

Effect of mowing regime on abundance of green-winged orchid *Anacamptis morio* on coastal grassland in Merseyside, England

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SUMMARY

This study describes a modified mowing regime that allowed green-winged orchids *Anacamptis morio*, discovered in 1985 on coastal grassland on a rifle range on the Sefton Coast, Merseyside, to flower and set seed. A delay in spring/summer mowing until 15 July each year led to a progressive increase in the population to a total of nearly 32,000 flower spikes by 2016, while adjacent ranges managed by regular mowing showed no such increase.

BACKGROUND

Altcar Training Camp occupies about 250 ha on the Sefton Coast, north of Liverpool in Merseyside and is owned and managed by the Reserve Forces and Cadets Association for the North West of England and Isle of Man. Much of the area was reclaimed from the shore in the late 18th century, before becoming the Altcar Rifle Range in 1860. Flanked to the west and south by high dune ridges and to the east by the alluvial flood-plain of the River Alt, the ranges consist of almost level sandy grasslands, often waterlogged in wet winters. To ensure uninterrupted sight lines from the firing positions to the targets, the ranges are managed by mowing several times a year. No fertilisers or herbicides are applied, and surface water is drained via a series of maintained ditches and culverts. Different ranges are identified by letters of the alphabet, those involved in the current study being 'B', 'C', 'D' and 'I'.

Soils on the ranges are mapped as ground-water gleys of the Formby Series (Hall & Folland 1967), later renamed the Greatstone Series by Beard *et al.* (1987). Samples from C-range conformed to this description, the texture being sandy loam, becoming sandier with depth and with a few small rusty mottles below 10 cm. Soil pH ranged from 5.3 to 5.8 with a mean of 5.5. Hall and Folland (1967) describe this soil type as having "inherently low fertility".

The botanical richness of the site first came to the attention of local recorders in 1985 when 35 flower spikes of green-winged orchid *Anacamptis morio* were found on C-range, as a new species for the Sefton Coast. As a result of habitat loss, cessation of traditional grassland management and eutrophication, green-winged orchid has been lost from 49% of its historical British range (Harrap & Harrap 2005), especially in central, eastern and southern England. Its threat status is Near Threatened in Great Britain and Vulnerable in England (Stroh 2014). In 1986, a more detailed survey of the Altcar ranges found 517 flower-spikes of green-winged orchid, many of which had been damaged by mowing. This led to the mowing regime being modified in selected areas of the ranges, so that the orchids could flower and set seed each year. We describe the effects of these changes on the orchid population, compared with similar adjacent ranges on which there was no change in management.

ACTION

In 1977, a Conservation Advisory Group, representing relevant statutory and voluntary organisations and individuals as well as the Training Camp authorities, was set up to support and give advice on the management of the Altcar estate. The Group developed a Conservation Management Plan for the site. Traditionally, mowing had taken place whenever the sward height exceeded about 15 cm. After the discovery of the orchids in 1985-1986, it was agreed that spring/summer mowing of the orchid-rich meadows (mainly about 3.4 ha of C-range and 0.5 ha of I-range) should be delayed until on or after 15th July. This was enacted by site managers from 1987 onwards and entered into the Management Plan in 1992. Cuts to a sward height of about 5 cm were made using a mechanical grass-cutter mounted on a tractor. Cut vegetation was not collected. Occasional mowing continued into the autumn and winter when necessary. Adjacent areas of B- and D-ranges, covering 2.1 ha and 1.9 ha respectively, with similar topography and soil conditions, continued to be mowed in the traditional way throughout the year.

The numbers of flowering-spikes were monitored during one or two visits in mid to late May almost annually. On C- and I-ranges, monitoring took place on 21 occasions between 1985 and 2016, while B- and D-ranges were monitored 16 times. Spikes were either counted individually or, for larger groups, estimated in 5s, 10s or 100s. Geographic features, such as field boundaries and ditches, were used to divide the sites into manageable units for counting, using binoculars where appropriate. In most springs, the orchids were taller than the surrounding vegetation, their bright colouration making them easily visible. Depending on the size of the population, each monitoring session was completed in about four man-hours.

