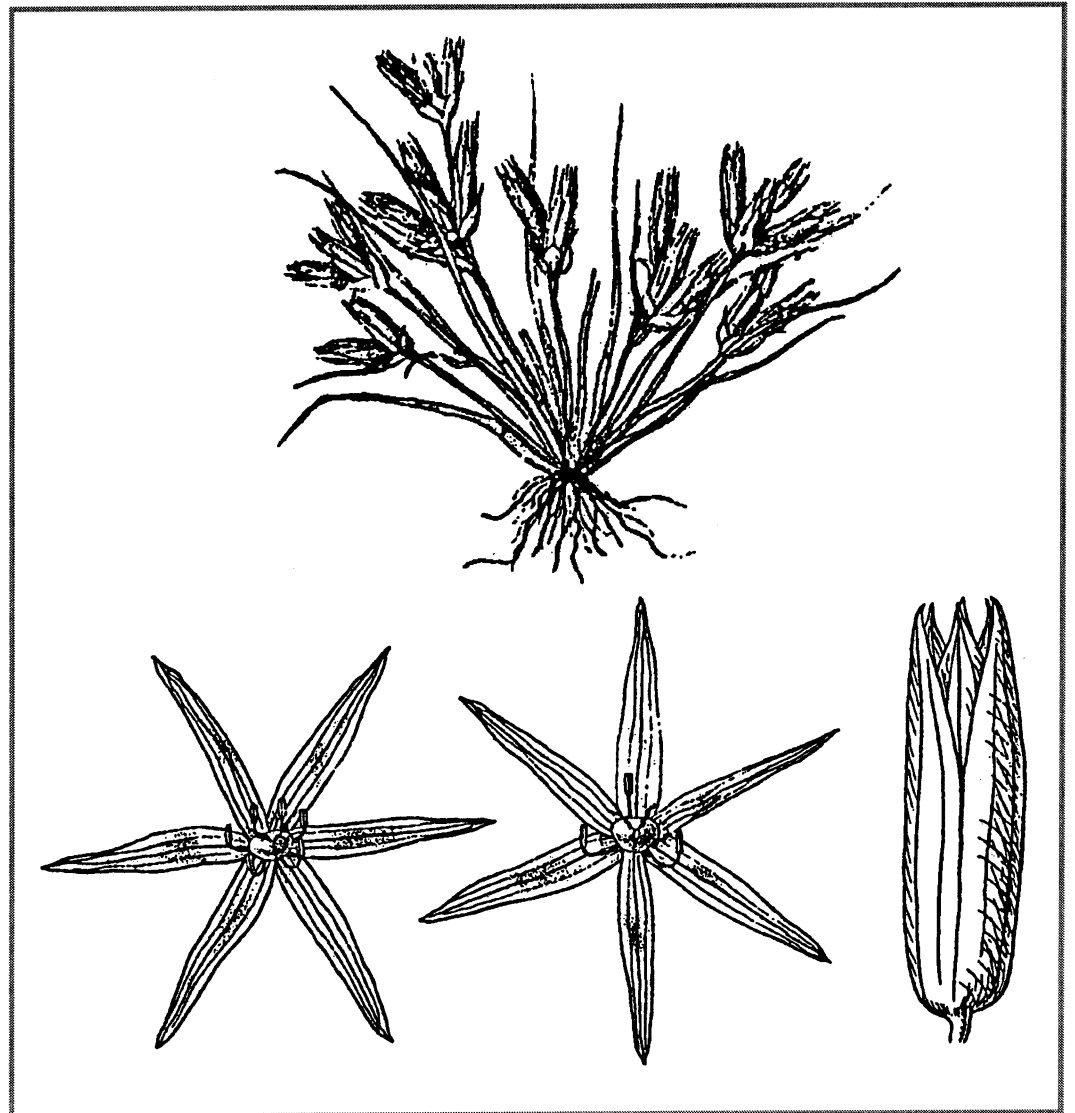


Pygmy rush *Juncus pygmaeus*
National status in 2000,
Lizard peninsula, Cornwall

No. 412 - English Nature Research Reports



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Number 412

Pygmy rush *Juncus pygmaeus*
National status in 2000, Lizard Peninsula, Cornwall

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May 2001

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ISSN 0967-876X

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Summary

Pygmy rush *Juncus pygmaeus* is a small annual rush which forms patches often on bare soil. It is a rare species known only from the Lizard Peninsula, Cornwall in the United Kingdom, and from west and southern Europe, north west Africa and the European part of Turkey. In Cornwall it is confined to the serpentine, gabbro and Crousa gravel heathlands of the Lizard.

It is one of a group of plants associated with the European Habitats Directive ephemeral water bodies, the 'Mediterranean Temporary Pool' which ranges in England from ruts and puddles in agricultural fields or on trackways, to permanent ponds. It is a Red Data Book species classified as Endangered. Growth activity is finely adjusted to hydrological fluctuation, and precise temperature and water conditions in spring control germination. This limitation causes erratic appearances, and increases the plant's vulnerability.

Pygmy rush is included in the UK Government Biodiversity Action Programme and is the subject of a published action plan. The 2000 survey demonstrated evidence of decline in Britain. This survey established that of 17 sites visited where the plant had been recorded since 1950, only seven supported extant colonies. Of the other ten sites, the reappearance of the plant might still be possible at five, but looks unlikely at the remainder. One additional site awaits confirmation.

Contents summary

Discussion of habitat, current and historic status (restricted to Lizard Peninsula, Cornwall in UK), threats, essential management for continuing viability. Field and desk surveys 2000. History of recording, incorporating data from NCC (1978), University of Bristol Lizard Project (1980-85), BSBI (1994). Site register collating historic records with results of 2000 field survey. Conclusions.

Key words: distribution, decline, management, oceanic, ephemeral water, disturbance, trackways, pinch points.

1. Background

1.1 Distribution, ecology and habitat

Pygmy rush (*J. pygmaeus*) has a restricted world distribution, with local occurrences in west and south Europe, north-west Africa and the more European part of Turkey. The main areas of distribution on the Atlantic fringes of the continents show obvious oceanic influence. In Britain it has never been recorded outside ± 17 1 km squares across the centre and south of the Lizard peninsula, so the core populations have been restricted to a minute land mass where climate and land use have historically favoured its highly specialised life-style. It is one of a group of (mostly rare) plants associated with ephemeral water-bodies, notably the SAC highlighted 'Mediterranean Ephemeral (Vernal) pools'. The Red Data Book account (in Byfield, 1999) summarises its autecology excellently:

J pygmaeus is a diminutive annual, restricted to the serpentine, gabbro and Crousa gravel heathlands of the Lizard peninsula. It is among the most threatened of the Lizard's special plants. Typically J pygmaeus is a plant of seasonally-flooded rutted tracks and gateways, where the drier Erica cinerea-Agrostis curtisii 'short heath' grades into wetter Erica vagans-Schoenus nigricans 'tall heath'. On tracks it grows on shallow loess largely bare of other vegetation or in an open community of other small wetland species, including Juncus bulbosus. It is also more rarely recorded from the shallow margins of natural erosion pans, from cob and borrow pits, and in wet ground in serpentine quarries. In all instances, disturbance, typically rutting by vehicles on trackways (and, traditionally, poaching by cattle in gateways), is essential to the survival of this small annual. Such ephemeral habitats are of exceptional botanical importance, and rarer associates of J. pygmaeus include Cicendia filiformis, Juncus capitatus (infrequently), Pilularia globulifera, Radiola linoides, Ranunculus tripartitus, and nationally rare cryptogams such as Cephaloziella dentata and Chara fragifera.

The plant germinates in spring as water levels decline and temperature rises, maturing on the exposed mud in early summer. The rate and timing of the drop in water level is critical in determining the size and vigour of populations. In good years some of the larger Lizard colonies number thousands of individuals, whilst in poor years, for instance 1994, the plant may perform very badly, the total British population numbering only a few hundred plants.

The Cornish Red Data Book (Spalding 1997) also emphasises the importance of human-

influenced habitat, notably the ‘rutted tracks that criss-cross Lizard heathlands’. Many of Britain’s rarer plants are associated with open habitats, rather than climax woodland. In the post-glacial period, large mammals would have created the necessary disturbance, followed by humans and their domesticated animals, so in historic times farming practices have maintained open ground by grazing and cultivation. The Lizard, with its very long history of human influence, has several extremely rare plants, such as *J pygmaeus* itself, another tiny annual rush *J capitatus*, and the bizarre fern ally *Isoetes histrix*, which have become in time almost entirely management-dependent, and are now supremely threatened by changing land use. The *Cornwall Red Data Book* (CRBD) gives a good sense of this ancient history

In the past, these tracks (relict of medieval times) with their deep ruts were created and maintained by oxen or horse-pulled carts. The animals not only poached the middle of the tracks keeping them open, but manured them at the same time.

and also throws light on the apparently erratic population changes and fluctuations, which have been a factor in causing its extremely endangered position now.

