

# Turf removal to stimulate natural regeneration of Spanish catchfly *Silene otites* (L.) Wibel at Cranwich Camp, Norfolk, UK

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## SUMMARY

Spanish catchfly *Silene otites* (L.) Wibel is an endangered plant declining in its UK stronghold of the Breckland. At Cranwich Camp, Norfolk, UK, formerly an important site for the plant, an area was stripped of turf to stimulate germination to attempt to revive the population. This led to significant colonisation of the area, with over 2,900 Spanish catchfly plants present on the experimental site three years after the management was carried out. These may have derived either from incoming seed or seed lying dormant beneath the turf and have begun to restore the population to its former high levels.

## BACKGROUND

Spanish catchfly *Silene otites* (L.) Wibel is an endangered plant (Wiggington 1999), which has declined in its UK stronghold of the Breckland. Of 117 historic known sites, it is currently present at 27 (Brecklands Rare Plant Database). The plant has been known from Cranwich Camp, Norfolk, since 1951, although it was formerly known from the environs and as recently as 1997 ‘thousands’ of plants were seen here (Brecklands Rare Plant Database); the most recent formal survey in 2007 returned a count of 221 plants (Brecklands Rare Plant Database).

Spanish catchfly is associated with shallow but well-drained, light calcareous soils (Preston *et al.* 2002). It is also associated with open, often disturbed, vegetation with a substantial component of bare ground. It is a long-lived, rosette-forming perennial with a deep tap-root but appears to be intolerant of competition when young. While it is palatable, the hemicryptophytic growth provides protection from grazing and, although flowering stems are often eaten off, the rosettes multiply vegetatively. The plant seeds plentifully when ungrazed and germination appears to be stimulated by soil disturbance.

The decline of the plant at the site is attributed to vegetation succession. The former military site was subject to considerable disturbance which maintained an open, skeletal vegetation but since its abandonment the vegetation has succeeded to a mature grassland sward with little bare ground.

Turf stripping an area of the Cranwich Camp formerly occupied by Spanish catchfly but close to extant plants was proposed as a possible means of revitalising the declining population by creating habitat which was a) considered suitable for germination and b) devoid of competition from other plant species.

## ACTIONS

Cranwich Camp, a former military site in Norfolk, UK, is comprised of two fields of calcareous grassland divided by a stony track. The site is approximately 13.1 ha in extent and is situated at National Grid Reference TL 775942. The fields are fenced off and subject to annual mowing with occasional

grazing, formerly by sheep but more recently by ponies. Both fields once held populations of Spanish catchfly but in 2011 only the west field continued to do so.

On 11<sup>th</sup> March 2011, a roughly square experimental plot approximately 50 m x 50 m was marked out (see Figure 1). The position of the plot was determined by a) the absence of any Spanish catchfly and b) an archaeological assessment that no significant remains would be disturbed by the proposed works.

On March 13<sup>th</sup> 2011, the vegetation of the experimental plot was surveyed. All plant species identified were assigned a Domin score (Rodwell 2006) for the whole plot (Table 1). Vegetation surveys were repeated in July or August in each subsequent year. The number of Spanish catchfly plants was also recorded annually, but not necessarily at the same time. Survey dates are presented in Table 1.

On 16<sup>th</sup> and 17<sup>th</sup> March 2011, in cool, overcast weather with little wind, the experimental plot was stripped of vegetation using a conventional Hitachi 360° excavator with a 1.2 m grading bucket (Figure 2). Turf was removed to a depth of approximately 150 mm, exposing clean, chalky sand beneath except for the exposed taproots of restharrow *Ononis repens* plants, which were tough enough to survive the blade (Figure 3). The arisings were removed from the site (approximately 250 m) using a JCB Fastrac 2170 pulling a 14 t tipping trailer. The excavator driver sat and waited for the trailer’s return after each load adding to costs. The task was completed in approximately 12 h and cost approximately £4500, excluding V.A.T. However, other works were

**Table 1.** Activity dates at experimental plot

Date	Activity
11/3/2011	Spanish catchfly surveyed and plot marked out
13/3/2011	Vegetation surveyed
16-17/3/2011	Turf stripped off the plot
25/8/2011	Vegetation* and Spanish catchfly surveyed
11/6/2012	Spanish catchfly surveyed
31/8/2012	Vegetation surveyed
16/7/2013	Vegetation and Spanish catchfly surveyed
26/8/2014	Spanish catchfly surveyed

\*There was no appreciable vegetation on the plot on this day, apart from a very small amount of restharrow *Ononis repens*, whose taproots survived the excavator blade.

