Gibraltar
* <i>Avena sterilis</i> ssp. <i>sterilis</i>	Animated or Winter Wild Oat ( <i>Avena loca; Ballueca</i> )	Common	Widespread throughout Gibraltar
* <i>Beta vulgaris</i> ssp. <i>maritima</i>	Sea Beet ( <i>Remolacha; Acelga</i> )	Common	Widespread round the littoral
§ <i>Biscutella megacarpaea</i>	Biscutella	Common	Widespread throughout Gibraltar
§ <i>Biscutella sempervirens</i>		Common	Widespread throughout Gibraltar
* <i>Brachypodium distachyon</i>		Common	Widespread throughout Gibraltar
§ <i>Bromus rigidus</i>	Upright or Stiff Brome	Common	East Side and North Front
§ <i>Cachrys libanotis</i>	Sand Cachrys	Rare	Above Both Worlds and North Front Cemetery
* <i>Cakile maritima</i>	Sea Rocket	Not common	East Side only
ssp. <i>maritima</i>			
* <i>Calendula suffruticosa</i>	Rock Marigold ( <i>Caléndula</i> )	Common	Widespread throughout Gibraltar
ssp. <i>lusitanica</i>			
* <i>Calendula suffruticosa</i>	Hairy Rock Marigold	Not Common	Widespread throughout Gibraltar
ssp. <i>tomentosa</i>			
* <i>Campanula erinus</i>	Annual Bellflower; ( <i>Asperilla</i> )	Common	Widespread throughout Gibraltar
* <i>Carduus tenuiflorus</i>	Slender Thistle	Common	Widespread throughout Gibraltar
* <i>Carlina corymbosa</i>	Flat-Topped Carlina Thistle;	Common	Widespread throughout Gibraltar
ssp. <i>corymbosa</i>	( <i>Cardo cuco; Cabeza de pollo</i> )		
* <i>Carpobrotus edulis</i>	Hottentot Fig	Common	Widespread throughout Gibraltar
* <i>Carthamus arborescens</i>	Yellow Tree Thistle ( <i>Cardo cabrero</i> )	Common	Widespread throughout Gibraltar
* <i>Centaurea sonchifolia</i>	Silver Knapweed	Common	East Side and Windmill Hill
* <i>Centranthus calcitrapae</i>	Cut-Leaved Valerian	Common	Widespread throughout Gibraltar
ssp. <i>calcitrapae</i>			
§ <i>Cerinthe major</i>	Honeywort; ( <i>Ceriflor; Palomera</i> )	Very rare	Above Catalan Bay only

<i>ssp. gymandra</i>				
* <i>Chenopodium album</i> <i>ssp. album</i>	Fat Hen ( <i>Cenizo</i> )	Common	Widespread throughout Gibraltar	
* <i>Chenopodium ambrosioides</i>	Aromatic Goosefoot ( <i>Pazote</i> ; <i>Té español</i> )	Common	Widespread throughout Gibraltar	
* <i>Chenopodium murale</i>	Nettle-leaved Goosefoot	Common	Widespread throughout Gibraltar	
§ <i>Chenopodium opulifolium</i>	Grey Goosefoot	Very rare	Middle sand slopes only	
§ <i>Chondrilla juncea</i>	Chondrilla	Very rare	Above Both Worlds only	
* <i>Chrysanthemum coronarium</i>	Crown Daisy; ( <i>Antimaño</i> ; <i>Flor de muerto</i> ; <i>Magarza</i> ; <i>Pajitos</i> ; <i>santimonía</i> ; <i>Mirabeles</i> ; <i>Ojo de buey</i> )	Common	Widespread throughout Gibraltarcoronarium	
§ <i>Cistus albidus</i>	Grey-Leaved Cistus; ( <i>Estepa blanca</i> ; <i>Estepilla</i> ; <i>Jaguarzo blanco</i> )	Rare	Above Catalan Bay and Mediterranean Road and Steps	
§ <i>Cistus salvifolius</i>	Sage-Leaved Cistus; ( <i>Jaguarzo</i> ; <i>Jaguarzo morisco</i> ; <i>Jara estepa</i> )	Rare	Above Catalan Bay and Mediterranean Road	
* <i>Convolvulus althaeoides</i> <i>ssp. althaeoides</i>	Mallow-Leaved Bindweed <i>Campanillas de Canarias</i>	Common	Widespread throughout Gibraltar	
§ <i>Convolvulus siculus</i> <i>ssp. siculus</i>	Small Blue Convolvulus; ( <i>Correhuela azul</i> )	Not common	Scattered about the East side slopes and the Upper Rock	
* <i>Conyza albida</i>	White Horseweed	Common	Widespread throughout Gibraltar	
* <i>Conyza bonariensis</i>	Horseweed	Common	Widespread throughout Gibraltar	
§ <i>Coronilla dura</i>		Rare	Above Both Worlds only	
* <i>Crithmum maritimum</i>	Rock Samphire ( <i>Hinojo marino</i> ; <i>Perejil de mar</i> )	Common	Widespread throughout the littoral	
§ <i>Crucianella maritima</i>	Coastal Crucianella ( <i>Rubia de mar</i> )	Rare	East Side only	
§ <i>Cuscuta planiflora</i>	Dodder	Rare	Above Both Worlds and Bruce's Farm Firebreak	
§ <i>Cutandia maritima</i>	Cutandia	Rare	North of Both Worlds only	
* <i>Cynodon dactylon</i>	Bermuda Grass ( <i>Gramma</i> )	Common	East Side and North Front	
§ <i>Cyperus capitatus</i>	Sand Sedge	Common	From above Both Worlds to around Blackstrap Cove	
* <i>Dactylis glomerata</i>	Cock's-Foot ( <i>Dacilo</i> ; <i>Jopillos</i> )	Common	Widespread throughout Gibraltar	
* <i>Daucus carotas</i> <i>ssp. maximu</i>	Wild Carrot ( <i>Zanahoria silvestre</i> ; <i>Acenoria</i> )	Common Europa area	Widespread throughout the littoral, North Front and	
§ <i>Delphinium nanum</i>	Violet Larkspur; Annual Delphinium	Common	East Side only	