*Such tracks are subject to winter flooding and *J pygmaeus* enters its period of rapid growth only when water levels start to decrease. Where a wet spring is prolonged, growth and flowering can be as late as July, but in a good year it will be in flower by early June.*

Pygmy rush formerly occurred in thousands at the various sites, but numbers have now so decreased that there is only one site where this kind of huge population is still maintained. Along this track, still used by cattle, low outcrops of serpentine are quite a feature.

The management crisis affecting a number of Lizard specialities, and relevant to *J. pygmaeus*, is discussed in more detail in FitzGerald (2000b). An extract is appended (Appendix III).

1.2 History in Britain

First found “in damp hollows around Kynance Cove” in 1872, pygmy rush *Juncus pygmaeus* has never been found off the Lizard in the UK and has always been considered a rarity. A restricted habitat, short season of visibility, and the fluctuating appearances typical of some annuals, make it difficult to find. Most records before the implementation of the OS grid are based on herbarium specimens, and in spite of an early flutter of excitement in the Botanical Exchange Club (Boswell 1874), these remain relatively sparse. As well as the collectors’ difficulties mentioned above, in the 19th and early 20th century the Lizard was a remote area, inaccessible by railway, which was the favoured transport for botanists. Working out accurate former locations from herbarium records is always difficult, as locations were mostly generalised. “The Lizard” or “Near Kynance” are typical references. Historical distribution has to be estimated from botanical records and documented land use which establishes the occurrence of various habitats. Trackways have been an important habitat and the Lizard heaths were formerly crossed by a large network, giving access to rough grazing and to the multitude of small serpentine quarries in use at various times. Serious decline must have begun in the second half of the 20th century when serpentine quarrying ceased and farming began to change.

However, despite the imprecise nature of early records, it is clear that pygmy rush was widely distributed in two main areas of the Lizard:

1. the western downs between Mullion and Lizard, comprising the main parts of Lower Predannack and Lizard/Kynance Downs;
2. east from Mullion, in the same latitude, across Goonhilly and Crousa Downs almost to St Keverne.

Even post 1950 there are known to have been at least 22 discrete populations, many of them seen by John Hopkins (NCC) and Andrew Byfield (UBLP) between 1977 and 1985.

However by 1990 the very small number of reports coming in was causing alarm in local and national botanical circles, and in 1994 a major search of known sites was initiated by the late Dr D.E. Coombe (University of Bristol Lizard Project), Rose Murphy (Cornwall Botanical Records) and David Pearman (Botanical Society of the British Isles). The search plan was based on maps and notes from Andy Byfield, generated during his Lizard work.

Seventeen populations were targeted, some of which had been substantial pre-1985, but only **five** were re-found, often with very small numbers of plants. Since 1994 the tally of known current sites at any one time had remained about the same, so in 2000 a preliminary report and site register was prepared from database and literature sources much of which has been incorporated into this report detailing the field survey reported below (see 2.4).

1.3 Current status

As noted above, between about 1950 and 1985, over 20 sites were recorded, with some accounts of local abundance, but by 1994 reports were frighteningly infrequent, causing the Cornish Biological Recorders and the BSBI, together with the late Dr David Coombe, to initiate a major survey. The results were both depressing and frustrating; depressing because almost nothing was found, but frustrating because the weather that year was bad for the species, remaining wet and cool till well into the summer. The main 'hunt' was 20-22 May, when encouraging amounts of the other target species *J capitatus* was found, but "*J pygmaeus* was.. a different story. . . it was re-found at only one [site] ... when just 6 flowering plants were seen." (R.J. Murphy in litt.). Various recorders continued the search at times up to July, but only three more populations were found, with the differing scores of two plants, 200 plants, >1000 plants!

For the next five years the status remained inconclusive, with most reports from the three best known populations, and small populations reported occasionally from three others. One of the difficulties of recording rare plants of disturbed ground is that disturbance is often erratic so finding all known populations performing well at the same time is virtually impossible. In 1998 RF began rare plant surveys on the Lizard for the National Trust, and revisited various favourite sites and species known to her in the 1980s. In spite of being involved by chance in re-finding a couple of populations with 'out of date' records (1998 was a 'good' year for *J pygmaeus*), it was clear that the species was frighteningly scarce, and that its actual status was largely unknown (see relevant causes in 1.4 Threats). It was therefore decided, in consultation with English Nature staff, to prepare a desk study tabling all post 1980 populations, and to follow this with a field survey in summer 2000. The present report collates the information from both studies.

2000 was a reasonable year for the species, and results of the field survey were generally satisfactory. Of the 17 sites accepted as having definite records post-1980, seven were found with plants, though populations varied from one plant to >500 in the usual style. No very large populations were seen, but in several places the ground had dried early, cutting off growth. Another site had been confirmed in 1998, giving a potential total of eight. Management conditions and possible reappearances are discussed under the individual sites in 3.3.

1.4 Threats

The catastrophic decline in *J pygmaeus* populations since c. 1950 makes this something of a cautionary tale for plant conservationists. There have been a number of factors involved, some connected with well-known threats to biodiversity such as recent changes in farming practice, some laughably trivial, but still dangerous, such as the plant's tiny size and brownish colour.

Farming on the Lizard used to produce a mosaic of habitats with regular patterns of use. Furze and heather cutting, burning to manage grazing, stock using the cliffs or rough heathy grazing at specific times of year were all common practice, with some cultivation for arable and root crops. In general, land was cyclically used quite hard, creating excellent habitat for annual species favouring ephemeral pools, which are often, in practice, the humble puddle! Extensive farming methods, in turn, produced a rich wilderness. More recently, intensive farming with high fertiliser inputs eliminated the need to rotate usage, horses have gone out of use, heavy machinery has demanded hard-core dry tracks, and even more recently BSE has started a major decline in stock farming. Neglect and changes in basic management practices present a huge threat to biodiversity in an area like the Lizard, where the climate and rare serpentine base rock have created historic plant communities not known elsewhere, in a place which is more continental than the rest of Britain and more oceanic than the Mediterranean. Unfortunately, although this unique richness was recognised by workers such as John Hopkins in the late 1970s, and the University of Bristol Lizard Project workers under the late wise men of botany Dr Coombe and Dr Lewis Frost, personnel scattered and their reports became entombed in university offices or on department shelves. Their warnings never became guiding principles in Lizard plant conservation.

J. pygmaeus also suffered, as people do, from not being pretty enough and from having a rather low profile. The imperfect but still necessary protection of Schedule 8 was mostly given to species considered collectable, such as orchids, alpines and ferns. One which could be referred to as 'a grubby little rush' got little consideration — who indeed would want to pick it. The danger of simple habitat neglect was not recognised. The tiny size and inconspicuous colouring also meant that maintenance workers, even on parts of the Lizard National Nature Reserve (NNR), were unlikely to notice populations, and several major sites such as Kynance Farm Track, and the Penhale and Garah Tracks, were victims of inadvertent destruction. Plants like orchids usually have plenty of local support when bulldozers appear. The great irony of Lizard conservation so far, and one which can only be changed by education, is that people immediately protest against efforts to control the invasive but flashy bright-flowered enemy of rare plants, *Carpobrotus edulis* Hottentot fig which covers Lizard point to the exclusion of all else, while when puddle rarities go under the tarmac no-one seems to know or care.

Although a British Red Data Book species classified **Endangered** (ed Wigginton, 1999),

J. pygmaeus is not yet on Schedule 8 of the Wildlife and Countryside Act, and badly needs this protection, as at least four potential sites are not in the NNR or on a Site of Special Scientific Interest (SSSI). The escalating importance of tourism in the Lizard economy has focused the threats alarmingly. More and more walkers come and, though they love 'the country', and wish to preserve the larger landscape, they also want footpaths without puddles and mud. The whole suite of mud annuals is now threatened by footpath improvement, and a major education programme is needed.

Major threats are therefore

- 1 changing land use, with fewer unsurfaced machinery tracks, fewer animals, less use of rough grazing, and more drainage;
- 2 the low conservation profile of *J pygmaeus* in particular, and to an extent several of the most specialised Lizard communities;
- 3 ever increasing tourism causing habitat destruction.

All these could be somewhat counteracted by positive conservation input, both practical and educational. In terms of both national and local biodiversity values, the Lizard must be indisputably highly rated, and it also has great international interest, having continental species at their western limit, in a super-oceanic setting.

1.5 Management

Clear and robust management recommendations for this species, and the whole suite of 'mud annuals', are extremely difficult to formulate, because the needs of these plants are in direct conflict with modern land use and public pressures. What is needed is:

- for heaths and rough grazing to be *used*; to be grazed or harvested;
- to have medium-weight machinery rutting unsurfaced tracks,
- animals poaching the gateways;
- to have puddles and disturbance in a perpetually shifting dynamic micro-environment.

In other words, *J pygmaeus* wants Lizard habitats to *be the way they were*. Management-dependent plants are always a conservation bugbear, because of the pressure they put on resources, and in the case of the Lizard the problem is bizarrely magnified by aesthetics. As these rare annuals grow on mud, an Arcadian landscape for them would be a matter of disgust to millennium tastes.

