The Invasive Alien Species Project

FACT SHEET: 1 Invasive Alien Aquatic Plant Species

Crassula helmsii (Kirk) Cockayne, Australian Swamp Stonecrop

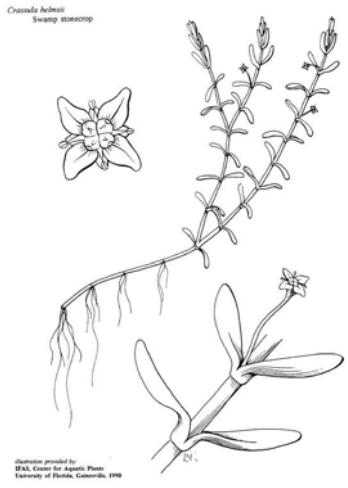
Synonyms *Crassula recurva; Tillaea recurva;* New Zealand Pygmyweed; Tillaea recurva

Introduction

Crassula helmsii causes major environmental problems in freshwater aquatic habitats. It has spread rapidly throughout the UK since it first became naturalised in the 1950s. It forms dense vegetation mats that out competes native species, and chokes ponds and drainage ditches. It readily reproduces vegetatively and does not die back during winter. Control is extremely difficult!!

Crassula helmsii was first recorded as naturalised in the mid-1950s, when it was observed in Greensted Pond, in Essex. As the English names suggest, *Crassula helmsii* originates from Australia and New Zealand. In its native range it inhabits a wide range of climatic variation, from a mean temperature of 30°C in summer to -6°C in winter (Leach & Newman, 2001). C. helmsii is also confined to areas which have levels of precipitation of between 0.1 - 0.55 m in summer (Nov - April) and 0.2 - 3 m in winter (May - Oct). Studies of genetic variation of isoenzymes suggest that only one introduction has been made to Britain, and that plants from along the River Murray are the likely source of the British population (Dawson, 1994).

Identification



Crassula helmsii is a perennial species with a creeping growth form with roots forming at the nodes. It has non-flowering, submerged shoots and emergent and terrestrial flowering ones. The leaves are somewhat fleshy, opposite, joined at the base and linear to narrowly oval. The flowers are stalked and solitary forming at the base of the leaves, they are four petalled, white or occasionally pale pink, with filaments and black anthers and appear between July-September (Figure 2 close up line drawing). In Europe two other species growing in damp muddy and sandy places on acid soils that are flooded in winter could be confused with the terrestrial form of C. helmsii. Northern Water Stonecrop, C. aquatica is annual, with pointed linear leaves and solitary, unstalked, white flowers. Southern Water Stonecrop, C. vaillantii differs from the northern species in its blunt-tipped leaves and forking clusters of stalked flowers (Fitter & Mannuel 1994). Submerged growth C. helmsii can also be mistaken for some Callitriche species especially C. hamulata, however Crassula never has notched leaf tips.

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Growth

Crassula helmsii is a perennial species with a creeping growth form with roots forming at the nodes. In the UK *C. helmsii* exhibits a range of growth forms.

When growing fully submerged in deep water (>0.5m), *C. helmsii* is well rooted at the base, reaching a maximum length of 1.3m at depth (Dawson & Warman 1987). Plants growing in such deep water have particularly thin, barely succulent leaves that are sparsely distributed along the upper stems. The thickness of these leaves is 0.3-0.4 mm with length exceeding 10 mm. Inter-nodal lengths are often very long (20-25 mm) in the lower part of the plant but are much shorter (5-12mm) towards the apical end.

In water depths of less than 0.5m, growth becomes dense with much more branching, with the stems becoming emergent during late spring and summer, either by the growth of the plant, or a decrease in water level or both. In these conditions the plant forms a very dense mat of sprawling stems from which many vertically growing side shoots with succulent leaves are produced, producing a turf which is very effective at excluding growth of other species. This is the form most commonly encountered in the UK. Culture trials in static water suggest that the change from production of the submerged to emergent leaves and visa versa is rapid. An additional shallow-water growth form can occasionally be seen extending into deeper water where, although rooted along the bank, its sprawling stems grow out across the surface to form an anchored floating mass.

In seasonal ponds and pond margins as they dry out and water levels decrease during summer the plants appear leafier and more compact than shallow water forms. Branching is more frequent as inter-nodal distances decrease and the plant usually forms a well-anchored turf. Growth on damp mud at the margins of ponds and lakes is restricted to dense mats which are not as erect as those in the water, this is considered more typical of its growth in its native range. In all cases leaves are opposite alternate.

Within its native range *C. helmsii* inhabits marginal situations in many riverine situations, however within the UK the plant has not effectively made the transition from static or slow flowing systems to more demanding habitats such as river margins. Studies have shown that biomass production in artificial stream systems is greater than for other species including *Elodea canadensis* (Dawson & Warman, 1987), highlighting the potential for this plant to colonise rivers systems.

Reproduction

In the UK *Crassula helmsii* produces flowers but does not produce viable seed and is reliant on vegetative methods of reproduction. It has non-flowering, submerged shoots and emergent and terrestrial flowering ones. The flowers are stalked and solitary forming at the base of the leaves, they are four petalled, white or occasionally pale pink, with filaments and black anthers and appear from July to September.

C. helmsii can reproduce vegetatively from small fragments of shoot (5-10 mm) that contain a node. Stem fragments can be broken away from mature plants and float around waterbodies before settling and growing. In addition, asexual reproduction is achieved via the production, in autumn, of short shoots with very short internodes, known as turions. These are produced apically, and float or are blown around the water surface, but have not been observed to sink. Turions appear to be very effective at colonising new areas.

