

Channelled Crystalwort

Riccia canaliculata in England

Sharon Pilkington reports on the only population of *R. canaliculata* in England: New Zealand pigmyweed, geese and other threats are considered

Channelled Crystalwort *Riccia canaliculata* is an ephemeral thalloid liverwort of seasonally exposed sediment around the margins of pools, lakes and reservoirs. It is a nationally rare species that is currently known from only four ten-kilometre Ordnance Survey grid squares in England and Scotland.

It is also a NERC Act Section 41 species and listed as Vulnerable on the current British Red List. In 2015 funding was made available through Natural England's Species Recovery Programme to review the status of English populations and to investigate possible causes of decline.

Verified English populations have only ever been known from three locations and since 2000 *R. canaliculata* has only been seen at Brown Moss Site of Special Scientific Interest (SSSI) in Shropshire. It was also recorded from Hawkins Pond, near Horsham in Sussex in 1968 and 1969 and at a locality thought to be The Mere, at Mere near Knutsford in Cheshire in 1834. The Natural England funding allowed the more recent (Shropshire and Sussex) sites to be revisited and resurveyed.

Autecology and identification

R. canaliculata completes its life-cycle in a single year, lacks asexual propagules and is usually fertile; along with other members of the genus its sporophytes develop within the thallus tissue.

Plants are monoicous and devote considerable energy to reproductive effort, producing numerous large spores from summer to spring. These have the capacity to stay dormant in submerged mud for a number of years until favourable conditions return.

The plant is a member of the European Southern-temperate element and is widespread in Europe east to Poland and Hungary. The complete world distribution is unclear due to confusion with other *Riccia* species but it is also known from south-west Asia, north Africa and parts of north and south America. It always seems to have been a rare plant in Britain, with the first record made in 1800 in north Wales (where it was last seen near Beaumaris in 1972).

Rosettes often grow among other ephemeral mosses and liverworts, including *Riccia cavernosa*, *R. huebeneriana*, *Aphanorrbegma patens* and species of *Ephemerum*. Plants have narrow, branched thalli with distinctly narrowed branch tips which form partial rosettes or intricate mats of thalli up to 2cm long. When plants are well-grown the channelled dorsal thallus surface is distinctive but this character can be poorly developed in young plants leading to possible confusion with the terrestrial form of *Riccia fluitans*. However, it is readily separated from that species by the way the apical ventral scale curves back over the thallus tip like a little concave flap.



△Fig 1. Several well-grown plants of *R. canaliculata*, showing the species' signature channelled thallus. S. Pilkington.

Brown Moss SSSI

R. canaliculata was first collected at Brown Moss in 1975 by Jeff Duckett. Since then it has been of episodic occurrence around the margins of the largest pool in the SSSI.

Brown Moss is one of the meres and mosses of the north-west Midlands which together form a nationally important series of open water and peatland sites. These have developed in natural depressions in the glacial drift left by the ice sheets which covered the Cheshire-Shropshire plain around 15,000 years ago. Brown Moss is of special importance for the marsh, swamp and fen communities associated with the pools which occupy hollows in the sand and gravel substrate.

Water levels at Brown Moss fluctuate naturally and in years when the water table is high *R. canaliculata* does not appear at all. Fortunately for the author, when the survey of Brown Moss was undertaken in September 2015, the habitat

looked ideal, as considerable areas of sediment were exposed around the pool margins.

Close inspection of the mud revealed a much larger and more extensive population than had been hoped for. Around the largest pool as many as 10,000 plants were estimated to be present, intermittently along the entire shoreline and only missing from places where the mud was overhung by trees or bushes and/or where Canada Goose *Branta canadensis* droppings were abundant. Some *R. canaliculata* thalli had even recolonised part of the eastern shore where major works were undertaken in 2003/4 in an unsuccessful attempt to eradicate a large and troublesome population of New Zealand Pigmyweed *Crassula helmsii*. This action probably resulted in the loss of *R. canaliculata* from this part of the pool for about a decade. Small colonies were also found in two other small pools in the SSSI, where it does not appear to have been noted before.



△ Fig 2. Southern shore of the large pool at Brown Moss. The arrow indicates the favoured niche of *R. canaliculata*. S. Pilkington.