As noted in 1.1 and 1.4, farm use of trackways has declined and they are now almost entirely used as public footpaths or bridleways. Remaining work tracks are mostly hard-surfaced because of the increasing weight of machinery, and the public paths are used by walkers, mostly the tourists who now support the finances of the Lizard. Their demands for dry tracks have brought the puddle habitat to crisis, and because of the urgency of the problem, Plantlife is implementing a major partnership project to survey the entire footpath system of the peninsula during 2002-3. (postponed from 2001-2 on account of foot and mouth outbreak). English Nature and the Environment Agency are expected to be important partners (EA because of the wet habitat context), and the survey is being designed both as an audit of the remaining rare plant resources, and to deliver management proposals which would balance the conflicting interests. *Juncus pygmaeus* and the ephemeral pool

habitat are specifically recognised in the legislation governing the Proposed Special Area of Conservation (pSAC) which covers much of the peninsula, so there is an international obligation to map the distributions, and to establish favourable conservation management. The proposed survey is intended to address both aspects, and will produce ecological information, species and habitat maps, and management proposals. The report will be accessible through all potential partners, including English Nature, Plantlife, EA, National Trust, Cornwall County Council, Environmental Records Centre for Cornwall and Isles of Scilly, the Cornwall Wildlife Trust and FWAG. Work will be undertaken in liaison with the BSBI network, local parish councils and landowners, and will also address the possibility of some 'conservation through education', ie attempts to make mud more popular.

The above study is intended to define optimum management conditions for *J pygmaeus* and other mud annuals, to identify potential monitoring sites, and investigate pro-active management possibilities. Three other national BAP plants, pillwort (*Pilularia globulifera*), three-lobed water crowfoot (*Ranunculus tripartitus*) and pennyroyal (*Mentha pulegium*) are found in similar habitat on the Lizard, and are target species in the above survey plan, so the results will be extremely important for the mud annuals. Nearly all these species have a good seed bank, and could be left until the results of the survey are analysed and management guidelines drawn up. However, meanwhile, it is essential that drainage or hard surfacing at or near any recorded sites for pygmy rush is avoided until the management proposals are available and consultation has taken place.

2. Survey 2000

2.1 Introduction

Work was undertaken in June and July, by the author with Rachel Holder, a botanist working under contract to the National Trust (and subsequently English Nature) who has an excellent working knowledge of some of the sites. All the locations in the desk study were searched, although in some, such as JP3 Lizard Downs, it was impossible to pinpoint former population sites. In such cases all possible habitat (remaining tracks, solution pans, heath pool edges, etc) was examined. Of the numbered sites (with post 1950 records) **seven** out of the **seventeen** were confirmed, two of these with more than one sub site. Details are given in the results list, and population forms (with site photographs) are deposited with English Nature Peterborough and the Cornwall office in Truro, and at the Lizard NNR office at Higher Bochyon on the peninsula and the results have been integrated into the BSBI Threatened Plant Database.

2.2 Results

The survey results showed a serious decline, even since c1980, but also suggest a cautious hope that favourable management conditions could restore some strength to the pygmy rush's status as a British plant. Accounts from the 1970s and 1980s, particularly records from Dr D.E. Coombe and Andy Byfield, describe appearances of 'thousands' of plants in some years. This is no longer evident. Not only were populations seen in 2000 recording between only one and 500 plants, but the most famous localities, JP4 Kynance Farm Track, JP10 The Garah Track and JP 11 The Penhale Track, which had been reported destroyed by hard surfacing, did indeed prove barren and unsuitable. However the spread of affirmative records – seven rather than the potential five of recent years – and the fact that several negative

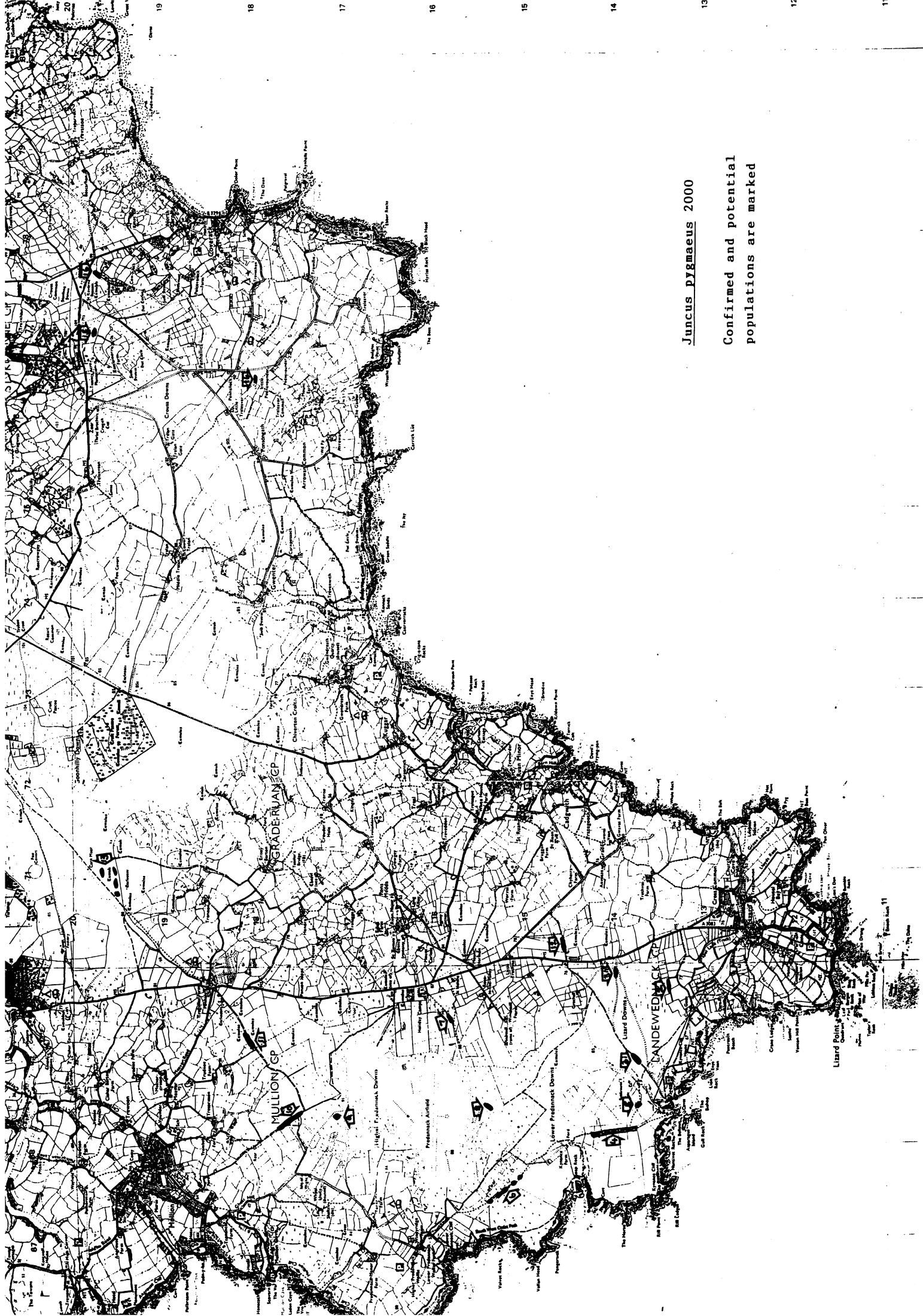
sites appeared to have options for easy management improvement — suggest that the BAP cliché ‘restore ten populations..’ might just be possible. There is however no room whatsoever for mistakes or habitat destruction: the plant is clearly in crisis. Only two of the confirmed populations were in ‘natural’ conditions where disturbance is not needed. These were both in shallow spoil pits on Predannack Airfield, where shallow winter pools dry out in areas with no topsoil, and populations of *J pygmaeus* and another rarity *Cicendia filiformis* slender centaury are sustained purely by the weather.

Weather in 2000 was moderately favourable. Two localities were examined in May by personnel from English Nature, Plantlife and the National Trust, during a Lizard biodiversity meeting. Plants were well up, though not in open flower, and puddles had dried by this relatively early date. This early dry weather stunted some plants, and may have been responsible for the relatively low numbers seen. Plants occurring at one of the ‘regular’ sites, on Lizard Downs, were small even for this species, and quite trampled into the dried ruts in July. However, after May rain was more frequent, and plants in the wetter sites were lusher, so certainly compared to the BSBI survey year, 1994, conditions were much more helpful. *Cicendia*, often the guide species, the visual clue for the exact conditions right for *J. pygmaeus*, performed extremely well during this particular survey year. It was obvious from the distribution patterns in the Predannack Airfield spoil scrapes, where disturbance is not a factor in performance fluctuations, that the precise winter water depths needed, or precise temperatures and times of the drying out, matter to a hair’s breadth. Both the rare plants followed ‘shore lines’ much too finely for the crude measurements of normal field survey to record, and more scientific monitoring is badly needed.