(Espuela)			
* <i>Desmazeria marina</i>	Sea Fern-Grass; Stiff Sand-Grass	Common	Widespread throughout the littoral
§ <i>Dianthus broteri</i>	Fringed Pink	Not common	East Side only
§ <i>Dipcaadi serotinum</i> Brown ssp. <i>serotinum</i>	Bluebell ( <i>Jacinto bastardo</i> )	Common	East Side only
* <i>Ecballium elaterium</i>	Squirting cucumber	Common	Widespread along East Side and southern parts of the Rock
* <i>Echium creticum</i> ssp. <i>coincyanum</i>	Bristly or Rough Bugloss	Common	Widespread throughout Gibraltar
* <i>Elaeoselinum foetidum</i>		Common	Widespread throughout Gibraltar
* <i>Elymus farctus</i>	Sand Couch	Not common	Above and north of Both Worlds; Europa Point
* <i>Ephedra fragilis</i> ssp. <i>fragilis</i>	Joint-Pine; <i>Hierba de las coyunturas</i>	Common	Widespread throughout Gibraltar
§ <i>Erodium ciliatum</i> ssp. <i>chium</i>	Greater Soft-Storksbill	Common	Widespread throughout Gibraltar
* <i>Erodium laciniatum</i>	Sand Storksbill	Rare	East Side only
§ <i>Eryngium maritimum</i>	Sea Holly ( <i>Cardo de mar</i> )	Very rare	Above Both Worlds only
§ <i>Euphorbia baetica</i>	Southern Spurge	Not common	Above Both Worlds only
§ <i>Euphorbia peplus</i>	Pety Spurge; ( <i>Lechecina; Tomagallos; Tesula redonda</i> )	Common	Widespread throughout Gibraltar
§ <i>Euphorbia segetalis</i>	Corn Spurge	Not Common	Above Both Worlds and Europa area
* <i>Euphorbia terracina</i>		Rare	Above and south of Both Worlds, and North Front
§ <i>Ferula tingitana</i>	Giant Tangier Fennel ( <i>Asa dulce</i> )	Common	Widespread throughout Gibraltar
* <i>Foeniculum vulgare</i> ssp. <i>piperitum</i>	Bitter Fennel ( <i>Hinojo</i> )	Common	Widespread throughout Gibraltar
* <i>Freesia refracta</i>	Freesia	Common	Widespread throughout Gibraltar
§ <i>Fritillaria lusitanica</i>	Southern Fritillary ( <i>Meleagria</i> )	Very rare	Above Catalan Bay only
§ <i>Fumaria bastardii</i>		Rare	East Side only
* <i>Fumaria capreolata</i> ssp. <i>capreolata</i>	Ramping Fumitory ( <i>Conejillos; Patomilla pintada</i> )	Common	Widespread throughout Gibraltar
* <i>Fumaria sepium</i>		Common	East Side, Europa Point area, and scattered places elsewhere
* <i>Galactites tomentosa</i>	Galactites	Common	Widespread throughout Gibraltar
* <i>Galium verrucosum</i>	Warty Bedstraw	Common	Widespread throughout Gibraltar
<i>Geranium purpureum</i>	Lesser Herb Robert; Little Robin	Common	Widespread throughout Gibraltar

