Adonis blue *Polyommatus bellargus*

Adonis blue *Polyommatus bellargus* L.

Climate Change Sensitivity:	POTENTIAL BENEFIT	Ability to Manage:	HIGH
Non climatic threats:	MEDIUM	Vulnerability:	LOW

Summary

Summer warming is likely to benefit the Adonis blue, which is known to require hot microclimates for egg laying and larval development. The role of management in creating these conditions is well established. Grazing regimes that deliver short swards are likely to be the most effective intervention, although extreme summer heat and drought may have an adverse impact on the species, meaning that more heterogeneous swards including isolated scrub should increasingly be the objective.

Description

The upper wings of the male are a brilliant sky blue or turquoise colour, with a fine black line round the edge and a white margin. The female is chocolate brown with a few blue scales near the base of the wings, and with orange spots bordered by blue scales around the edge of the hind wing. Both sexes have distinctive black lines that enter or cross the white fringes of the wings. The underside is brownish grey with black and orange spots. The wingspan of both sexes is about 3 cm. The caterpillar is green with short, yellow stripes.

Ecology and distribution

Within the UK, the Adonis blue is restricted to chalk and limestone grassland in southern England. It has two generations in the UK, with the offspring of the second adult generation over-wintering as larvae. Its sole larval host plant is horseshoe vetch *Hippocrepis comosa*.

Eggs are laid singly under young, unshaded horseshoe vetch leaves in May/June and August/September. The Adonis blue overwinters as a caterpillar. In April/May and July/August the caterpillar forms into a chrysalis, which is then taken and buried by ants (which 'milk' the pupa for its secretions), so protecting it from predators.

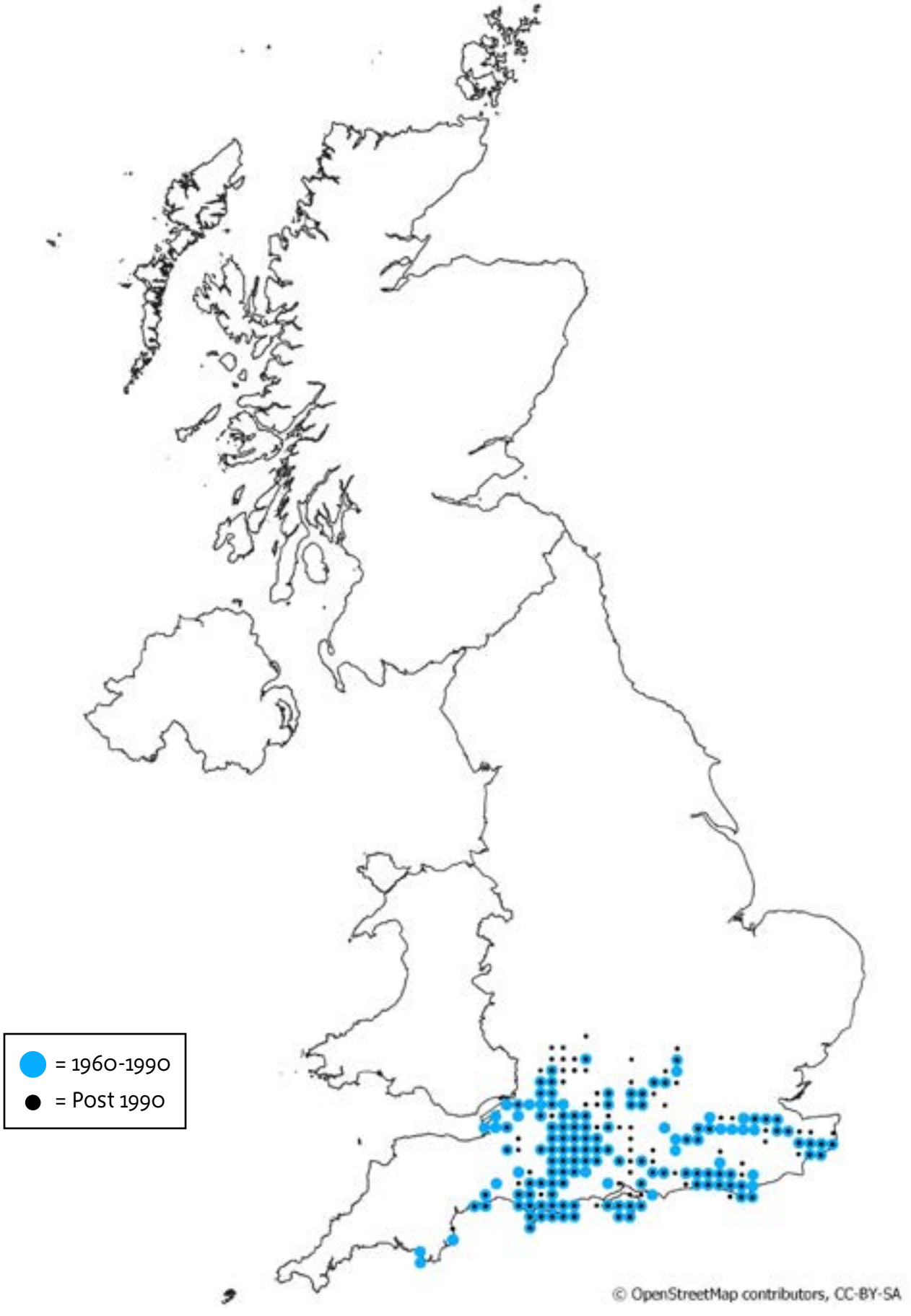
The two generations exhibit different requirements for egg laying and larval development. The first generation lay on horseshoe vetch growing in up to 7cm tall swards, while the second generation autumn/spring-feeding larvae are confined to short turf less than 3cm tall, in sheltered depressions. These microhabitat constraints ensure a warm microclimate but also impose an annual population bottleneck, as there will be fewer plants suitable for oviposition for the second generation (Roy and Thomas 2003).