2.3 Explanation of site list

Numbers used are consistent with those used in the 1994 BSBI survey, and repeated in the desk study. Populations confirmed in 2000 have the site name in capitals. Under ‘Last Date Seen’ confirmed sites have last previous date in brackets as well as 2000. Grid references have been refined where possible, but need confirming using GPS technology. Sources of previous records are identified in the desk study, which provided the search structure for the 2000 fieldwork. Earlier literature records are seldom localised enough to give more than general guidance to areas, so the most important chain of information, and that used in all directed searches post 1978, has been through the combined results of John Hopkins’ NCC surveys (1977-8) and the UBLP work (up to 1985). These results were known to local Cornish recorders, and collated by them, with their own results, to structure the 1994 BSBI survey. For the 2000 desk study and search, the author had access to all these records, together with any processed by Biological Records Centre and/or TPDB.

2.4 Site map



Juncus pygmaeus 2000

Confirmed and potential
populations are marked

2.5 Site list

Site Number	Site Name	NGR	Last Date Seen
JP1	Kynance Quarry	SW 690 131	1978

Tentatively identified with the popular >water-lily pool= near Kynance NT car park, now without suitable habitat, being a steep-sided stone cutting pit. A John Hopkins record never reconfirmed

JP2	Lizard Downs South	SW 698 ⁵ 134 ⁵	1984
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Reported by Andy Byfield from a little-used track between farm fields, leading to the heath. Now blocked by scrub, but there is still a pinch point used by cattle at the N end, between the fields. This is damp, and *Ranunculus tripartitus* was found here, so possibly suitable habitat could be restored.

JP3	LIZARD DOWNS	(i) SW 699 139 ⁵	2000
		(ii) SW 689 137	(1998) 2000

Six subsites with plausible grs had been identified in the desk study. Of these subsite (ii), on the main bridleway from Kynance Garage to the Cove, has recently been one of the most regular sites with records. Although quite dry in 2000, with extremely small plants, 300 were counted C a minimum count as some flowerless stunted leaves were not included.

The whole expanse of Lizard Downs south and east of this main bridleway, has become much overgrown and tracks disused, even since the 1980s. Aerial photographs from 1988 show a track system which can just be traced today, but previously showed much more use. All walkable paths were searched, with occasional damp habitat seen, little of it very promising. However very careful search was made in the vicinity of subsite (i), following information from Andy Byfield received after the desk study records were collated. In this area most of the main paths are either little disturbed, and have quite dense low vegetation, or have been altogether hidden by willow or tall heath. 3 rather immature plants were finally located near the junction of former tracks. This area could respond to disturbance.

JP4	Kynance Farm Track	SW 681 141	1985
		SW 681 137	1978

The rutted track, formerly famous for big populations, was destroyed in the 1980s by infilling with hard core. Muddy gaps and gateways lead off the main track, and several have *Ranunculus tripartitus*, but no *J pygmaeus* has been reported again. A careful search in 2000 was negative too.

deeper pools have a *Littorella* sward. *Cicendia filiformis*, seen again in 2000 (the 1999 visit had been too late for *J. pygmaeus*) and the little rush, appeared to follow minute 'shore lines' round 'islands' formed by clumps of *Schoenus nigricans* or *Molinia caerulea*. The absence of humus or topsoil in the scrape, combined with the winter water, seems to have limited growth of perennial vegetation, leaving grassy species and *Salix repens* quite stunted. This would be an excellent study area, as appearances must depend entirely on weather conditions in any year, without the more unpredictable disturbance element. In 2000 nearly 100 plants were counted, with conditions already very dry.

JP9 PREDANNACK AIRFIELD (NORTH) SW 684 171 (1978) 2000

Interesting for the same reasons as JP8, in that it is self-sustaining, this is a smaller pool, the east hollow of two scrapes close to an old tarmac works road. Again, this was only located by study of the aerial photos by RH, as the pools are quite hidden in tall heath. The west pool seemed deeper, and was more densely vegetated with *Littorella* and *Juncus bulbosus*, but the east scrape may be shallower. It also had little bare substrate, and some *Littorella*, but there was also chamomile and *Cicendia filiformis* was impressively abundant. More than 40 pigmy rush plants were seen, some very small, but most in flower.

A larger pool nearer the perimeter fence at SW 682 174 looked very hopeful, though plants were not found. The 1994 search had not located any of these features, as they are hidden from a walker without the aerial photographs. Further search of spoil hollows, using the same photographs, is advised.

**JP10 Garah Track SW 682 177- Pre 1978
684 174**

Exact locations for the huge ("thousands of plants") populations reported in the 1970s are thought to exist on the late Dr D.E. Combes' marked maps. However his papers are currently being catalogued and are inaccessible. In future they can be consulted at Cambridge University Library. The work in progress, to 'improve' the track, which was reported in 1994, has resulted in an utterly sterile hard-surfaced feature. The sides of the track have deep, steep-sided ditches, and there was no possible habitat for wet-ground species at all. The ditch bottoms were also affected by agricultural run-off.

JP11 Penhale Track SW 691 180 1989

This site still has slight possibilities. Although largely stabilised, with wet hollows infilled, in the late 1980s, and with the section NE of this grid reference recently definitively hard-surfaced, there are still occasional stretches with damp edges. *Mentha pulegium* is management-protected at SW 695 182 approx. Only rather vague anecdotal evidence existed for the last sightings of *J. pygmaeus*, in relict muddy habitat in the late 1980s, when that improvement work was finishing. However, since the desk study. RF has located photographs of pigmy rush quite abundant in 1989. During this year she was engaged on the SW Rare Plant Survey for NCC. The Lizard was outside the contract remit, because of the recent work by John Hopkins (NCC) and Bristol University Lizard Project, but RF revisited Lizard sites shown her by Andy Byfield in 1984, from personal interest, and hence these photographs giving a more definite >last date=. The overall site, although extremely damaged, does therefore have a fractional inconclusive element, and work planned to extend the damp verge at the *Mentha pulegium* site should be carefully monitored.

JP12 TUCKERS GRAVE SW 702 145 (1998) 2000

This site was visited in May and July 2000, to examine the effects of the 1998/9 work by Cornwall County Council Highways Department, which cut off use of the unsurfaced track where a population had been reconfirmed in 1998, putting its future existence in jeopardy. Adequate disturbance of the old wet track now depends on either liaison between EN and the farmer, and his good will and co-operation; or on planned maintenance work by EN. The population being thus entirely dependent on >artificial= management, has poor prognostication for a long-term future. In 2000 the habitat was found quite choked with rank weedy growth. After an intense search one plant was found in July.

This site is however easily accessible, and now well known to local conservation personnel. In spite of its doubtful future, it still has an adequate seed bank, and careful monitoring of its response to artificial disturbance in various weather years could benefit the species in general.

JP 13 Goonhilly Downs SW 706 194 1978
(Cam Maer) SW 709 196

Search of this area was the least successful part of the 2000 survey. Other sites also proved negative, but their status was comprehensible. Here it proved impossible to relate previous records to features on the ground, and no possible habitat was identified. Study of the 1988 aerial photo series shows that the trackway system on the heath was much more developed. It is now barely used, except for the SW-NE bridleway, and formerly visible paths are overgrown. The search was also conducted in fog, making landmarks difficult to locate in this large heath compartment of the N7NR. Further search might be useful if the compartment was hard-grazed for a season, causing plenty of disturbance, but in present conditions it is unpromising.

JP 14 PENHALLOCK (LITTLE SW 764 179 1998
PEDNAVOUNDER)

Known since 1983, this is a rutted track across a small heath compartment, which allows tractor access from the road to farm fields. The track is quite unsurfaced, and heavily rutted in several places. 50 plants were seen in 1998, with good amounts of *Cicendia*. In 2000 machinery use had been more frequent and recent, so no annual plants had been able to develop (or had grown and been crushed). This is not a problem within the short-term cycles of mud annuals, as long as an occasional seed year is possible, and this can be listed as an extant site overall. The heath belongs to St Keverne Parish Council, but may come into the care of EN, which could make monitoring and planned management possible.

JP15 Kestlemerris Track SW 769 197 1985

This site is on the Crousa gravels, rather than on the serpentine or gabbro, and several small populations were reported from tracks crossing the heath. In a triangle between roads, the heath compartment seems to have long had a multiplicity of tracks. The 1946 aerial photograph shows it extremely >busy= with many interconnecting and crossing paths. This is still the situation, as there is a picnic spot and car park in the NE corner of the heath, which has access to the pools in this corner, and public use is frequent. All identifiable tracks were searched. The access to Kestlemerris Farm is on a built-up hard track, but other footpaths and bridleways

3. Conclusions

Juncus pygmaeus is undoubtedly extremely threatened in Britain. There have been no reports of really large populations in the last 20 years, and of the confirmed populations in 2000, all appeared to be less than 500 plants, and some were very small in number. The results are as follows:

- 7 current extant sites C2 (Lizard Downs and Traboe) with more than one population, but 1 (Tuckers Grave) in fragile circumstances;
- 1 site (Penhallock) classified extant, but conditions unsuitable in 2000;
- 2 (Ruan Pool and St Keverne Beacon Track) supporting likely habitat. Monitoring (with minor disturbance work at Ruan Pool?) strongly advised;
- 2 (Lizard Downs South and Penhale Track) negative but with very slight possibilities;
- 5 apparently negative, although 2 (Carn Maer and Kestlemerris) need more detailed information about former records

These figures represent a probable loss of more than 50% of the national resource since c1980, a fairly catastrophic record. It is essential that the species (and other mud annuals) have a high profile from now on in all conservation planning and management to maintain the biodiversity interests of the potential SAC.

