

Species dossier:

# *Hagenella clathrata*

Window winged sedge

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Mating adult pair *Hagenella clathrata*

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***Hagenella clathrata* (Kolenati, 1848)**  
**Window winged sedge**  
**(Trichoptera: Phryganeidae)**  
Genus *Neuronia* or *Oligotricha* in some accounts

## Introduction

The Window winged sedge (*Hagenella clathrata*) is a priority species within the UK Biodiversity Action Plan. The purpose of this dossier is to draw together available information on its distribution in the UK and its ecology in order to assist Government Agencies, Planning Authorities, landowners and conservation practitioners with the implementation of action to conserve this species in the UK.

The Window winged sedge was classified as Endangered in Shirt (1987) and RDB1 in Wallace (1991). It has no formal legal protection and is not listed in any schedule of the Wildlife and Countryside Act or in annexes to EU directives. It is a scheduled species in Holland under an EC directive, being classed as vulnerable. From various web sites it is listed as threatened with extinction in the German states of Nordrhein-Westfalen, Bayern, Berlin, and Mecklenburg-Verpommen, critically endangered in Norway, endangered in the German state of Baden-Wurtemberg and Switzerland, seriously threatened in Poland, Ukraine and Belarus, threatened in the Czech Republic, vulnerable in Denmark, Sweden, Hungary and the Ardenne in France, on the Red List for Carinthia in Austria, the Leningrad region of Russia, and Estonia. Only in Finland (personal note from Aki Rinne) does it seem to be still widespread. Czachorowski (2004) provides a good summary of the predicament of this species as vanishing almost everywhere in Europe as bogs are exploited and the need for bogs to be protected and peat workings restored.

## Summary

The Window winged sedge (*Hagenella clathrata*) is one of Britain's rarer caddis flies. It has certainly been recorded from two sites near Aviemore, one in Galloway, Two adjacent sites on the Shropshire Welsh border, three sites in Staffordshire, one site in Greater London and three sites in Surrey. There are also records not backed by voucher specimens for an additional Surrey site and one in Hampshire.

## Ecology

In the UK the species uses three types of site. The edge of lowland raised bogs, the edge of schwingmoors (quaking bogs), and wet heaths. At all these sites it is associated with areas with well-developed tussocks, principally of Purple moor grass (*Molinia caerulea*). These areas need to have small pools from autumn to early summer. These pools are small, shallow, between tussocks and often so over-shaded by the plants and their associated litter that no surface water is apparent. They usually dry to mere sogginess by mid-summer when the adults fly. As this is a comparatively abundant habitat, the reasons for the Window winged sedge being so restricted is not known.

Birch trees appear to be an important element in the habitat as they provide at least some of the larval food and case-making material. As a scarce bog inhabitant it has not been the subject of detailed ecological investigation in any country. A series of unpublished reports from the current author give some insight into its requirements. Wallace (2009a, 2009b) & Wallace & Dodd (2010).

The habitat outside the UK seems similar, it can be difficult to decide on this when using on-line translation services but it seems to have been found in a surprisingly

wide range of habitats. Unfortunately the micro-habitat where larvae have been found is not detailed. Tussocks are never mentioned, but may be an important element of the habitat and the few photographs of Dutch habitats resemble those that support the species in this country. However the habitat in Sachsen-anhalt (Hohmann, 2007) looks much wetter and flatter. In Holland, Higler (2008) records it from bogs and heaths, as in the UK, and a summary of its distribution in Holland, (Verdenschot *et al* 2003) gives acidic bog pools ranging from the temporary to the heavily shaded, and also in temporary non acidic pools. A survey of the Korenburgerveen in southern Holland found that 98% of *Hagenella* were found on the peat moor but 11% were found in wet *Salix* woodland. Natuur Kennis (2008) records *Hagenella* from pools in reed-swamp associated with peat bogs. The habitat in Sachsen-anhalt seems to be dominated by the sedge *Rhynchospora* (Hohmann, 2007). In the Cesky Krumolka region of the Czech Republic the habitat is given as peat bogs and wet fir groves, (Verberk & Esselink, 2004). In the Lac de Remoray nature reserve in France it was taken in Malaise traps at the edge of a lake that was surrounded by marsh. At Tvarminne, Finland, Silfvenius (1904) describes the habitat as marshes with the larvae and pupae being found in very shallow water and that there is no obvious surface water. Finland seems to be one of the few countries where this species is still fairly common and Aki Rinne tells me he knows it from a variety of small still-water habitats. The Polish Red List gives the habitat as water bodies on raised bogs, including those that have been restored and re-wetted. A discussion of the habitat in a bog near Rabensburg (Jansen *et al*, 2003) suggests that it is a species of disturbed bog, marsh fen and varied fen but not of intact bog. Duinen *et al* 2009b describe *Hagenella* as being in 27% of natural Estonian bogs but only in 5% of remnant bogs. Duinen *et al* 2005 found *Hagenella* in bog, transition mire and the bog edge, the lagg. Duinen *et al* (2009) suggested that *Hagenella* was originally a species of this bog edge. The Baden Wurtemberg red list gives the habitat as moorland waters, and ditches with a slow current. Wiggins (1998) gives acidic bog pools as the general habitat for all members of the genus.