CONSEQUENCES

The number of green-winged orchid flower spikes on C- and I-ranges increased in most years, reaching a total of nearly 32,000 by 2016 (Figure 1). In contrast, numbers on B and D-ranges fluctuated widely, the maximum count being 967 in 2000 (Figure 2). Linear regression gave a growth rate for C- and I-ranges of 990 orchids/year ($r = 0.96$, $p < 0.0001$), while the rate of change at B- and D-ranges, at 4 orchids/year, was not significant ($r = 0.14$, $p = 0.6$). It is reasonable to infer,

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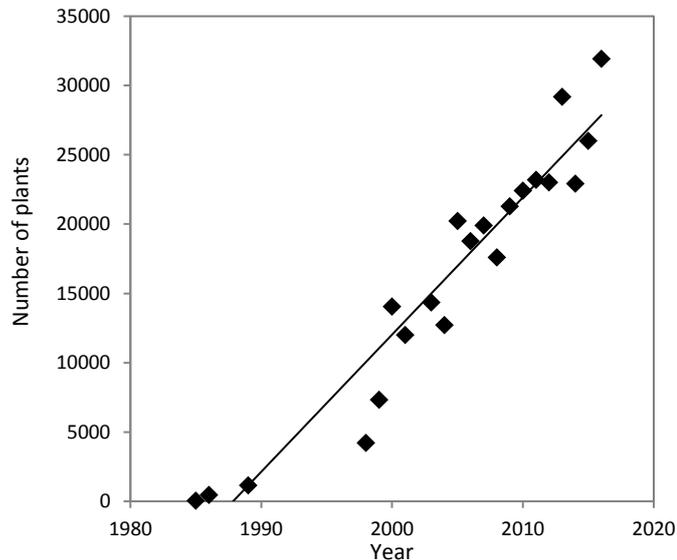


Figure 1. Number of green-winged orchids on C- and I-ranges, 1985-2016

therefore, that the modified mowing regime on C- and I-ranges may be at least partly responsible for the observed increase in the orchid population.

The average density of green-winged orchids during the study period was 4123 plants/ha for C- and I-ranges, while on B- and D-ranges it was 76 plants/ha. One specimen of green-winged orchid appeared in 2014 on a nearby duneland property about 1 km north of the nearest range population, increasing to two in 2016. This is now the only Sefton Coast locality outside the Altcar ranges for this species and is winter-grazed by cattle.

Characteristically, the populations of green-winged orchid at Altcar showed a wide range of colour-forms from typical deep magenta through to salmon-pink (0.08% of the population) and white (0.07%) (Foley & Clarke 2005). Perhaps because of the generally damp soil conditions, flower spikes were often up to 30 cm tall (Figure 3), towards the top end of stem heights cited by Foley & Clarke (2005).

Reference to keys and descriptions in Rodwell (1992) indicates that the plant community of the ranges accorded with UK National Vegetation Classification (NVC) MG5a (*Cynosurus cristatus-Centaurea nigra* grassland, *Lathyrus pratensis* sub-community). This vegetation type is typical of

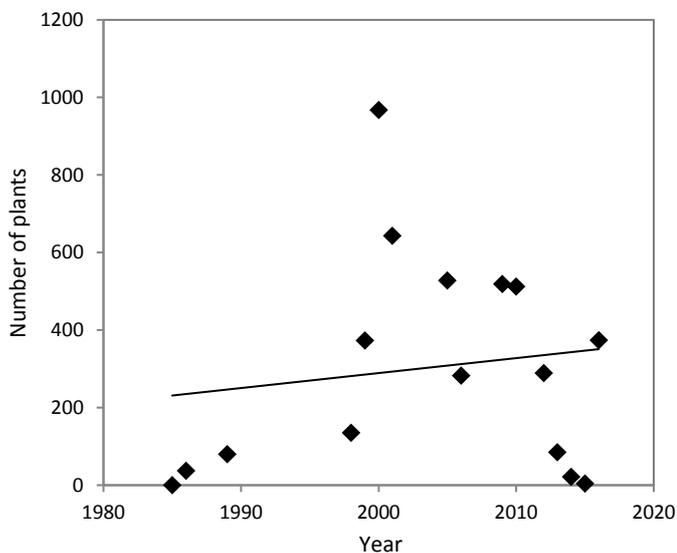


Figure 2. Number of green-winged orchids on B- and D-ranges, 1985-2016.