One of the most important (ie not management-dependent) populations, on Predannack Airfield is on Ministry Of Defence (MOD) land, although the other is in care of the National Trust. Tuckers Grave and the former St Keverne Beacon Track site are not in SSSIs, and all populations on public rights of way are endangered by track maintenance. In the long term, the survival of the species looks doubtful, unless pro-active management and increased grazing levels are established. In chosen areas the Plantlife/English Nature survey initiative mentioned in 1.5 should clarify and strengthen recommendations, as well as repeating most of the 2000 searches.

Acknowledgements

My best thanks to my co-worker Rachel Holder for her very able assistance and willingness in some difficult conditions; to Alastair Cameron (National Trust) for enabling this collaboration and for help in the field; to Andy Byfield for being a vital information source and always supporting and encouraging Lizard biological researches; to Rose Murphy for fielding so many enquiries about Cornish botanical records; to David Pearman for taking time to remember 1994 while sunk in the 2000 *Atlas* project; and to Jan and Russ Stanland for local information, and for sustaining me in comfort.

I would also like to extend heartfelt thanks to members of staff of English Nature who supported this project, to Ray Lawman (site manager, Lizard NNR), Simon Leach, Mary Roberts, Dr Jill Sutcliffe, John Prince and John Wilson.

This project was funded by the Species Recovery Programme of English Nature administered by Dr Roger Mitchell and Dave Stone.

Cover drawing by Henry Trimen, *J Botany* (1873).

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Appendix I: Photographs

Algal crust habitat (R Fitzgerald)



Edge of rut (Dr Coombe)



Constant associate, *Cicendia filiformis* (R Fitzgerald)



Appendix II: BAP plan for *Juncus pygmaeus*

1. Current status

- 1.1 Pygmy rush is a diminutive annual species of seasonally flooded sandy and peaty places, especially on rutted tracks and gateways. Its survival is dependent upon repeated ground disturbance, typically rutting by vehicles on trackways and, traditionally, poaching by cattle in gateways. Plants germinate in spring with numbers fluctuating markedly each year, depending upon the timing of seasonal changes in water level in its ephemeral habitats.
- 1.2 In Britain, pygmy rush has only been recorded from the Lizard Peninsula in west Cornwall, but even within this small area it has undergone a severe decline. It is believed to be amongst the most threatened of the Lizard's special plants. It has been recorded from over 20 sites, but is now known at only five, just two of these having large populations. Elsewhere, this species occurs locally in western and southern Europe, northwards to Denmark and also in northwest Africa and Turkey.
- 1.3 In GB pygmy rush is classified as *Endangered*. It receives general protection under the Wildlife and Countryside Act.

2. Current factors causing loss or decline

- 2.1 Cessation of use of unmade tracks and gateways where pygmy rush occurs
- 2.2 Upgrading and infilling of tracks and gateways where the species occurs. This recently resulted in the loss of the best UK site for the plant.

3. Current action

- 3.1 All remaining populations of pygmy rush are protected within SSSIs.
- 3.2 The species occurs in the candidate SAC for Mediterranean temporary pond habitats in the Lizard, Cornwall.

4. Action plan objectives and targets

- 4.1 Ensure that viable populations are maintained on all extant sites.
- 4.2 Restore populations to at least five historic sites by 2003.
- 4.3 Establish an *ex-situ* programme to protect genetic diversity, create a reserve population and provide experimental material.

5. Proposed action with lead agencies

The clear priority for this species is to ensure appropriate management of trackway and gateway sites as it is thought highly probable that this will result in regeneration of the plant from the seed-bank. Further damaging improvements (such as infilling with hard-core and surfacing) to extant and historic sites should be prevented.

5.1 Policy and legislation

5.1.1 None proposed.

5.2 Site safeguard and management

5.2.1 Ensure that appropriate management is in place on all remaining sites. (ACTION: EN)

5.2.2 Promote the uptake of appropriate mechanisms, for example Countryside Stewardship, to encourage the favourable management of historic trackway and gateway sites, and to discourage use of herbicides and fertilisers on land immediately adjacent to extant and restored populations. (ACTION: EN, MAFF)

5.3 Species management and protection

5.3.1 Undertake trial management on at least five suitable historic sites with the aim of regenerating plants from the seed-bank. (ACTION: EN)

5.3.2 Collect seed from all extant sites and deposit in the Millennium Seed Bank at Wakehurst Place (Kew). (ACTION: EN, RBG Kew)

5.4 Advisory

5.4.1 Advise all landowners and managers on extant and restored sites of appropriate management for the conservation of pigmy rush. (ACTION: EN)

5.4.2 As far as possible ensure that all relevant agri-environment project officers and local authority rights of way officers are advised of locations for this species, its importance and management needed for its conservation. (ACTION: EN, LA, MAFF)

5.5 Future researches and monitoring

5.5.1 Resurvey all sites where populations of this plant were found to be extant in the most recent (1994) survey in order to determine the current status of pigmy rush, ensure that appropriate management is in place, and identify potential threats. (ACTION: EN)

5.5.2 Devise and implement a monitoring programme for all extant and restored sites. Where possible, monitoring visits should be combined with meeting landowners to discuss conservation management for the species. (ACTION: EN)

5.5.3 Collate information, and resurvey historic sites where necessary, in order to determine the most suitable sites for restoration management. (ACTION: EN)

5.5.4 Undertake research in order to increase understanding of the biology and ecological requirements of this species and to refine management techniques for its conservation. (ACTION: EN, JNCC)

5.6 Communications and publicity

5.6.1 Raise awareness of the importance of ephemeral and superficially untidy habitats (such as unmade tracks and gateways) and their associated flora. For example an article could be written for farming and conservation magazines/newsletters in Cornwall and for a relevant national conservation publication. (ACTION: EN)

5.7 Links with other action plans

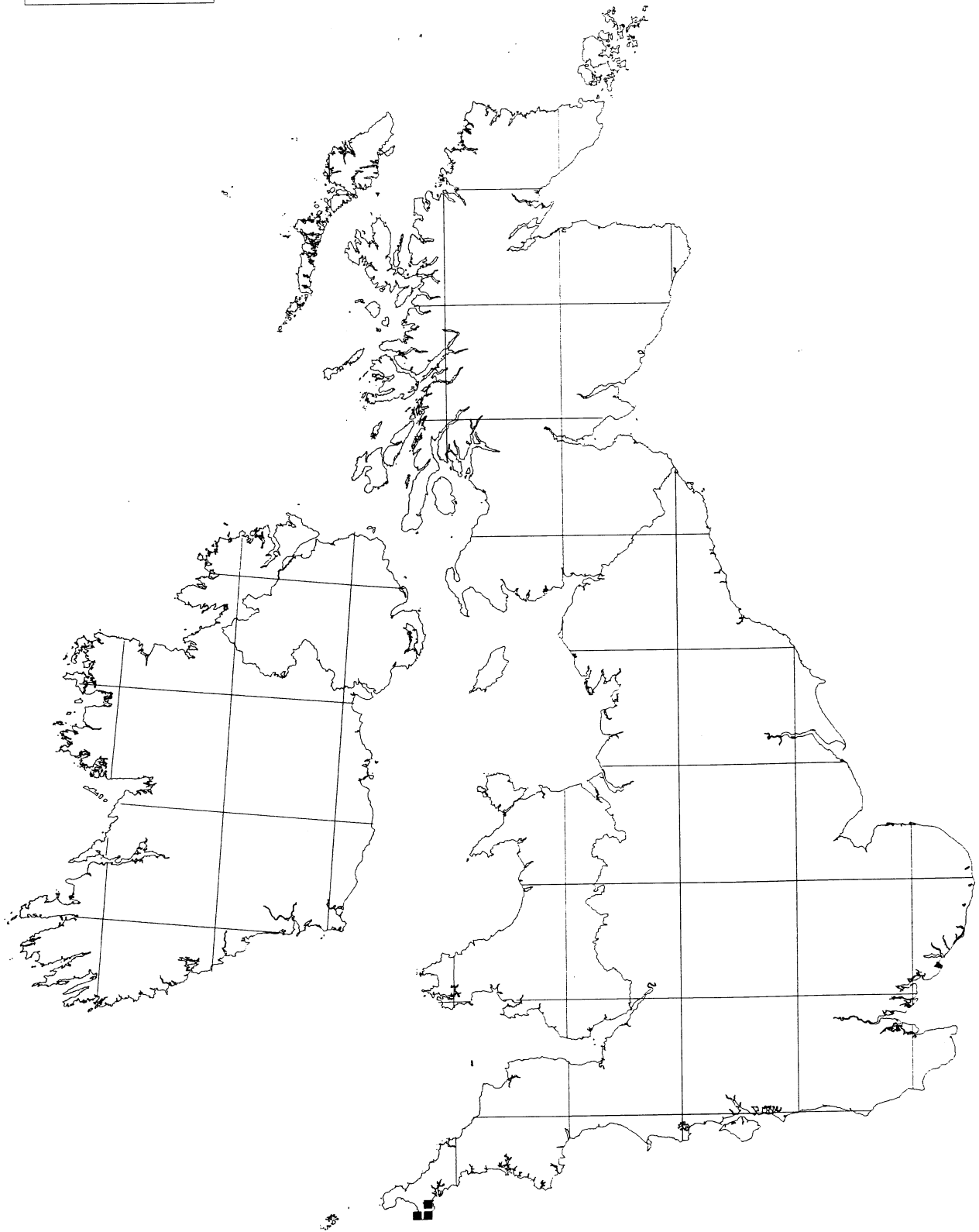
5.7.1 It is likely that implementation of this action plan will benefit *Ranunculus tripartitus*.