The adult is active on warm afternoons. At other times they rest on vegetation and can be easily disturbed. On Whitmoor Common, Surrey, Graham Vick noted that small trees seem to be a focus for activity. The flight period is May and early June in Surrey but June and early July in the northern sites. In captivity females lived for about five weeks (Wallace & Wiggins, 1978) but they have not been seen in the late summer or autumn which suggests that unlike the several limnephilids with which they share the site, they do not diapause before egg-laying. The Polish Red List, (Czachorowski, 2004), says that the adult flies in the evening and night, close to the water surface, and feeds on plant juices, presumably nectar; this is so at variance with other accounts that the suggestion must be made that species have been muddled.

I have not found eggs in the wild but in captivity they were laid on soggy peat at the bottom of a small flight cage (Wallace & Wiggins 1978). Silfvenius (1906) describes the egg mass as an irregularly spherical ball of jelly 8 mm in diameter. It is presumed that the egg masses are laid somewhere soggy beneath the litter layer that partially, or almost completely, overhangs the pools at most sites. The jelly surrounding the eggs may remain intact until the water returns, as described by Wiggins (1973) and Wiggins *et al* (1980). In captivity the larvae hatched within the two egg masses at 28 and 17 days after laying but did not escape from the egg jelly until it was submerged. The priority was to rear early instar larvae for taxonomic purposes so the length of time the egg masses might have remained if kept just damp was not investigated. The jelly of species which persist as the egg for long periods e.g. that of the Phryganeid *Trichostegia minor* and several *Limnephilus* species is usually firmer than was the case for *Hagenella clathrata*. It is thus speculated that the larvae hatch a few

weeks after laying and disperse slightly before hiding in the damp leaf litter. This is not described in the literature but was mentioned by Hiley (1970) in connection with premature hatching of a variety of temporary water body limnephilids, as might happen perhaps after a summer cloud-burst produced ephemeral pools. I have observed it for several species including *Limnephilus luridus* that is often found with *Hagenella* and can have a similar early flight period and egg laying, and long wait until the water returns and remains.

In water, the larvae grow quite rapidly and reach full size in spring. There seems to be a notable lack of nutritious foods in their pools. Almost all phryganeids eat a significant amount of animal food in later instars (Wiggins, 1978) and this would seem the most obvious way that a comparatively large larva could fuel its development over just a few months. It is even possible they are one of the major predators in their pools. The nature of that food is not known but oligochaets, chironomids, Trichoptera and helodid beetle larvae would seem to be available; cannibalism cannot be ruled out. Czachorowski (2004) describes the larvae as omnivores but feeding mainly on small animals. In captivity larvae were reared in a container with many dead leaves, amongst which they hid, but were also offered nutritious food in the form of cracked wheat grains and tropical fish food flakes; they were impossible to observe feeding amongst the dark peaty water and tree leaves. Deborah Proctor caught a final instar larva in a pit fall trap laid at Chartley Moss to collect spiders. This suggests larvae may wander out of the water, but is not restricted to that species in the habitat, as Liverpool Museum pit-fall traps set at Whixall Moss caught several *Limnephilus luridus* larvae. Leaving the water to feed on terrestrial material is thus another possible source of food, as was observed for stream limnephilids by Elliott (1970).

Phryganeid larvae have striped heads, presumably for camouflage in dappled light. *Hagenella* is a marked exception, probably reflecting the fact that it lives in shaded peaty pools where the uniform head colour is more effective.

*Hagenella* has the prominent ventral seta of the distal end of the tarsus and of the tarsal claw slightly adpressed, rather than being straight as in other genera. The biological significance of this feature is not known.

Preparation for pupation shows unusual features. Most caddis larvae shorten the larval case so that it is just long enough to enclose the pupa. *Hagenella* larvae either make a new case or add additional rings, probably the latter, so the resulting case is over twice the length of the enclosed pupa. As it is usual to find empty larval length cases in pools occupied by *Hagenella* pupae making a new case cannot be ruled out. Making a new or partially new case before pupation is known as an adaptation to particular conditions in some caddis and is discussed by Malicky (2000) and Wiggins (2001).

On Whitmoor Common, the pupal cases were found buried vertically into the damp leaf litter at the bottom of the pools with only the top visible. At Whixall Moss the pupal cases were found between layers of plant litter along the pool edges. The pupae will be able to maintain contact with damp or saturated conditions at the bottom of the buried pupal case. The case has a normal posterior closing grille but the anterior end is closed by a plug of plant material. Associated with this, is the absence of pupal mandibles that other caddis larvae use to cut their way out of the pupal case; *Hagenella* presumably just forces the anterior closing plug aside; some other foreign phryganeid genera also lack cutting pupal mandibles (Wiggins, 1998). The case form and pupation behaviour could also be in response to pressure from predators, cannibals or parasitoids.