Figure 3. Green-winged orchids on Altcar’s I-range during a public guided walk, May 2012

traditionally managed, grazed hay-meadows on circumneutral brown soils in the lowlands but is increasingly rare due to agricultural improvement. The *Lathyrus* sub-community is generally associated with fairly heavy brown-earths or superficial deposits with a low calcium content (Rodwell 1992).

DISCUSSION

Historically, green-winged orchid has always been highly localised in the Merseyside region (Savidge *et al.* 1963), its only other current locality in South Lancashire being an alkaline waste tip near Bolton where it may now be extinct (D.P. Earl, personal communication). The Altcar population is thought to be the largest of this species in northwest England and may be one of the largest in Britain. Stroh (2007) reported that the largest of 16 colonies found during his detailed survey of Huntingdonshire, the Soke of Peterborough and old Cambridgeshire supported 20,532 plants in 2006, with most sites having fewer than 100. Harrap & Harrap (2005) mention a site in Sussex with 50,000 flower spikes, while Clarke’s Pool Meadow in Gloucestershire is said to support over 45,000 (Gloucester Wildlife Trust 2016).

The target species is most often found in unimproved hay-meadows and pastures, coastal grassland mosaics, grazed lowland and some upland calcareous grasslands, as well as on thin soils in restored gravel-pits and quarries; also in churchyards, on roadside verges and in lawns (Foley & Clarke 2005, Harrap & Harrap 2005, Stroh 2014). Rodwell (1992) lists only MG5 as supporting the green-winged orchid in his NVC review of grasslands and montane communities, this being the inferred vegetation type for the ranges at Altcar.

Active management is essential to the maintenance of MG5, as a lack of mowing and/or grazing leads to a coarsening of the sward, the development of tall competitive vegetation and, eventually, invasion of shrubs (Rodwell 1992). In contrast, frequent mowing or early and heavy grazing produces a more impoverished sward, with loss of early-flowering species, such as green-winged orchid. Addition of mineral fertilisers is also deleterious to this plant (Harrap & Harrap 2005).

Although the removal of cut vegetation in the form of a hay crop is the traditional approach to MG5 management (Rodwell 1992), this was not followed at Altcar. Failure to remove cut material is often cited as undesirable because it can lead to build-up of leaf-litter and nutrients (Wells 1980). However, it seems that the relatively short sward produced by regular mowing of the ranges, coupled with inherent soil infertility (Hall & Folland 1967), counteracted any adverse effects. Thus, Stroh (2007) found that of the 16 sites for green-winged orchid he studied, four were cut with material not removed. However, none of them was a “key site” with the highest populations, these being managed by cutting and bailing, cutting and bailing with aftermath grazing, or grazing only. Stroh (2014) reported that cutting once or twice after flowering can improve flowering performance of green-winged orchid over time, as seen at Altcar.

Mowing invariably took place on Altcar’s B- and D-ranges soon after flower spikes were counted, thereby preventing seed-set. Nevertheless, some recruitment evidently occurred, together with vegetative growth. It follows that changes to the mowing regime on lower-lying parts of these ranges, if compatible with military requirements, could extend the distribution of green-winged orchid on the Altcar estate.

Site protection was cited by Stroh (2007) as an important factor in the conservation of green-winged orchid in his study area. Thirteen of the 16 extant populations he recorded in 2007 benefitted from Site of Special Scientific Interest (SSSI) or Local Wildlife Site (LWS) designation. At Altcar, only I-range is within the Sefton Coast SSSI. C-range and the other grasslands are not statutorily protected but have been granted LWS status within the draft Sefton Local Plan.

Despite non-removal of arisings, it is evident that adjusting the timing of mowing and not applying fertilisers have successfully created suitable conditions for the increase and spread of the green-winged orchid population on Altcar’s C- and I-ranges. Although most of the key areas are outside the SSSI, the work of the Altcar Conservation Group to promote long-term management continuity, coupled with the cooperation of the Training Camp authorities, have contributed to this conservation success.

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