5.7.2 The plan should be considered in conjunction with that for lowland heathland.

Juncus pygmaeus

Juncus pygmaeus

■ Records post 1987



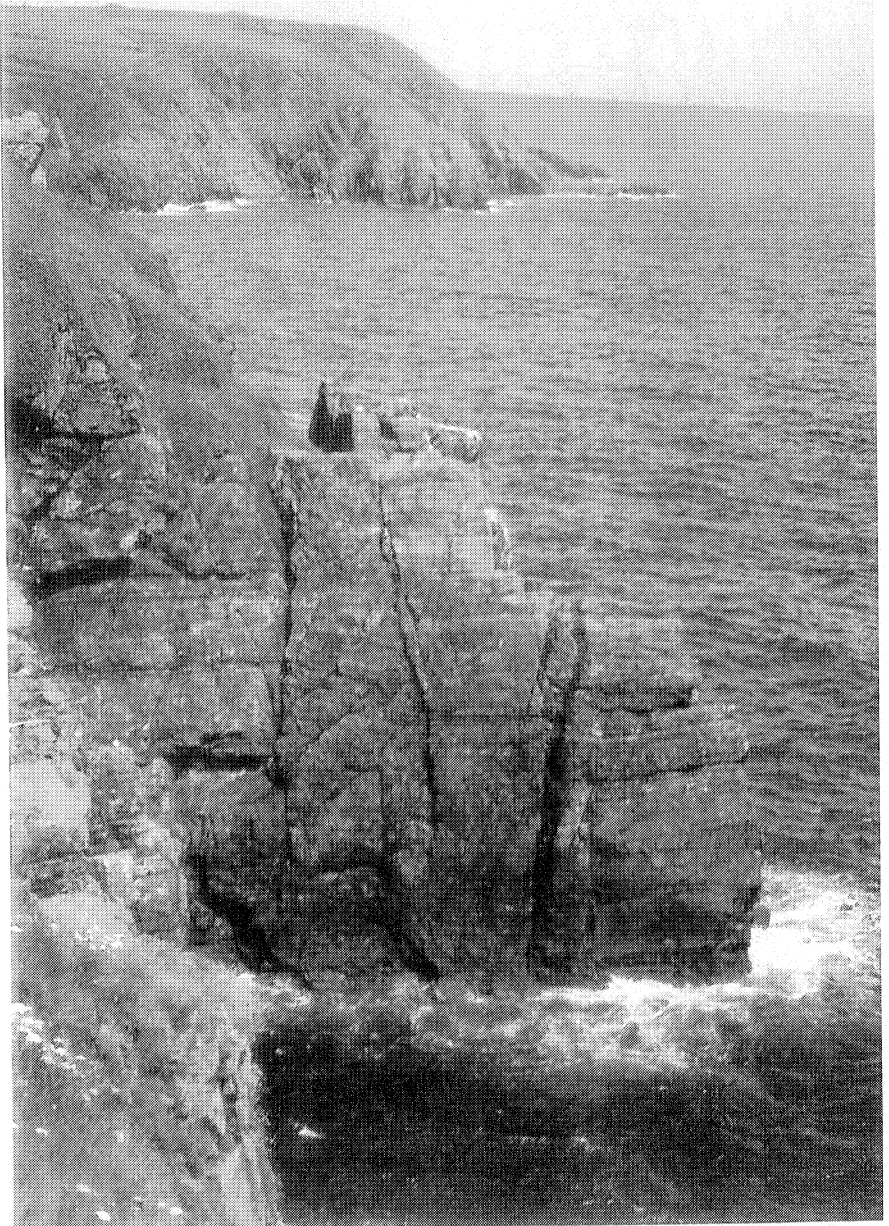
Distribution of *Juncus pygmaeus* - pygmy rush in Britain and Northern Ireland, by 10km square. Source: British Red Data Book - Vascular plants, 3rd edition, 1999.



▲ The spectacular Thyme Broomrape (*Orobanche alba*) at the Lizard

Far below Atlantic breakers surge into a cove, hurling spray up dramatic cliffs and rock pinnacles. The cliff top landscape is gaunt and strange – there are plants everywhere but the plants are carved and dwarfed by exposure. Inland, only distant telegraph poles stand out across a treeless expanse of wind-pruned heath. Nearby tourists exclaim at a famous view, but this is not Portugal's Cape St Vincent – it is a remote part of Cornwall in SW England called the Lizard.

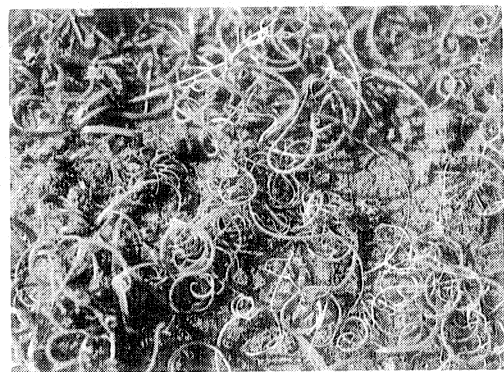
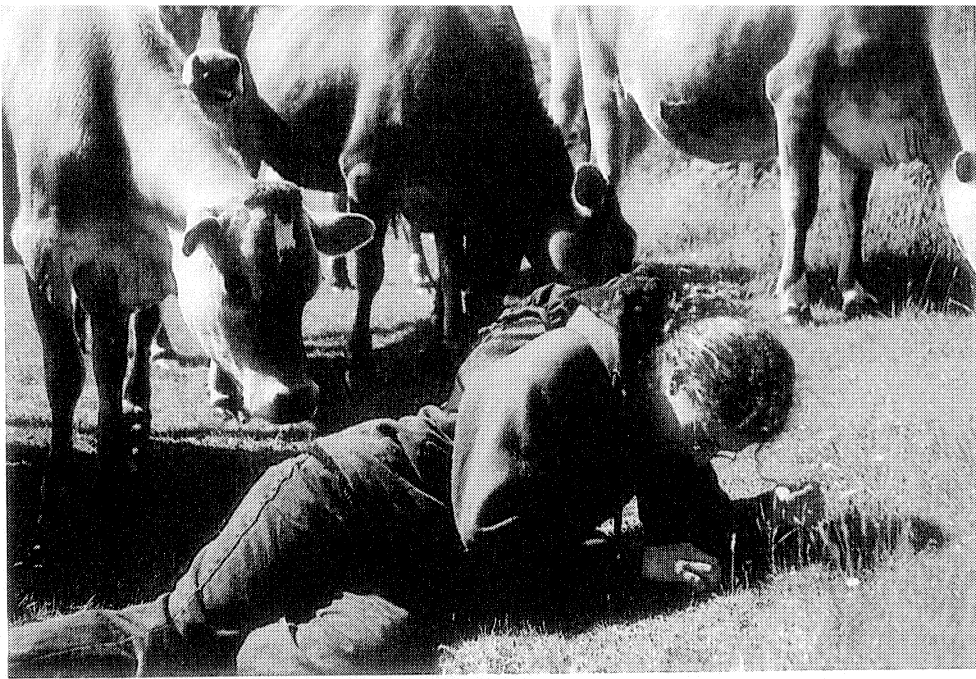
Britain and Ireland have a relatively small flora of less than 2000 species. Almost completely under ice during the last glaciation, the 'big thaw' led to a break away from the continent before many plants could recolonize. This all happened in a blink of geological time, so that we have almost no endemism. Crete had some 10 million years as an unglaciated island to develop a flora so individual that 10% of its plants are found nowhere else in the world, but Britain had only 10 thousand years, most of them rather chilly! Instead, much of the botanical interest comes from continental species out on the Atlantic fringes of Europe and at the limits of their range. Adaptations to extreme oceanic conditions have produced some unusual plant communities. The Burren in West Ireland is well known for its arctic alpinism flourishing at a mild sea-level. The Lizard is just such an enclave, though the oddities here are Mediterranean species growing in the rain and mists of Cornwall.