The morphological and behavioural adaptations to pupation conditions seem to suit pools with much leaf litter on the bottom that dry up but maintain a wet bottom under the superficial litter layer. This would enable them to exploit pools other larvae might be unable to utilise due to premature drying up, or that would not be wet long enough to support the growth of a large larva; this is very much the largest caddis found in its pools. At Whixall and Chartley Mosses, the bottom of the pools may be kept in contact with deeper peat due the action of voles that make tunnels around the edge of the tussocks; it is quite common to bring up vole droppings with *Hagenella* material. From the surface it is often impossible to recognise a potential *Hagenella* pool. However when walking, or perhaps floundering would be a better description, over its general habitat, when you seem to step through the superficial litter cover into a particularly deep hole and hit firm bottom they are the pools to investigate; some of the pools at Whitmoor also fitted that category but others were shallower. The shallower pools however, had a very thick fringe of overhanging plant litter and a deep litter layer on the bottom. It is possible that such shallow pools are a sub-optimal habitat and colonised as outliers.

Occasionally larvae fail to mature in time before the pools dry up but may seal up both ends of the case to await better conditions. These have been found on two or three occasions. It is possible they could survive over summer in this way and give rise to a two season life-cycle. In May 2010 such a larva was found at Whitmoor Common. Despite being put into water it re-sealed its case with a grille at each end. It was kept at about 10 degrees Centigrade and did not re-open the case until some time in December; unfortunately its re-opening was not observed in time and it died, presumably of starvation. Whilst this is an isolated observation it does suggest yet another strategy adopted by this species of temporary water-bodies. This behaviour is not unique to *Hagenella*, as reported by Zamora-Muinoz & Svensson (1996) for *Limnephilus coenosus* Curtis and *L. vittatus* (Fabricius) in Sweden and Sommerhauser *et al* (1997) for *Oligostomis reticulata*, (L.) a caddis with morphological and relational affinities to *Hagenella*, as well as other species in streams that dry in Germany. I have noticed in the UK that *L. coenosus* is able to exploit shallow pools on moorland that dry up irregularly in drought, but only those where there is an extensive fringe of leaf litter, into which the larvae can burrow and which stay moist inside.

A semi-terrestrial existence for this larva could also explain why it is attacked by an ichneumon. *Sulcarius biannulatus* (Gravenhorst), Siltala (1906) and Neilsen (1906), a parasitoid also of several *Limnephilus* species in Europe and North America. Parasitised *Hagenella* have not yet been noticed in Britain, but their discovery would require opening sealed pupal cases and the inevitable injury to many individuals of this threatened caddis. Other caddis larval cases from temporary water bodies have been occasionally encountered by this author, enclosing a parasitoid cocoon, but success in breeding out an adult is restricted to one *Theroscopus megacentrus* (Scchiodte) reared from a case of *Limnephilus sparsus* Curtis from a tussocky marsh. Like *Sulcarius. biannulatus*, it too may be a parasite of other caddis of semi-dry areas.

## History in Britain

This attractive insect was first taken in this country by Joseph Chappell at Bishop's Wood Staffordshire in 1867 (Natural History Museum specimen and Chappell, 1868a), followed by its capture in June 1868 at Bishop's Wood and at nearby Burnt Wood (Chappell, 1868b). Edwin Brown took it around that time at another Staffordshire site which he does not specify except that it is "many miles from Mr.

Chappell's locality". That this was Chartley Moss is a very strong possibility as it, Bishop's and Burnt Woods remain the only three Staffordshire sites and Burnt Wood is close to, not "many miles" away from the original site of Bishop's Wood; I am told that some collectors regarded Bishop's and Burnt Woods as synonymous. It continued to be taken in the Burnt Wood area until the site was destroyed by afforestation with the last recorded specimen being from H.L. Burrows on 21.6.1942, that specimen being in Manchester Museum. There are specimens from Chartley Moss almost certainly pre 1900 but there is no date on the specimens in Manchester Museum or in the G.T. Porritt collection in the Tolson Memorial Museum, Huddersfield; the latter were apparently taken by a Mr. Ellis of Solihull. The Chartley Moss site continues to support the species with the latest record known to this author being a male seen there by David Pryce on 10.7.2004.

The next record is from the Tottenham Marshes, London in 1885 by Mr. Boden (McLachlan, 1888a), with the latest record of 2.6.1888 being from Robert McLachlan himself (McLachlan, 1888b).

There is a very intriguing record for the New Forest in July 1897. There are no specimens, just an entry in a collection catalogue made before the particular collection was acquired by the National Museum of Wales at Cardiff. Whilst this is probably an error the recent records from the comparatively nearby Surrey Heaths raises the interesting possibility that this was a genuine record.

In June 1903 the species was found near Corsemalzie in Wigtownshire by J.G. Gordon and reported on by Morton (1904). Ian and Brenda Wallace visited the area in 1985 but there has been so much afforestation, and there were obviously so many possible sites based on topography, that it was not sensible to devote a large amount of time and that which was proved unsuccessful. The significance of this find is that there are an awful lot of fine raised bogs between the known two Scottish areas for *Hagenella* of Speyside and Wigtownshire and the possibility of this species being found elsewhere in Scotland is good.