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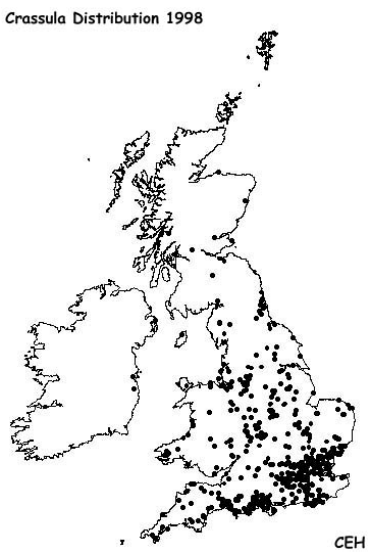
Dispersal

In the UK, all *Crassula helmsii* dispersal is via a combination of human-initiated primary invasion and secondary spreading of plants via vegetative mechanisms. In the 1950s and 1960s primary invasion was almost entirely caused by direct planting and deliberate introductions, with the *C. helmsii* being available from aquatic plant suppliers directly by name and as an unnamed 'oxygenator'.

While increased public awareness of the problem of invasion of natural sites has led to a reduction in the direct sale of the species, *C. helmsii* is often found passively as a contaminant of a wide range of other named species of native and non-native marsh and aquatic plants (Dawson, 1994). Other vector routes for the expansion and invasion of the species include:

i) Passive transfer of plant fragments via human activities e.g. transfer on fishing nets, during transfer of fish, disposal of aquaria and pond contents, on boat propellers, and during ecological survey and management work.
ii) Passive transfer by movement of wildlife, e.g. New Forest Ponies.
iii) Passive drift along canals and drainage channels.

N.B. Extreme care should be taken when visiting waterbodies infested with *C. helmsii* to ensure that plant fragments are not transferred to other uncontaminated sites.



UK History

Crassula helmsii is thought to have been introduced to the United Kingdom from Tasmania in 1911 (CAPM, 1999), but was only commercially available from 1927, when it was sold as an “oxygenating plant” by Perry's Hardy Plant Farm in Enfield, Essex. The first record of the species being naturalised is also from Essex, where it was recorded at Greensted Pond in 1956 (Dawson & Warman, 1987). However, there is anecdotal evidence to suggest that *C. helmsii* was present on the Isle of Wight in the 1930s, possibly related to the import of sheep from Australia. This mode of transfer is thought to explain the movement of the species from eastern to western Australia (Dawson, 1994).

In the UK, current sources of *C. helmsii* include Garden Centres and Aquatic Nurseries as well as vegetative spread.

Habitats Affected

Most British freshwaters are susceptible to invasion by *Crassula helmsii*, although it has not been found naturalised in flowing water. However it may be present in sites adjacent to moving water, such as backwaters, or seasonally drying river banks (Dawson & Warman, 1987).

Environmental Tolerance

The wide environmental tolerance of *C. helmsii* renders it ideally suited to UK climatic and environmental conditions.

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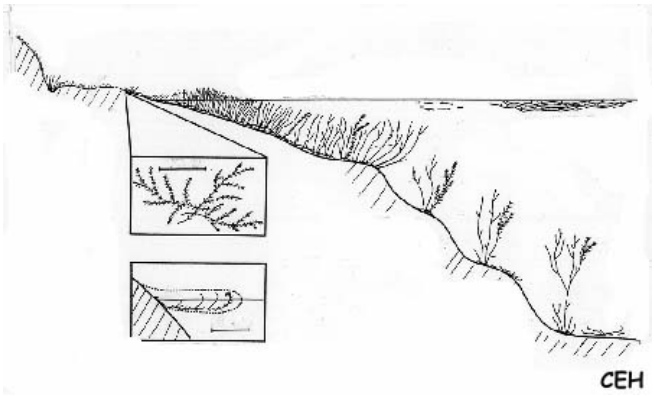
Control

Best Option Emergent
Material on banks should be treated with Glyphosate, formulated for use in aquatic environments. Emergent material in the water should be treated with both glyphosate and Midstream if access is possible

Best Option Submergent
Treat with "Midstream" at least twice per growing season at intervals of between 3 and 5 weeks. Herbicide applications can be started as early as February. Re-treatment should take account of ANY green vegetation.



Two growth forms of *C. helmsii*; floating mats and submerged plants

Biological
No known biological control agents exist in the UK. Grass Carp will eat small infestations that are not well developed. Dense infestations cause sever fluctuations in dissolved Oxygen content of the water, and subsequent fish mortality.

Mechanical
Do NOT use mechanical methods on *Crassula helmsii*!! Small plant fragments are produced by cutting and tearing which can rapidly regrow. In this way, treatment of an area may lead to infestation of downstream areas or rapid reinfestation of the treated area. No mechanical methods are recommended.

Chemical
Only really susceptible to herbicides containing diquat and glyphosate. "Midstream" - a gel formulation of diquat is recommended as greater penetration of the herbicide into the plant is achieved. This formulation is recommended even in still water, and can be applied when the plant is emergent.

Other
Shading can be effective if maintained for long periods.

References
Leach, Newman (2001)
Dawson (1994)
Fitter & Manuel (1994)
Dawson & Warman (1987)
CAPM (1999)

Further Information Available From
Environment Agency

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