North Wyke Farm Platform

Case study no. 28

Seasonal dynamics of *Sitona obsoletus* in the UK and the potential impacts of rising surface temperatures on the life cycle.

Megan Pearce and Phil Murray

Sitona obsoletus, commonly known as the clover root weevil (CRW) is a pest of white clover, an integral part of the approximately 12 x 10^6 hectares of grassland, within production systems, in the UK.

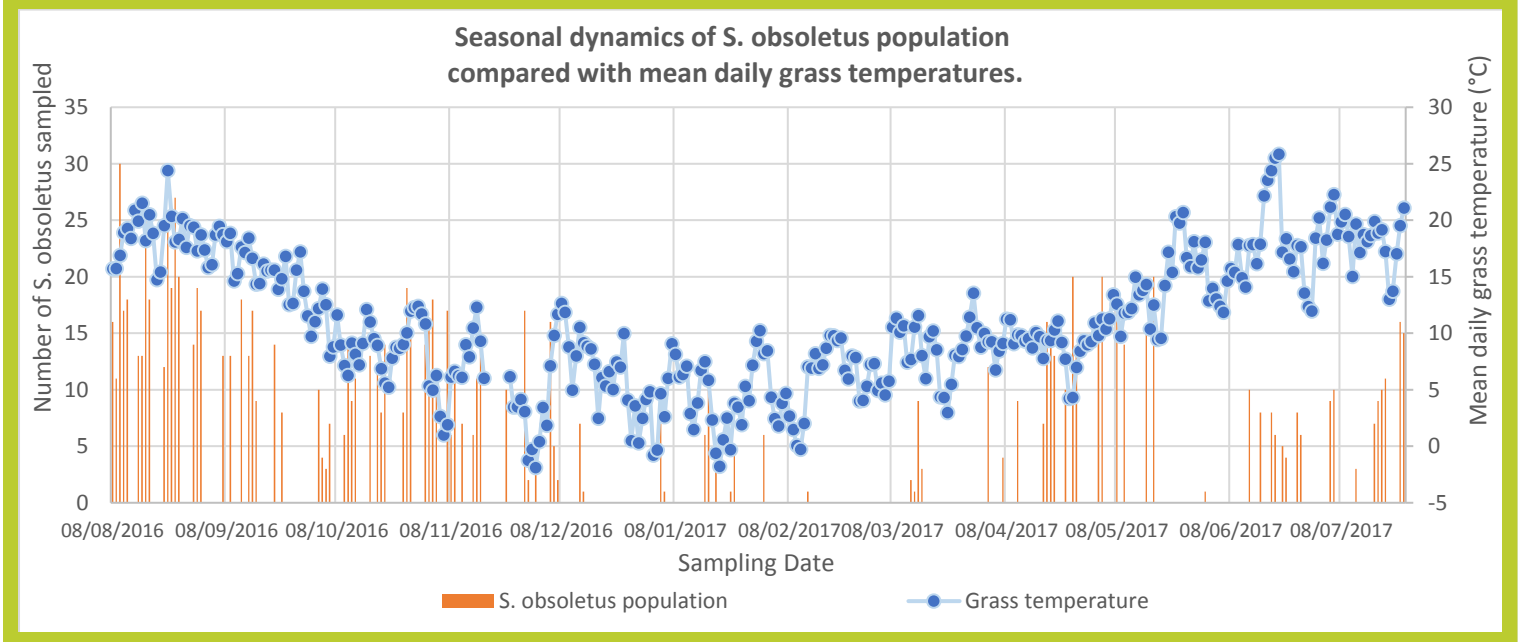
In the UK CRW has a univoltine life cycle with a single generation of adults emerging in late summer. CRW have no diapause and can overwinter as eggs, larvae or as adults. Adult CRW are found on the clover surface, feeding on foliage, and lay eggs randomly on soil and plant material. Damage by adults can be identified by a distinctive u-shaped notch in the leaf. The larvae are the most destructive stage due to their impact on nitrogen fixation. There are 5 instar stages of larvae, all feeding on various part of the root system. Punctures in the nodule cortex caused by first-instar larva affect the oxygen concentration required for *Rhizobium* bacteria, therefore directly affecting the number of functioning nodules. The plant diverts carbohydrates and nitrogen to the nodules, stolons and roots to regenerate new tissue, resulting in significant secondary effects on foliar production.

White clover is usually sown within ryegrass swards for livestock grazing, due to its leguminous properties and beneficial feeding quality. When sown at optimum levels, white clover has shown the potential to fix 150-200 kg ha^{-1} yr^{-1}. Conservative estimates show that the loss of biological fixation from white clover could cost the UK £16.5 million. The potential threat of *S. obsoletus* can be observed from problems faced in New Zealand.

New Zealand Case Study: CRW was introduced in New Zealand in 1996 but with larval populations at a much higher density than in native areas. This was predominately the result of the warmer climatic conditions favouring two generations of adults each year. This has been estimated to have had an economic impact between $800 million to $2 billion.

The predictions of increased temperatures between 1-4 ˚C would indicate that conditions in the UK may permanently favour a two-generational life cycle, resulting in a direct increase in population levels, grassland damage and potentially an economic issue.

This project aimed to observe the current CRW life cycle in UK, determining potential new generations, and compare this pattern to surface temperatures. Sampling took place on dry weather days between August 2016 and July 2017 in Dairy Corner field, using a Burkhard Vortis sampler. Preliminary results are shown below. These can be used to identify vulnerable stages in the life cycle and locate major damage periods. Further work will test the impact of increased temperatures on individual developmental stages to create a phenological model.



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