It is surprising that there are no records from the Whixall Moss complex in Shropshire until the 1950s. The area was very popular with lepidopterists and the lack of records for even this striking caddis probably reflects the general lack of interest in the group. The first record was taken by a schoolboy entomologist, Richard Wash, on an outing of the Lancashire & Cheshire Entomological Society on 21.6.1958 (specimen in World Museum Liverpool having been acquired in 1975). The area that the society used to work, principally for Large Heath Butterflies, is where the species persists today. Hugh Michaelis took an adult at adjoining Bettisfield Moss on 22.6.1960 (specimen in National Museum of Wales, Cardiff). Colin Johnson publicised the Whixall site after recording it there on 3.6.1961 (Johnson, 1962). Michaelis was closely associated with Manchester Museum at the time so it may seem curious that Johnson did not mention his record. The most probable explanation is that Michaelis, who collected few caddis, did not appreciate the significance of what he had taken and like Richard Wash before him just took it because it was a striking insect that he would get around to identifying some day. Whixall Moss is a complex of several mosses, now bisected by the Shropshire Union Canal. North of the canal there is Fenns Moss, occupying the western Welsh end, abutting Whixall Moss that is in Shropshire. Despite many visits since 1975, *Hagenella* has not been taken on Fenns Moss. The peat extraction history of the two mosses is probably significant. Whixall was enclosed earlier and has more small peat cutting areas. This has led to a greater diversity of older long abandoned peat cuttings. Enclosure at Fenns was later by which time mechanical extraction was more intensive (Joan Daniels personal comments and Berry *et al* 1996). It is fascinating that events 200 years ago are still

being reflected in today's fauna. Some of the Whixall sites are also long-abandoned bullock-grazing fields, once used seasonally. It is interesting that *Myrica*, which occurs south of the canal on the uncut moss, Wem, is not present at Whixall/Fenns. This is interpreted as indicating that the marginal parts which would probably have supported *Hagenella* in the totally unexploited moss, were developed a long time ago. *Hagenella* has been seen on Whixall Moss many times since 1975, the latest being of empty pupal cases on 3.7.2010. The recent management work on Fenns Moss should mean that sites there will eventually be colonised, providing it can be maintained in the interim on Whixall moss. After the initial find in 1960 on Bettisfield, it was not until 1986 that the Wallaces re-discovered it there; they were at the time ignorant of the earlier unpublished Michaelis capture. They took it again in 1987 and 1992 but the site was then drying due to it being dominated by pine trees, - now felled. A single section of larval case was found there in 2010, but how old and from a population of what size is not clear. As far as can be ascertained, the area at Bettisfield was also an old hand-cut area. Wem Moss is the most southerly of the Whixall complex, and now separated from Bettisfield Moss. Much of it has not been exploited for peat. The Wallaces thought they saw an adult there on 9.7.1986, but could not confirm that, or on subsequent visits. David Pryce provided the necessary confirmation, finding several on 6.7.2002 and 13.7.2002. Cadney Moss is the smallest of the mosses and adjoins Wem Moss, but did not seem to have suitable habitat when investigated by the Wallaces in February 2010. However some may develop and be colonised from Wem, providing that population can be maintained, and drying up of Wem Moss seems a problem.

The next population to be discovered was on Speyside with Ted Pelham-Clinton finding it at Kinrara, near Aviemore on 23.6. and 27.6.1967 (National Museum of Scotland specimens) and Ted Aubrook, a friend of Pelham-Clinton, taking it there on 23.7.1968 (Manchester Museum specimen). Bill Ely took it at the R.S.P.B. reserve of Insh Marsh on 16.6.1982 (personal message, but presumably now in Rotherham Museum).

The last place *Hagenella* was discovered is the Surrey heaths. On 11.6.1995 Andrew Halstead took a specimen at Whitmoor Common, near Guildford. It was several years later that it was offered for identification to Ian Wallace and Peter Barnard; another specimen whose significance the collector did not appreciate, it being merely a caddis! Ian Wallace investigated the site on 30.6.2002. He found the area east of the railway line, where Halstead had taken it then too dry, but old pupal cases were found in a wetter area of the western section; another pupal case was found in the western section in 2009 (Wallace, 2009) and that year Graham Vick saw many adults over a short period at the end of May and early June. Ian Wallace and associates located larvae, pupal cases, and even a single adult on 27.4.2010. (Wallace & Dodd, 2010). After Halstead's find became generally known, discussion with Don Tagg, a general Surrey entomologist suggested he had seen it to the east of the railway line several years before Halstead's find. Don Tagg had also taken specimens elsewhere in Surrey, but not appreciated their significance. He showed a specimen to Graham Vick, taken at Witley Common on 27.5.1988. The area has subsequently been re-developed and Ian Wallace found very little suitable habitat, and no *Hagenella* in June 2009. Don Tagg also believed he saw it at Thursley Common in 1988 and again on 12.6.1996, in the very famous area that used to support the White-faced Darter Dragonfly. This record is curious. Even with the unpopularity of caddis with collectors it seems astonishing that no-one else took a specimen of this striking insect at this very frequently visited entomological spot. The habitat is now lacking tussocks, but in the past had a more diverse vegetation structure (Graham Vick, pers comms.); the entire site suffered a very severe fire in 2006. Descriptions of the habitat in Europe, whilst a little difficult to determine from