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**Figure 1.** The experimental plot before start of work.



**Figure 2.** Turf-stripping underway



**Figure 3.** Stripped plot, showing stumps of restharrow.



contracted at the same time and the same equipment performed other tasks on site, so a stand-alone turf removal would have cost more.

The work was undertaken by Plantlife and Butterfly Conservation because of the benefits envisaged both to Spanish catchfly and to a number of invertebrate species; only the observations relating to Spanish catchfly are reported here.

The site was subsequently visited to count Spanish catchfly plants; simplistic vegetation data were also collected to provide some interpretative context for any observed change in numbers.

**Table 2.** Number of plants of Spanish catchfly observed on experimental plot.

Date	11/3/11	25/8/11	11/6/12	16/7/13	26/8/14
Plants	0	0	61	94	2929

### CONSEQUENCES

The experimental plot was surveyed on 25<sup>th</sup> August 2011, several months after the management was completed, and no Spanish catchfly plants were found (Table 2). Sixty one plants were recorded in the year following works; most were young but a few were flowering and had rosettes of a size that suggested that they had germinated the previous year. A small increase in the number of plants was observed the year after that (2013) but considerable expansion of the population was recorded in year three (2014) (Table 2). The large number of plants observed in 2014 placed this site amongst the top five sites for Spanish catchfly in the UK.

Table 3 shows the structure of the vegetation before and at intervals after works. Most notable, apart from the numbers of Spanish catchfly, is the increased quantity of bare ground where there was very little previously. The plot has also acquired 22 new plant species (mainly annuals), three of which have since disappeared. Nine species, mainly perennials, have not reappeared after the works (Table 3). Some of the restharrow plants, which were stripped of greenery in the works, survived for a period and provided a very small amount of vegetative cover in the first months after the completion of works.

**Figure 4.** Regenerating stand of Spanish catchfly showing established plants with flowering spikes and plentiful young germinands.