* <i>Glaucium flavum</i>	Yellow Horned Poppy ( <i>Glaucio</i> ; <i>Amapola de playa</i> )	Common	Widespread throughout the littoral
* <i>Hedynois arenaria</i>	Sand Hedynois	Common	Widespread throughout Gibraltar
* <i>Herniaria lusitanica</i> ssp. <i>lusitanica</i>	Southern Rupture-Wort	Very rare	Above Both Worlds only
* <i>Hirschfeldia incana</i> ssp. <i>incana</i>	Hoary Mustard	Common	Widespread throughout Gibraltar
* <i>Hordeum leporinum</i>	Wall Barley ( <i>Paspayas</i> ; <i>Cebadilla de ratón</i> )	Common	Widespread throughout Gibraltar
§ <i>Hypochoeris salzmanniana</i>	Sand Catsear	Not common	East Side only, south of Catalan Bay
§ <i>Jasione montana</i> ssp. <i>blepharodon</i>	Sheep's Bit; ( <i>Botón azul</i> )	Not common	East Side only, mainly above Both Worlds
* <i>Lathyrus clymenium</i>	Perennial Pea	Common	Widespread throughout Gibraltar
§ <i>Lavatera arborea</i>	Tree Mallow ( <i>Malva arborea</i> )	Common	Widespread throughout the littoral
* <i>Lavatera cretica</i>	Lesser Tree Mallow ( <i>Malva</i> )	Common	Widespread throughout Gibraltar
§ <i>Limonium emarginatum</i>	Gibraltar Sea Lavender	Common	Widespread throughout the littoral
* <i>Linaria amethystea</i> ssp. <i>amethystea</i>	Spanish Toadflax ( <i>Zapatillas</i> ; <i>Linaria</i> )	Common	Mainly East Side, and also along Martin's path and Mediterranean Steps
§ <i>Linaria pedunculata</i>	Branched Toadflax	Not common	East Side, mainly above Both Worlds
* <i>Linum strictum</i> Upright ssp. <i>strictum</i>	Yellow Flax	Common	Widespread throughout Gibraltar
* <i>Lobularia maritima</i>	Sweet Alison; ( <i>Mastuerzo marino</i> )	Common	Widespread throughout Gibraltar
§ <i>Lotium rigidum</i>	Stiff Darnel; Stiff Rye-Grass	Common	Widespread throughout Gibraltar, mainly the littoral
§ <i>Lotus arenarius</i>	Sand Brdsfoot Trefoil	Common	Widespread throughout the littoral
§ <i>Lotus collinus</i>	Common Brdsfoot Trefoil	Common	Widespread throughout Gibraltar, mainly the Upper Rock
§ <i>Lotus creticus</i>	Southern Brdsfoot Trefoil*	Common	Mainly East Side, and some at Europa Point
* <i>Lotus edulis</i>	Edible Brdsfoot Trefoil	Common	Widespread throughout Gibraltar
* <i>Lotus orithopodioides</i>	Birdsfoot Trefoil	Not common	Widespread throughout Gibraltar
§ <i>Malcolmia littorea</i>	Silver Sea Stock; ( <i>Alhelf de mar</i> )	Common	East Side only
§ <i>Malva sylvestris</i>	Common Mallow ( <i>Malva comin</i> )	Common	Widespread throughout Gibraltar
* <i>Medicago littoralis</i>	Shore Medick	Common	Widespread throughout the littoral and North Front
§ <i>Medicago marina</i>	Sea Medick ( <i>Carretón de playa</i> )	Very rare	East Side mainly, and some on harbour reclamation