the various accounts, would seem to suggest that a variety of peatland pools are suitable. However, without a voucher specimen I must raise the possible query that what was seen was the related *Oligotricha striata* (L.) which when on the wing does look very like *Hagenella* and has quickened the pulse of this current author on a number of occasions.

### **European distribution**

The Fauna Europaea website lists this species from the following countries and major regions, listed alphabetically: Austria; Belarus; Belgium; Czech Republic; Denmark; Estonia; Finland; Germany; Hungary; Latvia; Lithuania; Netherlands; Romania; Russia (Central); Russia (North West); Slovakia; Slovenia; Sweden; United Kingdom.

### **Recent Survey Work**

*Hagenella* adults have been observed in most years at Whixall since 1975, but there have been very few systematic surveys (Wallace, 2008) and none that have aimed at population estimates. There have also been occasional visits in the past few years, by Ian Wallace Peter Boardman and David Pryce to Chartley Moss and David Pryce to Wem Moss. Ian Wallace undertook surveys for new sites in Surrey in 2009 (Wallace, 2009) and the Whitmoor Common population was investigated by Graham Vick in 2009 for adults and for the immature stages by several workers in 2010 (Wallace & Dodd, 2010). Scotty Dodd recorded several adults at Whitmoor in May 2011, and he and a colleague also found it at Chobham Common, in Surrey in May 2011.

### **Survey methods**

Searching for larvae seems destructive of the habitat as the particular features of overhanging litter is easily disturbed (At Whitmoor there is currently limited, and experimental cattle grazing in part of its range, which may prove beneficial by the creation of deep poached pools, or my prove too destructive due to destruction of litter at pool edges.)

It is thought that survey for adults by a walked transect will be possible, using the method adopted for day-active Lepidoptera. The observation by Graham Vick at Whitmoor that particular bushes were popular as swarming points suggests that the transect includes such features, identified by initial survey each season. Whilst walking through the habitat may be damaging, a carefully marked route would limit its overall effect.

### **Identification**

The distinctive adult is featured in popular works such as Greenhalgh & Ovenden (2007). It can also be identified using Macan (1973) or Malicky (2004); a new key to adult UK caddis, authored by Peter Barnard and Emma Ross is expected to be published in 2011. In flight it seems much darker than at rest and looks quite similar to the phryganeid *Oligotricha striata* (L.) which can share its general habitat but lives in more open ditches or *Sphagnum*-filled pools. It is important if a suspected *Hagenella* is seen that it is pursued to rest so it can be seen to have yellow chequered wings, rather than black-streaked, dark brown wings; the striking orange-yellow neck of *Oligotricha* is not shared by *Hagenella*.

Wallace *et al* (2003) provides features to enable the certain identification of larvae.

Pupae in cases and empty pupal and larval cases will be easy to identify. If pupal exuviae are encountered away from the cases, and I have never found any, then their unusual mandibles will distinguish them from those of other phryganeid pupae.

Wallace & Wiggins (1978) and Wiggins (1998) also provide many useful illustrations.

No features are known to certainly distinguish the egg masses from those of limnephilids that live with them such as *Limnephilus elegans* Curtis and *L. luridus*.



**Pupae case of *Hagenella clathrata*, modified from Wallace & Wiggins (1978)**



**Adult mating pair of *Hagenella clathrata* © Matthew Wallace**

## **Threats**

The main threats include:

1. Drying out of habitat
2. Encroachment of trees into habitat
3. Opening up of tussock habitat by trampling of livestock

## **Action plan for the Window Winged Sedge (*Hagenella clathrata*)**

- 1 A method of monitoring adults by means of a walked transect should be developed.
- 2 Adults should be monitored at the four English sites of Whitmoor, Chobham, Chartley and Whixall at appropriate times in the flight period of May to early June at Whitmoor and mid June to early July at the other sites.
- 3 The two known Speyside sites should be investigated and other suitable sites, probably initially identified by aerial survey, (Google Earth), should be visited.
- 4 The Riverfly Postcard for *Hagenella* should be circulated in Berkshire, Surrey and Hampshire to encourage finding possible new sites.
- 5 Possible Surrey sites identified in a habitat survey in June 2009, by Ian Wallace, deserve a re-visit in late May.
- 6 The Whitmoor grazing experiment requires careful monitoring and swift cessation if it appears to be damaging the population.
- 7 Habitat creation should be investigated at Chartley. The suggestion is that very small pools could be dug in drier areas of Chartley adjacent to locations where the species is found in to see if they would be re-colonised; this would also be a possible development at Whitmoor.
- 8 Cutting invading birch at Chartley may assist in maintaining marginal populations; at Whixall, tree thinning has enabled the species to persist and increase at a part of the site where *Hagenella* was observed by Ian and Brenda on their first visit to that site in 1975.
- 9 Wem Moss appears to be drying out and this should be investigated and remedied, if possible.