**Table 3.** Vegetation structure in experimental plot

	Domin scores						Domin scores				
	Mar '11	Aug '11	Aug '12	Jul '13	Aug '14		Mar '11	Aug '11	Aug '12	Jul '13	Aug '14
Bare Ground	1	10	8	8	8	<i>Senecio jacobaea</i>	2	1	3	1	1
<i>Achillea millefolium</i>	3	0	2	2	3	<i>Senecio vulgaris</i>	0	0	1	1	2
<i>Agrostis capillaris</i>	3	2	1	1	2	<i>Silene latifolia</i>	0	0	2	2	2
<i>Anthoxanthum odoratum</i>	0	0	1	0	2	<i>Silene otites</i>	0	0	2	2	3
<i>Anthyllis vulneraria</i>	4	0	1	2	6	<i>Silene vulgaris</i>	1	0	1	1	2
<i>Arabis hirsuta</i>	1	0	1	1	2	<i>Thymus pulegioides</i>	0	0	0	0	1
<i>Arenaria serpyllifolia</i>	1	0	3	3	3	<i>Trifolium arvense</i>	1	0	2	3	3
<i>Arrhenatherum elatius</i>	1	0	0	0	0	<i>Trifolium campestre</i>	3	0	2	3	3
<i>Artemisia vulgaris</i>	0	0	1	1	1	<i>Trifolium dubium</i>	0	0	0	0	1
<i>Astragalus danicus</i>	2	0	1	2	2	<i>Trifolium scabrum</i>	0	0	0	1	1
<i>Brachythecium rutabulum</i>	1	0	0	0	0	<i>Trisetum flavescens</i>	1	0	1	1	1
<i>Bryum argenteum</i>	0	0	0	1	0	<i>Urtica dioica</i>	1	0	0	0	0
<i>Centaurea scabiosa</i>	0	0	1	1	1	<i>Verbascum thapsus</i>	0	0	1	1	0
<i>Cerastium arvense</i>	1	0	0	1	3	<i>Veronica chamaedrys</i>	1	0	0	0	0
<i>Cerastium fontanum</i>	1	0	1	1	1	<i>Vicia hisuta</i>	2	0	0	0	0
<i>Chenopodium album</i>	1	0	1	0	0	<i>Vicia pannonica</i>	1	0	0	0	0
<i>Convolvulus arvensis</i>	0	0	1	1	2						
<i>Conyza canadensis</i>	0	0	2	3	3						
<i>Crataegus monogyna</i> (g)*	1	0	1	1	2						
<i>Crepis capillaris</i>	3	1	4	3	3						
<i>Dactylis glomerata</i>	1	0	0	0	0						
<i>Echium vulgare</i>	0	0	2	1	2						
<i>Euphrasia nemorosa</i>	3	0	0	1	3						
<i>Fallopia convolvulus</i>	0	0	1	0	2						
<i>Festuca ovina</i>	8	1	3	3	3						
<i>Festuca rubra</i>	2	0	1	1	1						
<i>Galium verum</i>	4	0	2	3	3						
<i>Helictotrichon pratense</i>	3	0	1	0	0						
<i>Holcus lanatus</i>	0	0	2	1	1						
<i>Hypochaeris glabra</i>	0	0	1	0	1						
<i>Hypochaeris radicata</i>	1	0	1	1	2						
<i>Knautia arvensis</i>	1	0	0	0	1						
<i>Koeleria macrantha</i>	1	0	0	2	2						
<i>Leontodon saxatilis</i>	0	0	0	0	1						
<i>Lotus corniculatus</i>	1	0	0	1	2						
<i>Malus sylvestris</i> (g)*	1	0	0	0	0						
<i>Medicago lupulina</i>	2	0	2	1	2						
<i>Ononis repens</i>	3	2	5	3	3						
<i>Papaver dubium</i> ssp <i>dubium</i>	0	0	1	1	1						
<i>Papaver rhoeas</i>	0	0	0	1	0						
<i>Pastinaca sativa</i>	4	0	1	1	1						
<i>Peltigera</i> sp.	1	0	0	0	0						
<i>Phleum bertolonii</i>	2	0	3	2	3						
<i>Pilosella officinarum</i>	2	0	3	4	4						
<i>Plantago lanceolata</i>	3	0	5	4	3						
<i>Pseudoscleropodium</i> <i>purum</i>	3	0	0	1	2						
<i>Reseda lutea</i>	1	1	3	3	2						
<i>Rhytidadelphus</i> <i>squarrosus</i>	4	0	0	1	0						
<i>Rosa canina</i> agg.	0	0	1	1	1						
<i>Sedum acre</i>	0	0	3	3	3						

\* (g) signifies ground layer shrubs, after Rodwell (2006)

**DISCUSSION**

Preliminary results suggest that the turf stripping has been successful in stimulating the germination of Spanish catchfly and that sufficient open ground has persisted in subsequent years for the population to become established. As the number of seeding plants increases, the prospect of substantial further increase in numbers seems plausible as long as the amount of bare ground remains high.

Difficulties are foreseen however with continuing the methodology for counting Spanish catchfly plants. In areas of plentiful germination, swarms of tiny plants have been observed in very close proximity (Figure 4). The prognosis for such plants is that they will either self-thin, and fewer larger plants take over, or that they merge to become indistinguishable from each other; what are now groups of plants may then be counted as one plant. In such circumstances, an observed decline in numbers would not necessarily mean a decline in fortune for the population. To avoid misinterpretation, consideration will have to be given to adopting an alternative method for quantifying the amount of Spanish catchfly on the plot.

Although the plants may have come in as seed from the adjacent grassland or grown from seed lying beneath the turf, it seems likely that, given the relatively low number of plants in year one, most dormant seed were lost in the turf removal. In this context, the positioning of the excavation plot within the same ecological unit as an extant population is important.

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