<i>§Melilotus sulcata</i> elsewhere	Furrowed Melilot	Rare	Above Both Worlds mainly, and very scattered
* <i>Mercurialis annua</i> Annual <i>ssp. ambigua</i>	Mercury; ( <i>Mercurial</i> )	Common	Widespread throughout Gibraltar
* <i>Misopates orontium</i>	Weasel's Snout	Common	East Side and North Front Cemetery
* <i>Narcissus papyraceus</i> <i>ssp. papyraceus</i>	Paper-White Narcissus ( <i>Narciso blanco</i> )	Common	Widespread throughout Gibraltar
* <i>Nicotiana glauca</i>	Shrub Tobacco ( <i>Gandul</i> ; <i>Tabaco moruno</i> )	Common	Widespread throughout Gibraltar
<i>§Ononis natrix</i> ssp. <i>ramosissima</i> var. <i>gibraltaria</i> <i>Hierba melera</i>	Gibraltar Restharrow ( <i>Pegamoscas</i> ; <i>Hierba melera</i> )	Common	East Side only
<i>§Opuntia vulgaris</i>	Prostrate Cactus	Not common	East Side only
* <i>Orobancha ramosa</i> <i>ssp. nana</i>	Branched Broomrape ( <i>Hierba tora</i> )	Common	Widespread throughout Gibraltar
* <i>Osyris quadripartita</i>	Osyris ( <i>Bayon</i> )	Common	Widespread throughout Gibraltar
<i>Otanthus maritimus</i>	Cottonweed	Very rare	Southern sandsploes
* <i>Oxalis pes-caprae</i>	Bermuda Buttercup; Cape Sorrel ( <i>Vinagrera</i> )	Common	Widespread throughout Gibraltar
<i>§Panicratium maritimum</i>	Sea Daffodil ( <i>Nardo marino</i> )	Not common	East Side only
* <i>Panicum repens</i>	Creeping Millet	Common	East Side and North Front
<i>§Papaver dubium</i>	Long-Headed Poppy ( <i>Anapola</i> )	Not common	East Side and North Front
* <i>Papaver rhoeas</i>	Field, Corn, Red or Common Poppy	Common	Very common along the East Side, less so elsewhere
<i>§Parapholis filiformis</i>		Not common	Widespread throughout the littoral
<i>§Parapholis incurva</i>	Curved Sea Hard-Grass	Not common	Widespread throughout the littoral
* <i>Parietaria judaica</i>	Pellitory-of-the-wall	Common	Widespread throughout Gibraltar
* <i>Paronychia argentea</i>	Silver Paronychia; ( <i>Nevadilla</i> )	Common	East Side and North Front
* <i>Phagnalon saxatile</i> ( <i>Phoenix canariensis</i> )	Rock Phagnalon Canary Palm	Common	Widespread throughout Gibraltar
* <i>Piptatherum miliaceum</i>		Common	East Side, mainly above Catalan Bay
* <i>Pistacia lentiscus</i>	Mastic Tree; Lentisc; ( <i>Lentisco</i> ; <i>Charneca</i> )	Common	Widespread throughout Gibraltar
* <i>Plantago coronopus</i> <i>ssp. coronopus</i>	Buck's-Horn Plantain ( <i>Estrellamar</i> ; <i>Pie de cuervo</i> ; <i>hierba del costado</i> )	Common	Widespread throughout the littoral and Windmill Hill
* <i>Polycarpon tetraphyllum</i>	Four-Leaved All-Seed	Common	Widespread throughout Gibraltar

§ <i>Portulaca oleracea</i> ssp. <i>nitida</i>	Purslane ( <i>Verdolaga</i> )	Common	Widespread throughout Gibraltar, mainly waste ground
* <i>Psoralea bituminosa</i>	Pitch Trefoil; Bitumen Pea ( <i>Higuernela</i> ; <i>Trébol hediondo</i> ; <i>Hierba cabruna</i> )	Common	Widespread throughout Gibraltar
§ <i>Reichardia gaditana</i>	Sand Reichardia ( <i>Lechuguilla dulce</i> <i>Cosconilla</i> ; <i>Lechuguilla dulce</i> )	Rare	East Side and North Mole reclamation Windmill Hill
* <i>Reseda alba</i>	Upright or White Mignonette	Common	Widespread throughout Gibraltar
§ <i>Rumex bucephalophorus</i>	Horned Dock	Common	East Side only
* <i>Rumex intermedius</i>	Intermediate Dock	Common	Widespread throughout Gibraltar
* <i>Sagina apetala</i> ssp. <i>apetala</i>	Common or Annual Pearlwort	Common	Widespread throughout Gibraltar
§ <i>Sagina maritima</i>	Sea Pearlwort	Very rare	Along the littoral and Windmill Hill
§ <i>Salsola kali</i> ssp. <i>kali</i>	Prickly Saltwort ( <i>Barilla</i> <i>pinchosa</i> ; <i>Espinardo</i> )	Rare	East Side only
* <i>Scabiosa atropurpurea</i>	Sweet Scabious; Mourful Widow; ( <i>Escobilla morisca</i> ; <i>Viuda</i> )	Common	Widespread throughout Gibraltar
§ <i>Scilla peruviana</i>	Giant Squill ( <i>Fior de la corona</i> ; <i>Flor de la pina</i> ; <i>Albarrana</i> )	Common	Widespread throughout Gibraltar
* <i>Sedum album</i>	White Stonecrop; ( <i>Uña de gato</i> ; <i>Vermicularia</i> )	Common	Widespread throughout Gibraltar
* <i>Sedum sediforme</i>	Yellow Stonecrop; ( <i>Uña de gato</i> ; <i>Uña de pájaro</i> )	Common	Widespread throughout Gibraltar
* <i>Senecio bicolor</i> ssp. <i>cineraria</i>	Cineraria; Silver Ragwort	Common	East Side and Europa area
* <i>Senecio vulgaris</i>	Groundsel; ( <i>Hierba cana</i> ; <i>Lechocino</i> ; <i>Hierba de las quemaduras</i> ; <i>Zuzón</i> )	Common	Widespread throughout Gibraltar
* <i>Silene colorata</i> elsewhere	Pink Mediterranean Catchfly	Not common	Above Both Worlds mainly, and very scattered
§ <i>Silene littorea</i>	Shore Champion	Not common	East Side only
§ <i>Silene nicaeensis</i>	Sticky Catchfly	Common	East Side only
* <i>Silene obtusifolia</i>	Blunt-Leaved Catchfly	Common	Widespread throughout the littoral and North Front
* <i>Solanum alatum</i>	Orange Nighthshade	Common	Widespread throughout Gibraltar
* <i>Solanum sodomium</i>	Apple of Sodom ( <i>Tomatillos del diablo</i> )	Not common	East Side and Europa area
* <i>Solanum villosum</i>	Hairy Nighthshade	Common	Widespread throughout Gibraltar
* <i>Sonchus tenerrimus</i>	Slender Sow-Thistle; ( <i>Cerraja de pared</i> )	Common	Widespread throughout Gibraltar