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## Appendix 2 Records of (*Hagenella clathrata*) from the UK

DAY	MONTH	YEAR	DAY2	MONTH2	YEAR2	VC	GRIDREF	LOCALITY	SOURCE	STAGE	NAME	Recorder name	Determiner name
		1867				39	SJ75-31-	Bishop's Wood	Natural History Museum	A	Hagenella clathrata	Chappell, J.	Not known
		1867				39	SJ75-31-	Bishop's Wood	Oxford Hope Department Museum	A	Hagenella clathrata	Chappell, J.	Not known
		1867				39	SK7--3--	Bishop's Wood, Staffs	Natural History Museum	A	Hagenella clathrata	Chappell, J.	Chappell, J.
		1868				39	SJ75-31-	Bishop's Wood	Daltry (1933)	A	Hagenella clathrata	Chappell, J.	Chappell, J.
	6	1868				39	SJ7--3--	Bishop's Wood and Burnt Woods	Chappell (1868b)	A	Hagenella clathrata	Chappell, J.	Chappell, J.
		1868				39	SK7--3--	Bishop's Wood, Staffs	Chappell (1868a)	A	Hagenella clathrata	Chappell, J.	Chappell, J.
		1869				39	00000000	Staffordshire "many miles from Mr. Chappell's locality"	Brown (1869)	A	Hagenella clathrata	Brown, E.	Brown, E.
		1885				21	TQ3--8--	Tottenham Marshes	McLachlan (1888a)	A	Hagenella clathrata	Boden	McLachlan, R.

DAY	MONTH	YEAR	DAY2	MONTH2	YEAR2	VC	GRIDREF	LOCALITY	SOURCE	STAGE	NAME	Recorder name	Determiner name
2	6	1888				21	TQ3--8--	Tottenham Marshes	McLachlan (1888b)	A	Hagenella clathrata	Boden	McLachlan, R.
		pre 1900				21	TQ3--8--	Tottenham Marshes	Natural History Museum	A	Hagenella clathrata	Boden	Not known
	7	1897				11	00000000	New Forest	National Museum of Wales	A	Hagenella clathrata	Not Stated	Not known
		1900				39	SJ7--3--	Burnt Wood	Manchester Museum	A	Hagenella clathrata	not stated or recorded	Not known
		1900				39	SK0--2--	Chartley	Tolson Memorial Museum, Huddersfield	A	Hagenella clathrata	Ellis, Mr.	Porritt, G.T. & superficially checked by Wallace, I.D.
		1900				39	SK0--2--	Chartley	Manchester Museum	A	Hagenella clathrata	not stated or recorded	Not known
		sometime before 1939			1939		SK02-28-	Chartley Moss, Master site,	Staffordshire Record Centre		Hagenella clathrata	Mosely, Martin	not known
	6	1903				74	NX3--5--	Corsemalzie	Morton (1904)	A	Hagenella clathrata	Gordon, J.G.	Morton, K.J.



DAY	MONTH	YEAR	DAY2	MONTH2	YEAR2	VC	GRIDREF	LOCALITY	SOURCE	STAGE	NAME	Recorder name	Determiner name
23	6	1916	26	6	1916	39	SK0--2--	Chartley	Tolson Memorial Museum, Huddersfield	A	Hagenella clathrata	Morton, K.J.	Porritt, G.T. & superficially checked by Wallace, I.D.
22	6	1916	26	6	1916	39	SK0--2--	Chartley	Glasgow Hunterian Museum	A	Hagenella clathrata	Morton, K.J.	Wallace, I.D.
23	6	1916	24	6	1916	39	SK0--2--	Chartley	Oxford Hope Department Museum	A	Hagenella clathrata	Morton, K.J.	Morton, K.J.
23	6	1916	26	6	1916	39	SK0--2--	Chartley	National Museum of Scotland	A	Hagenella clathrata	Morton, K.J.	Pelham-Clinton, E.C. and / or Wallace, I.D.
23	6	1916	26	6	1916	39	SK0--2--	Chartley Moss	Morton (1916)	A	Hagenella clathrata	Morton, K.J.	Morton, K.J.
24	6	1916				39	SK0--2--	Chartley Moss	Natural History Museum	A	Hagenella clathrata	Morton, K.J.	Morton, K.J.
26	6	1916				39	SK0--2--	Chartley Moss	Ipswich Museum & Art Gallery	A	Hagenella clathrata	Morton, K.J.	Gray, J.R.A.
26	6	1916				39	SK0--2--	Chartley Moss	Natural History Museum	A	Hagenella clathrata	Mosely, M.E.	Mosely, M.E.