The thalli preferred damp, semi-vegetated organic sediment approximately half-way down the inundation zone. They were mostly absent from the most recently exposed mud close to the water and from the top of the inundation zone where the vascular plant community was well-grown and where the sediment was drier.

BRECOG-style measurement of certain environmental variables showed that *R. canaliculata* appeared to favour moist but consolidated organic sediment with a moderately acid pH, high levels of natural light and some micro-shelter provided by scattered vascular plants. The species is a relatively poor competitor and was absent from otherwise suitable sediment where aerial cover of emergent vascular plants was greater than about 60%. Amphibious *Bistorta Persicaria amphibia* was its most frequent vascular associate, along with frequent Celery-leaved Buttercup *Ranunculus sceleratus*, American Willowherb *Epilobium ciliatum*, Bulbous Rush *Juncus bulbosus* and numerous other vascular species. The greatest density of rosettes was found where there were patches of bare mud between vascular plants, permitting rapid colonisation and growth. *R. canaliculata* appeared to be indifferent to aspect and interestingly, did not appear unduly affected by the presence of scattered *C. helmsii*,

a species that was locally abundant around the upper edge of the inundation zone.

Causes of decline

Because there are so few populations of *R. canaliculata* and even fewer that have been meaningfully monitored or documented, little is known about the causes of loss and decline of this species in England, or the British Isles in general.

The work uncovered some historical clues about the fate of the species at Hawkins Pond in Sussex. When this pool was visited in September 2015 the banks were extensively wooded and there was little sign of any exposed sediment that might offer suitable habitat.

A local fishery manager provided an interesting history of the pond (actually a small lake). Following severe flooding of the nearby town of Horsham in the late 1960s, the water levels in the pool were artificially and permanently lowered, exposing extensive areas of bare mud around the margins of Hawkins Pond for several years. This period coincides with the records of *R. canaliculata* from the pool and it seems that the population there was short-lived, remaining only as long as the mud remained open. Since then natural colonisation of the banks by broad-





△Fig 3. Grazed *C. helmsii* (centre) growing with *R. canaliculata* (top right) and *R. cavernosa* (bottom).
S. Pilkington.

leaved woodland and scrub has taken place and unwooded margins are now fringed by stands of tall emergent vegetation, rendering Hawkins Pond unsuitable for *R. canaliculata*.

Threats to populations

Generic threats to populations of *R. canaliculata* include (i) alteration of the natural seasonal fluctuation of water levels, (ii) pollution and (iii) eutrophication. To these must be added successional change e.g. terrestrialisation of wetlands via drying out and the advance of woodland and scrub.

R. canaliculata has been known from Brown Moss for 40 years and there is little doubt that it is currently doing well there. The SSSI is well managed and current management operations include episodic tree and scrub removal around the margins of the pools to maintain open inundation habitat.

An interesting interplay is going on between

two unwanted guests at Brown Moss and it is unclear as to how much of an impact each has on the population of *R. canaliculata*. *C. helmsii* has been known there since 1990 and has been a cause of great concern for site managers, competing in the inundation zone with numerous special plants. No recent attempt has been made at wholesale eradication but in places it seems that its vigour is checked by grazing waterfowl (presumably including the large resident flock of geese, also regarded as an invasive species).

However, future impacts of this flock of geese (estimated to number 70-100 birds) on the population of *R. canaliculata* are unknown and must be a grave concern. Whilst geese clearly play a role in helping to control *C. helmsii* through grazing of plants in the inundation zone, their droppings are known to contribute to water enrichment. It has been suggested that water fouling caused by the expanding British population of Canada geese in the 1990s has possibly caused loss of the commoner *R. fluitans* from some sites. Certainly no *R. fluitans* was found during the fieldwork, despite Brown Moss being a long-known locality for the species. Monitoring of the population of geese, dissolved nutrient levels and of the extent of *C. helmsii* are all therefore going to be important in ensuring that the only remaining population of *R. canaliculata* in England continues to flourish.

Acknowledgements

I am grateful to Natural England for funding the project work and for providing site-specific information and to Jonathan Cox who reviewed a draft of this article. Thanks also to Tom Ottley, Mark Lawley, Martin Godfrey, David Long and Oli Pescott for all providing assistance in various ways.

Sharon Pilkington

66 Newtown, Westbury, BA13 3EF
e sharon.pilkington1@btinternet.com