* <i>Spargularia marina</i>	Lesser Sand Spurrey	Common	Widespread throughout the littoral
§ <i>Sporobolus pungens</i>	Sporobolus	Rare	Above and north of Both Worlds
§ <i>Succowia balearica</i>	Succowia	Common	Widespread throughout Gibraltar
§ <i>Tamarix gallica</i>	Tamarisk ( <i>Taray</i> ; <i>Tamarisco</i> ; <i>Atarfe</i> )	Common	Along the littoral
§ <i>Tamarix parviflora</i>	Small-Flowered Tamarisk	Common	Along the littoral
* <i>Teline linifolia</i>	Teline; Southern Whin ( <i>Escobón blanco</i> )	Common	Widespread throughout Gibraltar
* <i>Thapsia villosa</i>	Thapsia ( <i>Zumillo</i> ; <i>Canditeja</i> ; <i>Tiera</i> ; <i>Canateja</i> ; <i>Tagarno</i> )	Common	Widespread throughout Gibraltar
* <i>Urginea maritima</i>	Sea Squill ( <i>Escila</i> ; <i>Cebolla albarrana</i> ; <i>Cebolla de grajo</i> ; <i>Esquila</i> )	Common	Widespread throughout Gibraltar
* <i>Urtica membranacea</i>	Nettle	Common	Widespread throughout Gibraltar
§ <i>Valantia muratis</i>	Horned Valantia	Common	Widespread throughout Gibraltar
§ <i>Verbascum giganteum</i> <i>ssp. martinexii</i>	Giant or Large-Flowered Mullein; ( <i>Gordolobo</i> ; <i>Verbasco</i> )	Rare	East Side only, mainly above Catalan Bay
§ <i>Vulpia alopecuroides</i>	Sand Fescue	Not common	East Side only
* <i>Vulpia ciliata</i>	Bearded Fescue	Common	Widespread throughout Gibraltar



Table 2. Domin Values for main species, ground cover and height classes, Talus Slope, Gibraltar.

Species	PLOT No.									
	1	2	3	4	5	6	7	8	9	10
<i>Allium ampeloprasum</i>					2	2	2	1	1	
<i>Allium sphaerocephalon</i>	2		2							
<i>Asparagus albus</i>	1			2	2	3	3	3	3	
<i>Asphodelus albus</i>				3	3					
<i>Asteriscus maritimus</i>	1									
<i>Avena barbata</i>	5	4	5	3	3	3	2	6	5	4
<i>Calendula suffruticosa</i>			1							
<i>Carthamus arborescens</i>										
<i>Centaurea sonchifolia</i>	2	1			3					
<i>Daucus carota</i>	1				1					
<i>Delphinium nanum</i>		1								
<i>Ephedra fragilis</i>							3			
<i>Echium creticum</i>	1									
<i>Ferula tingitana</i>	1		2							
<i>Foeniculum vulgare</i>		1								
<i>Grass spp.</i>	5	4	3	3	3	4	3	4		3
<i>Hirschfeldia incana</i>		1				5	2	3	4	5
<i>Malcolmia littorea</i>		3	3	3		2	4	3	1	2
<i>Ononis natrix</i>	3	5	1	4	7	5	5	5	4	4
<i>Paronychia argentea</i>	6	4	4	4	4	3	5	5	6	4
<i>Phagelalon saxatile</i>	1		1							
<i>Pistacia lentiscus</i>									3	1
<i>Pistacia terebrinthus</i>	2									
<i>Psoralea bituminosa</i>	1	2	2							
<i>Psoralea bituminosa</i>	1									
<i>Scabiosa atropurpurea</i>	2	3	3	4	3	3	2	3	2	3
<i>Sedum album</i>				X						
<i>Sedum sediforme</i>				X						
<i>Silene nicaeensis</i>										3
<i>Thapsia villosa</i>			1				X			
<i>Urginea maritima</i>	1	1		3	2					