DAY	MONTH	YEAR	DAY2	MONTH2	YEAR2	VC	GRIDREF	LOCALITY	SOURCE	STAGE	NAME	Recorder name	Determiner name
30	6	1918				39	SK0--2--	Chartley Moss	National Museum of Scotland	A	Hagenella clathrata	Evans	Pelham-Clinton, E.C. and / or Wallace, I.D.
12	6	1931				39	SJ7--3--	Burnt Woods	Coventry Museum		Hagenella clathrata	Daltry, H.W.	Daltry, H.W.
2	7	1931				39	SJ7--3--	Burnt Woods	Coventry Museum		Hagenella clathrata	Daltry, H.W.	Daltry, H.W.
2	7	1932				39	SJ7--3--	Burnt Wood	Natural History Museum	A	Hagenella clathrata	Daltry	Mosely, M.E.
2	7	1932				39	SJ7--3--	Burnt Woods	Mosely (1936)	A	Hagenella clathrata	Daltry, H.W.	Mosely, M.E.
25	6	1932				39	SK0--2--	Chartley Moss	Natural History Museum	A	Hagenella clathrata	Donisthorpe, H. St. J.	Not known
4	6	1933				39	SJ7--3--	Burnt Wood	Manchester Museum	A	Hagenella clathrata	Burrows, H.L.	not known
		1933				39	SJ7--3--	Burnt Woods	Daltry (1933)	A	Hagenella clathrata	Daltry, H.W.	Britten, H.
12	6	1933				39	SK0--2--	Chartley	Manchester Museum	A	Hagenella clathrata	Burrows, H.L.	not known
12	6	1933				39	SK0--2--	Chartley Moss	Kimmins (1933)	A	Hagenella clathrata	Daltry, H.W.	Kimmins, D.E.
		1933				39	SK0--2--	Chartley Moss	Daltry (1933)	A	Hagenella clathrata	Daltry, H.W.	Britten, H.
		1933				39	SK0--2--	Chartley Moss	Daltry (1933)	A	Hagenella clathrata	Morton, K.J.	Morton, K.J.

DAY	MONTH	YEAR	DAY2	MONTH2	YEAR2	VC	GRIDREF	LOCALITY	SOURCE	STAGE	NAME	Recorder name	Determiner name
12	6	1933				39	SK0--2--	Chartley Moss, Staffs	Coventry Museum	A	Hagenella clathrata	Daltry, H.W.	Daltry, H.W.
6	7	1941				39	SJ7--3--	Burnt Wood	Manchester Museum	A	Hagenella clathrata	Burrows, H.L.	not known
30	6	1941				39	SJ7--3--	Burnt Wood	Manchester Museum	A	Hagenella clathrata	Burrows, H.L.	not known
22	6	1942				39	SJ7--3--	Burnt Wood	Natural History Museum	A	Hagenella clathrata	Burrows, H.L.	Burrows, H.L.
26	6	1942				39	SJ7--3--	Burnt Wood	Manchester Museum	A	Hagenella clathrata	Burrows, H.L.	not known
28	5	1943				39	SK0--2--	Chartley Moss	Hickin (1943) & Natural History Museum	A	Hagenella clathrata	Hickin, N.E.	Hickin, N.E.
30	6	1946					SK02-28-	Chartley Moss, Master site, Chartley Moss	Staffordshire Record Centre	A	Hagenella clathrata	Warren, Richard	not known
21	7	1946					SK02-28-	Chartley Moss, Master site, Chartley Moss	Staffordshire Record Centre	A	Hagenella clathrata	Warren, Richard	not known
		1947				39	SK0--2--	Chartley Moss	Daltry (1947)	A	Hagenella clathrata	Edwards, J.	Edwards, J.

DAY	MONTH	YEAR	DAY2	MONTH2	YEAR2	VC	GRIDREF	LOCALITY	SOURCE	STAGE	NAME	Recorder name	Determiner name
26	6	1948					SK02-28-	Chartley Moss, Master site, Chartley Moss	Staffordshire Record Centre	A	Hagenella clathrata	Warren, Richard	not known
		1950				39	SJ7--3--	Burnt Wood	World Museum Liverpool	A	Hagenella clathrata	Britten, H.	Wallace, B. & or I.D.
		1950				40	SJ4--3--	Whixall	Manchester Museum	A	Hagenella clathrata	not stated or recorded	Not known
20	6	1952				39	SK0--2--	Chartley Moss	Natural History Museum	A	Hagenella clathrata	Edwards	Not known
26	6	1952				39	SK0--2--	Chartley Moss	Natural History Museum	A	Hagenella clathrata	Edwards, J.	Not known
22	6	1952					SK02-28-	Chartley Moss, Master site, Chartley Moss	Staffordshire Record Centre	A	Hagenella clathrata	Warren, Richard	not known
2	7	1955					SK02-28-	Chartley Moss, Master site, Chartley Moss	Staffordshire Record Centre	A	Hagenella clathrata	Warren, Richard	not known