Historically, the butterfly was recorded in chalk areas over much of southern Britain (Bourn & Warren 1998), but in the second half of the 20th Century it underwent a dramatic decline (Thomas 1983). Between 1950 and the 1980s, 70% of Adonis blue colonies in the UK had become extinct and its range had retracted by 42% (Thomas 1983; Warren *et al* 1997). The cause of this decline was the loss of short-turfed unimproved grassland, largely due to agricultural intensification and the abandonment of extensive grazing, followed by the loss of rabbit populations due to myxomatosis.

Conservation intervention and the recovery of rabbit populations has significantly reduced the height of the sward in many chalk downland sites in the last decades (O'Connor, Hails & Thomas 2014), resulting in warmer microclimates at the host plant level. This has reversed the butterfly's decline (Fox *et al* 2007, O'Connor, Hails & Thomas 2014). Climate change driven warmer summers are also thought to be contributing. Site quality has been shown to be more important than proximity to neighbouring sites in ensuring the persistence of the butterfly (Thomas *et al* 2001), and genetic studies indicate that there is an element of dispersal at distances considerably greater than field observations suggest (Harper, Maclean & Goulson 2003). However, field observations suggest that the butterfly has poor dispersal ability (Thomas 1983) and many former sites remain un-colonised, irrespective of their current condition.

Butterfly Conservation's presence records for Adonis Blue over 2 timeslices, 1960-1990 and post 1990, are shown on the map below (10km grid scale).

Presence of Adonis Blue records, 10km^2.
Source: Butterfly Conservation: Butterflies for the New Millennium.



Confidence in climate change impacts[13]

Distribution change: MEDIUM CONFIDENCE Mechanism: HIGH CONFIDENCE

The Adonis blue requires a warm microclimate to complete its life cycle. The recent changes in populations and distribution appear to have been largely driven by changes in the management of sward height (O'Connor, Hails & Thomas 2014). Climate change driven summer warming is likely to benefit to the species.