ROCK	4	5	7	5	4	6	4	6	7	5
STONES	7	5	5	6	4	5	3	5	3	5
BARE SAND	4	7	1	5	4	5	5	3	2	7
<b>Height Class</b>										
1 (0-25cm)	8	8	5	5	6	5	6	6	7	4
2 (25-50cm annuals)	2	2	7	5	3	5	3	7	6	7
3 (25-50cm perennials)	2	5	4	5	4	5	5	5	4	7
4 50-100cm	1		0		4	4	2		3	
5 100-200cm			1				3			

Cover	Domin value
Cover about 100% .....	10
Cover > 75% .....	9
Cover 50-75% .....	8
Cover 33-50% .....	7
Cover 25-33% .....	6
Abundant, cover about 20% .....	5
Abundant, cover about 5% .....	4
Scattered, cover small .....	3
Very scattered, cover small .....	2
Scarce, cover small .....	1
Isolated, cover small .....	X

**Table 3.** Species from which seed was collected for the original seeding in 1997.

<i>Allium ampeloprasum</i>	<i>Olea europaea</i>
<i>Ammophila arenaria</i>	<i>Ononis natrix</i> *
<i>Antirrhinum majus</i> *	<i>Orlaya maritima</i>
<i>Asphodelus albus</i>	<i>Otanthus maritimus</i> *
<i>Calicotome villosa</i>	<i>Paronychia argentea</i> *
<i>Chaeromops humilis</i> *?	<i>Piptatheim miliaceum</i> *
<i>Dactylis glomerata</i> *	<i>Plantago coronopus</i> *
<i>Daucus carota</i> *	<i>Rumex</i> Sp.
<i>Ecballium elaterium</i> *	<i>Scabiosa atropurpurea</i> *
<i>Eryngium maritimum</i>	<i>Senecio bicolor</i> *
<i>Ferula tingitana</i> *	<i>Silene colorata</i> *
<i>Glaucium flavum</i> *	<i>Silene nicaeensis</i> *
<i>Hirschfeldia incana</i> *	<i>Silene obtusifolia</i> *
<i>Lavatera arborea</i>	
<i>Lobularia maritima</i> *	

\* denotes species subsequently established on the seeded areas.

Table 4. Plants growing on sand slopes where catchment sheeting has been removed. May 1998

Plant species	Common name	Status on the re-seeded area
<i>Acacia cyclops</i>		Rare
<i>Achyranthes sicula</i>	Achyranthes	Rare
<i>Anacyclus radiatus</i>	Yellow Anacyclus	Occasional
<i>Anagallis arvensis</i>	Blue Pimpernel	Rare
<i>Anthyllis hamosa</i>	Sand Kidney Vetch	Rare
<i>Antirrhinum majus ssp. cirrhigerum</i>	Snapdragon	Frequent
<i>Arundo donax</i>	Giant Reed; Cane	Occasional
<i>Brassica napus</i>	Rape; Swede	Occasional
<i>Bromum rigidus</i>	Upright or Stiff Brome	Occasional
<i>Calendula suffruticosa ssp. lusitanica</i>	Rock Marigold	Occasional
<i>Campanula erinus</i>	Annual Bellflower	Rare
<i>Carduus tenuiflorus</i>	Slender Thistle	Rare
<i>Carlina corymbosa</i>	Flat-topped Carlina Thistle	Occasional
<i>Centaurea sonchifolia</i>	Silver Knapweed	Occasional
<i>Chamaerops humilis ?</i>	Dwarf Fan Palm	Rare
<i>Chenopodium album</i>	Fat Hen	Frequent
<i>Chenopodium ambrosioides</i>	Aromatic Goosefoot	Frequent
<i>Chrysanthemum coronarium</i>	Crown Daisy	Frequent
<i>Conyza albida</i>	White Horseweed	Occasional
<i>Coronopus didymus</i>	Lesser Swine-Cress	Rare
<i>Cyperus capitatus</i>	Sand Sedge	Rare
<i>Daucus carota ssp. maximus</i>	Wild Carrot	Occasional
<i>Delphinium nanum</i>	Violet Larkspur; Annual Delphinium	Occasional
<i>Ecballium elaterium</i>	Squirting Cucumber	Rare
<i>Echium creticum ssp. coincyanum</i>	Bristly or Rouch Bugloss	Frequent
<i>Ephedra fragilis ?</i>	Joint Pine	Rare
<i>Galactites tomentosa</i>	Galactites	Frequent
<i>Geranium purpureum</i>	Lesser Herb Robert; Little Robin	Rare
<i>Glaucium flavum</i>	Yellow Horned Poppy	Occasional
<i>Hedypnois arenaria</i>	Sand Hedypnois	Rare
<i>Hippocrepis multisiliquosa</i>	Horseshoe Vetch	Rare
<i>Hirschfeldia incana</i>	Hoary Mustard	Abundant
<i>Linaria pedunculata</i>	Branched Toadflax	Abundant
<i>Linaria tristis</i>	Melancholy Toadflax	Rare
<i>Lobularia maritima</i>	Sweet Alison	Abundant
<i>Lolium rigidum</i>	Stiff Darnel; Stiff Rye-Grass	Occasional
<i>Lotus arenarius</i>	Sand Birdsfoot Trefoil	Occasional
<i>Malcolmia littorea</i>	Silver Sea Stock	Occasional
<i>Medicago littoralis</i>	Shore Medick	Occasional