MANAGEMENT CRISIS *for the extraordinary flora* OF THE LIZARD

ROSEMARY FITZGERALD

The Lizard is a small peninsula only 10 miles long, jutting south into the English Channel. Sheltered

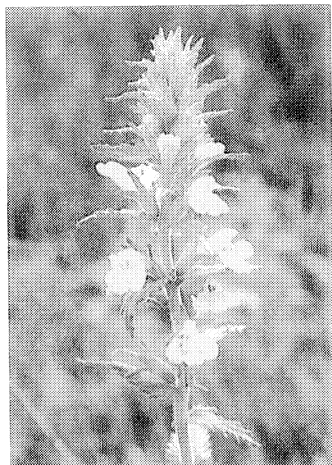


MANAGEMENT CRISIS for the extraordinary flora OF THE LIZARD

▲▲ The surveyor surveyed. National Trust botanist Rachel Holder counting Land Quillwort.

▲ All the curts. Land Quillwort (*Isoetes histrix*), among chives & squills

▼ Nationally scarce Yellow Bartsia (*Parentucellia viscosa*)



from the north by the mainland, it is almost frost-free. Much of the underlying rock is base-rich serpentine, which is rare in Britain. The combination of climate and geology has given the district an unusually long continuous history of farming and quarrying, with patterns of land use changing little through two millennia. The rare plant interest, integral in the historic land use, was discovered in the 19th Century, and is well documented. The records provide a good basis from which to assess change, which is urgent since the last fifty years have brought fundamental alterations to ancient ways of life and farming, and catastrophes threaten the special plants.

Farming, the key factor

From prehistory the peninsula has been well settled and productive, supporting farms and villages. Basically a plateau of heath and bog fringed by coves and stream valleys, land use has been concentrated round the coasts where the valleys give shelter and the soils are not blanketed by peat. Meat, milk, grain, roots and winter keep for animals had to be produced from this land in spite of steep rocky terrain and exposure. Skills were developed to make the best of every scrap of land, such as using controlled and precisely timed burning on the south-facing cliffs to produce spring growth, 'first bite', for stock wintered inland.

The intricate mosaic of traditional farming, with every corner used, has left a frightening proportion of the rare plant communities dependent on farming. Today, however, the mixed pattern of

traditional farming that has maintained the plant diversity of the Lizard for 2000 years is in crisis. The harm done by modern farming to biodiversity is ubiquitous in Britain, but on the Lizard it is particularly bitter because some of the plant species and communities are literally unique. Not only are they absent from the rest of Britain and Ireland, but they are north and west of continental populations, and may prove to have rare genetic adaptations to the extreme oceanic conditions.

Farming change is the crux of Lizard plant conservation. As I write, the British beef controversy rumbles on, whittling down the number of cattle grazed. Dairy cattle need to be near home, not down on the cliff, and anyway the subsidies supporting milk prices are dropping. Sheep rearing is uneconomic at present. This will ease the gross overstocking which high headage payments caused on so much hill pasture, but down on the Lizard it's just another chance lost for some animals to keep the cliffs grazed. Without grazing, the rare plants become swamped by coarse grass, bramble, bracken and scrub. Even the central heaths, which look thoroughly wild, are changing. Now their web of quarry tracks is disused, there is no grazing, and heathers and furze are not cut for fuel, thatch or bedding.

The lifestyle of one of the greatest rarities, Land Quillwort (*Isoetes histrix*), shows clearly the help it needs in current British conditions. Only found on the Lizard here, its real home is the Atlantic edges of France and Iberia and through the Mediterranean to Turkey. An extraordinary organism, it is a tiny perennial, a green catherine wheel less than 2.5 cm across, flowerless and flat on the ground. Being so small, it needs bare ground, or at least very low competition. On the continent, nature takes care of this as hot summers scorch off the competition, but here it can be threatened by what most of us love too much, 'the green, green grass of home'. Being a perennial it needs consistently favourable conditions – death of a population of perennials may mean catastrophe. The largest Lizard populations are found in well-grazed, open turf, where hoofprints can cut the thin sward to allow new plants to establish, so grazing is essential. Even the most natural of its Lizard habitats, erosion

pans on the serpentine so thin-soiled that competition cannot develop, can become choked and shaded by uncontrolled scrub. Land Quillwort needs to be able to grow unimpeded through the mild damp winter, until a sunny spell, usually in April, starts it preparing for the opposite to hibernation, disappearing underground to *aestivate* for the summer. Any development of coarse or dense swards is harmful, so fertilizer application can be as bad as neglect; even the decline of the once pestilential rabbit since myxomatosis in the 1950's has been bad news for *Isoetes histrix*. Given that commercial farming has moved well away from the difficult cliff habitats, what can be done to preserve this wonderful, if barely visible plant?

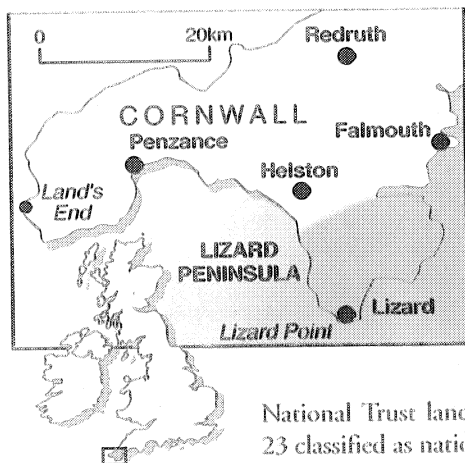
The answer is that the land where this plant grows must be managed for conservation. The National Trust, the largest land-owning charity in Europe, owns much of the Lizard coast, 700 ha in all. English Nature, the government conservation agency, owns some National Nature Reserves, including the Lizard NNR, which covers much of the central heath. Most of the coast and inland heaths are designated as Sites of Special Scientific Interest (SSSIs) and parts are to be designated as a Special Area of Conservation (SAC) under the European Union's Habitats Directive. Ownership, however, is critical, as designations such as SSSI offer only frail protection and they certainly do not guarantee optimum management. The National Trust, although traditionally associated with the conservation of country houses and art treasures, has been managing land on the Lizard for nature conservation for the last 20 years. In 1979 it carried out its first biological surveys here, building up base-line records of the interests of each property. The Trust is now commissioning specialist surveys of many taxonomic groups, comparing the status of rare species with former records to assess current trends,

while keeping a clear focus on the management needed for rarities to thrive.

This was how I came to spend the summers of 1998–9 looking for rare plants in the National Trust's coastal properties on the Lizard – probably the most enviable job in British botany! I was however apprehensive before starting. I had begun a serious love affair with the Lizard in the early 1980's, when the University of Bristol was studying the management needs of the key plant habitats, but since then I had heard gloomy tales of heaths and pasture neglected and overgrown. I feared finding gorse and brambles where I remembered short turf starred with flowers. I was overjoyed in 1998 to find I was working on land where conditions were not always ideal, but where improvement for plants was the priority.

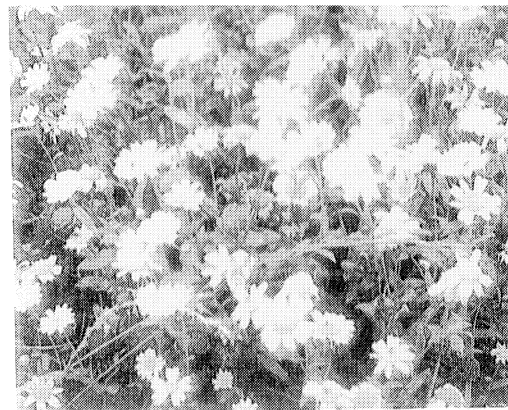
A multitude of habitats

The Lizard peninsula is barely ten miles long, but has a multitude of habitats, each with its special plant communities. The 1999 British Plant Red Data Book lists some 200 species for England, and about 10% of them are found on this tiny piece of land. My survey confirmed 13 red-listed species on National Trust land alone, with another 23 classified as nationally Scarce.



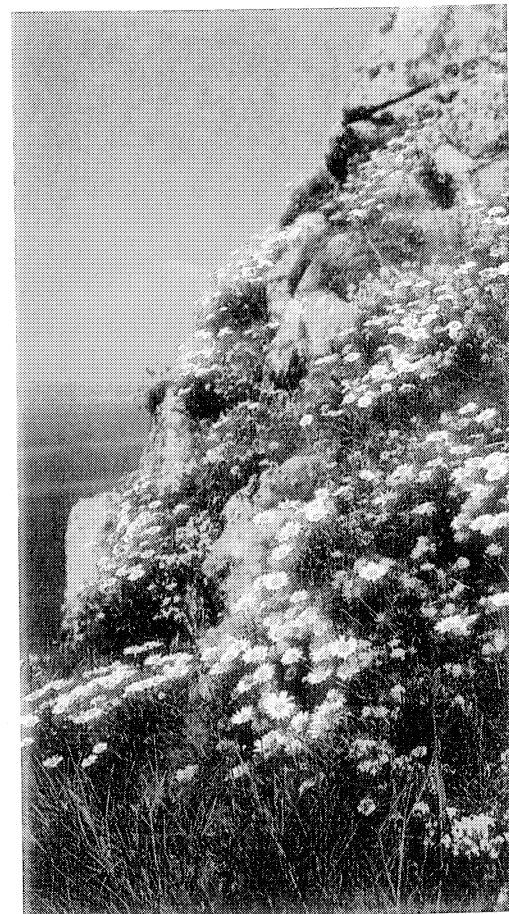
The inland Lizard heaths are famous for the dominant Cornish Heath (*Erica vagans*) with its strange association of species including many normally found on limestone soils. Found nowhere else in Britain, this habitat has priority rating under the EU Habitats Directive. However, it is the cliffs and adjoining pastures, with their subtle variations in soil and aspect, which are the real 'flower gardens' (right and cover).