Egg-laying females in the first generation have been shown to avoid the hottest locations, laying in taller, less sheltered turf (Roy & Thomas 2003), suggesting that extreme summer temperatures may have an adverse impact if the sward is uniformly short. The butterfly has also been shown to be vulnerable to drought, due to the impact on its host plant (Thomas 1983), suggesting that summer drying could adversely affect the butterfly.

Please read this case study alongside the relevant habitat sheets.

Adaptation options

Managing sward height to produce a favourable microclimate provides a clear mechanism to support the recovery of the species. The provision of warm microhabitats through short swards will remain important for maintaining populations in cooler regions of the species' range, and in cooler years (O'Connor, Hails & Thomas 2014). The potential adverse impact of extreme summer heat and drought highlights the need to ensure fine scale heterogeneity in sward and shade to promote micro-refugial areas. Habitat restoration and creation should be used to strengthen downland ecological networks to promote the colonisation of new sites.

- Ensure sites that support the Adonis blue are managed to ensure small-scale structural heterogeneity within the habitat, with shorts swards and patches of long grass and scrub. Short swards are needed for both generations of the butterfly, but are most important in late summer for the second generation. Patches of taller vegetation and isolated scrub are needed to provide shading and potential micro-refugial areas on sites susceptible to drought. Cattle grazing will produce this variation in structure, which is also important for other chalk grassland butterfly species.
- To ensure suitable sward conditions stocking levels may need adjustment to compensate for changes in rabbit populations.
- Identify and manage appropriately sites that have populations of horseshoe vetch within the Adonis blue's current and former range, to promote natural spread and colonisation.
- Restore or create habitat in close proximity (< 500m) to existing sites to strengthen the ecological network.
- Translocation to sites outside the natural colonisation range of the species, including those to the north of its current range, should be considered where the management of these sites can provide suitable microclimate.

13 An assessment of the strength of evidence that distributions are changing and the mechanisms causing change are understood. Refer to Part B, section 5 of the species section introduction for more information.

Relevant Countryside Stewardship options

GS6 Maintenance of Species Rich Grassland

GS7 Restoration towards Species Rich Grassland

GS8 Creation of Species Rich Grassland

WD7 Management of successional areas and scrub

References and further reading

Bourn N.A.D. &. Warren M.S. (1998) Adonis Blue: Lysandra Bellargus (Polyommatus bellargus). Species Action Plan. Butterfly Conservation.

Fox, R., Warren, M. S., Asher, J., Brereton, T. M., & Roy, D. B. (2007). The state of Britain's butterflies 2007. Butterfly Conservation and the Centre for Ecology and Hydrology.

Harper, G. L., Maclean, N., & Goulson, D. (2003). Microsatellite markers to assess the influence of population size, isolation and demographic change on the genetic structure of the UK butterfly Polyommatus bellargus. Molecular Ecology, 12(12), 3349-3357.

O'Connor, R. S., Hails, R. S., & Thomas, J. A. (2014). Accounting for habitat when considering climate: has the niche of the Adonis blue butterfly changed in the UK? Oecologia, 174(4), 1463-1472.

Roy DB, Thomas JA (2003). Seasonal variation in the niche, habitat availability and population fluctuations of a bivoltine thermophilous insect near its range margin. Oecologia 22 134:439–444.

Thomas JA (1983). The ecology and conservation of Lysandra bellargus (Lepidoptera: Lycaenidae) in Britain. J Appl Ecol 20:59–83.

Thomas, J. A., Bourn, N. A. D., Clarke, R. T., Stewart, K. E., Simcox, D. J., Pearman, G. S., & Goodger, B. (2001). The quality and isolation of habitat patches both determine where butterflies persist in fragmented landscapes. Proceedings of the Royal Society of London B: Biological Sciences, 268(1478), 1791-1796.

Warren MS, Barnett LK, Gibbons DW, Avery MI (1997). Assessing national conservation priorities: an improved red list of British butterflies. Biol Conserv 82:317–328.