# Comunicaciones

<i>Misopates orontium</i>	Weasel's Snout	Occasional
<i>Nicotiana glauca</i>	Shrub Tobacco	Abundant
<i>Ononis cossoniana</i>		Rare
<i>Ononis natrix ssp. ramosissima var. gibraltarica</i>	Gibraltar Restharrow	Frequent
<i>Papaver rhoeas</i>	Field, Corn, Red, or Common Poppy	Occasional
<i>Parietaria judaica</i>	Pellitory-of-the-wall	Occasional
<i>Phalaris canariensis</i>	Canary-Grass	Rare
<i>Piptatherum milliaceum</i>		Occasional
<i>Plantago coronopus</i>	Buck's-Horn Plantain	Occasional
<i>Polycarpon tetraphyllum</i>	Four-leaved All-seed	Frequent
<i>Polypogon monspeliensis</i>	Annual Beard-Grass	Rare
<i>Rostraria cristata</i>	Crested Hair-grass	Occasional
<i>Silene nicaeensis</i>	Sticky Catchfly	Abundant
<i>Silene obtusifolia</i>	Blunt-leaved Catchfly	Rare
<i>Solanum alatum</i>	Orange Nightshade	Occasional
<i>Solanum villosum</i>	Hairy Nightshade	Abundant
<i>Sonchus tenerrimus</i>	Slender Sow-thistle	Occasional
<i>Spergularia marina</i>		Rare
<i>Urtica membranacea</i>	Nettle	Occasional
<i>Vulpia geniculata</i>		Rare

**Table 5.** Plants growing on sand slopes where catchment sheeting has been removed. April 1999 (Plants marked \* : not recorded at the site in 1998 survey)

Plant species	Common name	Status on the re-seeded area
<i>Acacia cyclops</i>		Rare
<i>Achyranthes sicula</i>	Achyranthes	Occasional
<i>Amaranthus blitoides</i>		Rare*
<i>Anacyclus radiatus</i>	Yellow Anacyclus	Occasional
<i>Anagallis arvensis</i>	Blue Pimpernel	Rare
<i>Andryala integrifolia</i>	Andryala	Rare*
<i>Anthyllis hamosa</i>	Sand Kidney Vetch	Rare
<i>Antirrhinum majus ssp. cirrhigerum</i>	Snapdragon	Frequent
<i>Arundo donax</i>	Giant Reed; Cane	Occasional
<i>Asteriscus maritimus</i>	Sea Daisy	Rare*
<i>Avena barbata</i>	Bearded Wild Oat	Occasional*
<i>Biscutella megacarpa</i>	Biscutella	Rare*
<i>Brachypodium distachyon</i>		Frequent*
<i>Brassica napus</i>	Rape; Swede	Rare
<i>Bromum rigidus</i>	Upright or Stiff Brome	Frequent
<i>Bromus madritensis</i>	Compact Brome	Rare*
<i>Campanula erinus</i>	Annual Bellflower	Rare
<i>Carduus tenuiflorus</i>	Slender Thistle	Rare
<i>Carthamus arborescens</i>	Yellow Tree Thistle	Rare*
<i>Centaurea sonchifolia</i>	Silver Knapweed	Occasional
<i>Centranthus calcitrapae</i>	Cut-leaved Valerian	Rare*
<i>Chenopodium album</i>	Fat Hen	Frequent
<i>Chenopodium ambrosioides</i>	Aromatic Goosefoot	Rare
<i>Chenopodium murale</i>	Nettle-leaved Goosefoot	Rare*
<i>Chrysanthemum coronarium</i>	Crown Daisy	Occasional
<i>Convolvulus althaeoides</i>	Mallow-leaved Bindweed	Rare*
<i>Convolvulus siculus</i>	Small Blue Convolvulus	Rare*
<i>Conyza albida</i>	White Horseweed	Occasional
<i>Cyperus capitatus</i>	Sand Sedge	Occasional
<i>Dactylis glomerata</i>	Cock's-foot	Rare*
<i>Daucus carota ssp. maximus</i>	Wild Carrot	Occasional
<i>Dittrichia viscosa</i>	Aromatic Inula	Rare*
<i>Ecballium elaterium</i>	Squirting Cucumber	Rare
<i>Echium creticum ssp. coincyanum</i>	Bristly or Rouch Bugloss	Occasional
<i>Erodium chium</i>	Greater Soft Storksbill	Rare*
<i>Ferula tingitana</i>	Giant Tangier Fennel	Rare*
<i>Galactites tomentosa</i>	Galactites	Rare
<i>Glaucium flavum</i>	Yellow Horned Poppy	Occasional
<i>Helichrysm rupestre</i>	Wall Helichrysm	Rare*
<i>Hirschfeldia incana</i>	Hoary Mustard	Abundant
<i>Hordeum leporinum</i>	Wall Barley	Rare*