The most exposed cliff vegetation is controlled by wind and influenced by salt, but the spring flora can be spectacular. Pink thift, yellow legumes, white campion and blue squills crowd together. Ox-eye



▲▲ Lavish displays of Corn Marigold (*Chrysanthemum segetum*) in arable fields are another loss to modern farming.

▲ The rare clover, *Trifolium occidentale*
▼ In spring, the sea cliffs are spectacular wild flower gardens.





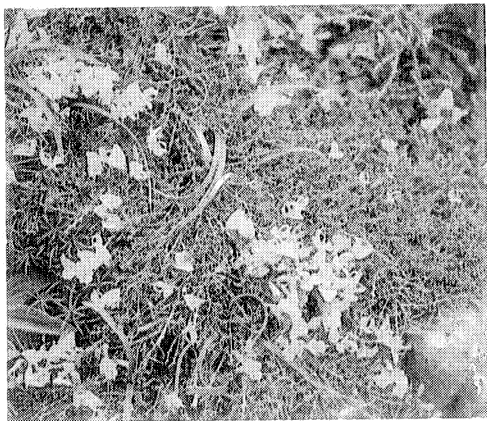
MANAGEMENT CRISIS for the extraordinary flora OF THE LIZARD

Daisies, almost a metre high inland, here have their handsome heads looking huge on stems dwarfed to a couple of centimetres. The rare plants are often less conspicuous. The white Western Clover (*Trifolium occidentale*) discovered by one of the greatest Lizard botanical researchers, the late David Coombe, clings modestly round the rocks. Its world distribution is limited to the coasts of west Britain and east Ireland, Brittany, and a few spots on the northern seaboard of Spain and Portugal. Rather dim little green mats on rocky paths may be *Herniaria ciliolata*, bizarrely called Fringed Rupturewort in English and unknown elsewhere in Britain. Rich gold pea flowers apparently crowded on flattened dead twigs are the red-listed Hairy Greenweed (*Genista pilosa*), fresh growth protected by last year's wind-stripped stems. A surprise can be familiar and delicious-looking fat asparagus spears poking out of dense spray-tolerant grass mats of *Festuca rubra* on steep slopes, but gathering them for the pot is a forbidden treat as this is the very rare prostrate form. A thrilling feature of the flora is that top national rarities can be all over the place, so gorgeous plants like Thyme Broomrape (*Orobanche alba*) (really an intense reddish brown) and the delicate Autumn Squill (*Scilla autumnalis*) make lavish local displays.

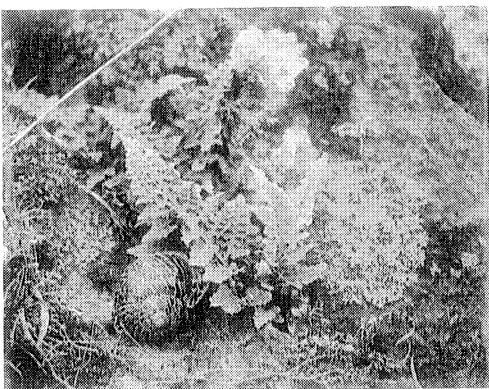
open cliff turf here, their comparatively large flowers like a beautiful oriental carpet, but are quickly lost under gorse or blackthorn. Rock outcrops, sometimes isolated on farmland as well as forming part of the cliffs, are also vulnerable. Serpentine typically outcrops in a series of shallow ledges or as a low thinly-turfed 'bench'. Where these face south, they form one of the most special Lizard habitats, where rain seeps over the rock in winter and the thin soils bake easily in summer. Rare plants seem to jostle for space – Green-winged Orchid (*Orchis morio*), one of the main victims of intensive pasture management in Britain, the bold purple heads of *Allium schoenoprasum*, ancestor of the familiar garden chives, or the dramatic pink and white heads of one of the rare clovers confined to the Lizard, *Trifolium incarnatum* ssp. *molinerii*, usually affectionately known as 'E. mol.'. Among these beauties there are often hidden treasures, like the Land Quillwort, or another minute Mediterranean plant Dwarf Rush (*Juncus capitatus*), its shining red-brown heads standing a perky 1.5 cm high!

Managing these coastal grassy habitats is a problem. Grazing animals are a less important part of the modern farm than before, and tourism is displacing farming as the main livelihood. The National Trust and English Nature have found it necessary to own animals themselves. The Trust have Shetland ponies, and English Nature Soay sheep. These breeds both come from the outer islands of Scotland, so might have been designed for Lizard cliffs and storms. Being native breeds they do a fine job in eating unpalatable coarse vegetation and helping to control scrub, so opening up dense vegetation which might be choking rare plants. Fencing extremely steep cliff slopes and providing drinking water can make sites very difficult to graze but the National Trust now has grazing on 7 of the 10 sites where it is needed.

Animal husbandry, even of hardy, native breeds, is labour intensive, and so wherever possible the National Trust prefers to let its land on licences or tenancy agreements to be grazed as part of a working farm. The Trust seeks tenants who will graze land regularly, without using fertilizers or other intensive practices. The tenants receive financial compensation



- ▲▲ The hardy Shetland ponies are proving ideal for grazing plant sites.
- ▲ Hairy Greenweed (*Genista pilosa*)
- ▼ Even common plants contribute to Lizard biodiversity, like the small fern *Asplenium adiantum-nigrum* with snail and lichen-coated rocks.



from government environmental grants, or from the Trust itself, usually in the form of low rents. In 1999, previously unrecorded populations of Land Quillwort were found on two tenanted pastures. Large enough to be of national importance, populations of this really fussy plant show the approach is working. Other tenants are converting three farms from intensively managed arable land to semi-natural cliff grassland and heath.

Tourism, the future option

Much of the financial income to the Lizard area now comes not from farming but from tourism. The National Trust own a number of prime tourist spots such as the Most Southerly Point (as it appears on signposts) of mainland Britain, and a long-distance footpath runs through all the coastal properties. Visitor pressure is a mixed blessing in rare plant conservation. Accidental fires are a danger. Grazing may be even more difficult to arrange in sites with many visitors. A specially tricky problem comes from an alien succulent, *Carpobrotus edulis*, a South African plant imported as an ornamental, which has invaded cliffs in many parts of Cornwall. It forms monoculture blankets which obliterate native vegetation, but unfortunately its very showy large purple or yellow flowers are beloved of both visitors and non-botanical locals, who see it as a lovely wild flower and are distressed by any attempt to control it!

On the other hand, survey work commissioned by the Trust has shown that tourist pressure, usually seen as a threat to botanical interest, has sometimes been beneficial. Light trampling along paths and round viewpoints can keep sites free from scrub, so acting as effective refugia for small populations of the rarities. Simple management such as strimming can then be the start of dramatic recoveries from these relict populations.

Overall, my survey has shown that in the last twenty years, some sites and plant populations have improved, some have stayed stable and some have declined. The Trust has treated its largest and most important sites as a priority and these have improved in condition markedly. On the other hand, grazing has been insufficient on some smaller sites and populations of some rarities such as



Juncus capitatus and *Trifolium bocconei* have been lost. Fortunately, grazing has now been arranged for these so the next decade should see an upturn.

However, the threat from lack of grazing will not go away. Beef production is unlikely to recover quickly, and so it is vital that conservationists continue to press for EU support for old-fashioned (and plant-friendly) forms of mixed farming. The future of the Lizard is uncertain, as the long history of human involvement in its diversity of habitats means that nature can no longer look after her own.

Working on endangered species, I often see too much loss and neglect, but my work on the Lizard gave me great hope. The Trust is willing and able to manage proactively to maintain the immensely rich biodiversity of this extraordinary little corner of outer Europe. Management to imitate the old farming ways is sometimes seen as a rich man's game, and conservation bodies have to have vision and courage to be proactive on what is an indefinite commitment. The Lizard is uniquely worth saving, and at the beginning of its third grazed millennium it looks in with a chance!

A long-distance coastal footpath traverses the whole Lizard coast, and there are numerous other public paths. The coastal flora is at its best in May, but a visit is worthwhile any time in spring & summer.

Lady Rosemary FitzGerald is an independent field botanist specializing in British and Irish rare plants. This article is based on work commissioned by the National Trust.



▲▲ Brighter than the herb garden. Chives (*Allium schoenoprasum*) are characteristic of the Lizard serpentine.

▲ Mowing is one way of keeping the vegetation open and preventing scrub.

▼ The deadly but attractive *Carpobrotus edulis* from South Africa is invading the sea cliffs.

All photographs by the author except middle, p. 23 (†D.E. Coombe) and middle, this page (National Trust)