<i>Iberis gibraltarica</i>	Gibraltar Candytuft	Rare*
<i>Lavatera cretica</i>	Lesser Tree Mallow	Rare*
<i>Linaria pedunculata</i>	Branched Toadflax	Abundant
<i>Linaria tristis</i>	Melancholy Toadflax	Occasional
<i>Lobularia maritima</i>	Sweet Alison	Abundant
<i>Lolium rigidum</i>	Stiff Darnel; Stiff Rye-Grass	Abundant
<i>Lotus arenarius</i>	Sand Birdsfoot Trefoil	Occasional
<i>Lotus edulis</i>	Edible Birdsfoot Trefoil	Rare*
<i>Malcolmia littorea</i>	Silver Sea Stock	Occasional
<i>Medicago littoralis</i>	Shore Medick	Rare*
<i>Mercurialis annua</i> ssp <i>ambigua</i>	Annual Mercury	Occasional*
<i>Misopates orontium</i>	Weasel's Snout	Rare
<i>Nicotiana glauca</i>	Shrub Tobacco	Abundant
<i>Ononis cossoniana</i>		Rare
<i>Ononis natrix</i> ssp. <i>ramosissima</i> var. <i>gibraltarica</i>	Gibraltar Restharrow	Frequent
<i>Otanthus maritimus</i>	Cottonweed	Rare*
<i>Papaver rhoeas</i>	Field, Corn, Red, or Common Poppy	Rare
<i>Parietaria judaica</i>	Pellitory-of-the-wall	Occasional
<i>Paronychia argentea</i>	Silver Paronychia	Rare*
<i>Phagnalon saxatile</i>	Rock Phagnalon	Occasional*
<i>Piptatherum milliaceum</i>		Frequent
<i>Plantago coronopus</i>	Buck's-Horn Plantain	Occasional
<i>Plantago lagopus</i>	Hare's-foot Plantain	Rare*
<i>Polycarpon tetraphyllum</i>	Four-leaved All-seed	Frequent
<i>Psoralea bituminosa</i>	Pitch Trefoil; Bitumen Pea	Occasional*
<i>Reichardia gaditana</i>	Sand Reichardia	Rare*
<i>Reseda alba</i>	Upright or White Mignonette	Rare*
<i>Scabiosa atropurpurea</i>	Sweet Scabious; Mournful Widow	Rare*
<i>Sedum sediforme</i>	Yellow Stonecrop	Rare*
<i>Senecio bicolor</i> ssp. <i>cineraria</i>	Cineraria; Silver Ragweed	Rare*
<i>Silene colorata</i>	Pink Mediterranean Catchfly	Rare*
<i>Silene nicaeensis</i>	Sticky Catchfly	Abundant
<i>Silene obtusifolia</i>	Blunt-leaved Catchfly	Occasional
<i>Solanum alatum</i>	Orange Nightshade	Occasional
<i>Solanum villosum</i>	Hairy Nightshade	Abundant
<i>Sonchus tenerrimus</i>	Slender Sow-thistle	Frequent
<i>Succowia balearica</i>	Succowia	Rare*
<i>Triticum</i> sp.		Rare*
<i>Urospermum picroides</i>	Urospermum	Rare*
<i>Urtica membranacea</i>	Nettle	Occasional
<i>Verbascum giganteum</i> ssp <i>martinezii</i>	Giant or Large-flowered Mullein	Rare*