DAY	MONTH	YEAR	DAY2	MONTH2	YEAR2	VC	GRIDREF	LOCALITY	SOURCE	STAGE	NAME	Recorder name	Determiner name
21	6	1958				40	SJ48-35-	WHIXALL	World Museum Liverpool	A	Hagenella clathrata	Wash, Richard, J.	Wallace, B. & or I.D.
21	6	1958	16	6	2004	50	SJ4--3--	Whixall, Bettisfield Mosses	7		Hagenella clathrata	Natural England Site Database	not stated
22	5	1960				50	SJ47-35-	Bettisfield Moss	National Museum of Wales		Hagenella clathrata	Michaelis, H.N.	Not known
		1961				39	SK0--2--	Chartley Moss, Blithfield and Blythe Bridge	BRC Record Card	A	Hagenella clathrata	Warren, R.G.	Warren, R.G.
		1961				40	SJ4--3--	Fenns, Whixall & Bettisfield Mosses SSSI	Countryside Council For Wales Invertebrate Data base		Hagenella clathrata	not stated or recorded	Not known
3	6	1961				40	SJ48-35-	Whixall	Manchester Museum	A	Hagenella clathrata	Burrows, H.L.	not known
3	6	1961				40	SJ48-35-	Whixall Moss	Manchester Museum	A	Hagenella clathrata	Brindle, A.	Wallace, I.D.
3	6	1961				40	SJ4--3--	Whixall Moss	Johnson (1961)	A	Hagenella clathrata	Johnson, Colin	Not known
12	6	1961				40	SJ48-35-	Whixall Moss	Manchester Museum	A	Hagenella clathrata	Johnson, Colin	Wallace, I.D.

DAY	MONTH	YEAR	DAY2	MONTH2	YEAR2	VC	GRIDREF	LOCALITY	SOURCE	STAGE	NAME	Recorder name	Determiner name
23	6	1962				40	SJ4--3--	Whixall [Moss]	Cambridge University Zoology Museum	A	Hagenella clathrata	Michaelis, H.N.	not stated
		1964				39	SK0--2--	Chartley	Manchester Museum	A	Hagenella clathrata	Burrows, H.L.	not known
13	6	1965				40	SJ48-35-	Whixall	Manchester Museum	A	Hagenella clathrata	Burrows, H.L.	not known
23	6	1966				40	SJ48-35-	WHIXALL MOSS	World Museum Liverpool	A	Hagenella clathrata	Burrows, H.L.	Wallace, B. & or I.D.
23	6	1966				40	SJ4--3--	Whixall Moss	Manchester Museum	A	Hagenella clathrata	Burrows, H.L.	Wallace, I.D. checked superficially
	5	1967				39	SK0--2--	Chartley	Manchester Museum	A	Hagenella clathrata	Burrows, H.L.	not known
23	6	1967				96	NH8--0--	Kinrara, Aviemore	National Museum of Scotland	A	Hagenella clathrata	Pelham- Clinton, E.C.	Pelham-Clinton, E.C.
27	6	1967				96	NH8--0--	Kinrara, Aviemore	National Museum of Scotland	A	Hagenella clathrata	Pelham- Clinton, E.C.	Pelham-Clinton, E.C. and / or Wallace, I.D.

DAY	MONTH	YEAR	DAY2	MONTH2	YEAR2	VC	GRIDREF	LOCALITY	SOURCE	STAGE	NAME	Recorder name	Determiner name
23	6	1967				96	NH883097	Kinrara, Aviemore	Pelham-Clinton notebooks at National Museum of Scotland	A	Hagenella clathrata	Pelham-Clinton, E.C.	Pelham-Clinton, E.C.
23	7	1968				96	NH8--0--	Kinrara	Manchester Museum	A	Hagenella clathrata	Aubrook, E.W.	Wallace, I.D.
27	6	1970					SK02-28-	Chartley Moss, Master site,	Staffordshire Record Centre	A	Hagenella clathrata	Warren, Richard	not known
		1973				39	SJ7--3--	Burnt Woods	Brindle (1973)	A	Hagenella clathrata	Burrows, H.L.	Burrows, H.L.
23	6	1975				40	SJ48-35-	Whixall Moss	World Museum Liverpool	A	Hagenella clathrata	Wallace, I.D.	Wallace, B. & or I.D.
8	5	1976				40	SJ48-35-	Whixall Moss	World Museum Liverpool	L & P case	Hagenella clathrata	Wallace, B. & I.D.	Wallace, B. or I.D.
26	6	1981				40	SJ48-35-	Whixall Moss	World Museum Liverpool	A	Hagenella clathrata	Wallace, I.D.	Wallace, B. & or I.D.
		1982				96	NH8--1--	Aviemore	BRC Record Card	A	Hagenella clathrata	Ely, W.A.	Ely, W.A.
27	6	1982				39	SK02-28-	Chartley Moss (East End)	World Museum Liverpool	L	Hagenella clathrata	Wallace, I.D.	Wallace, B. & or I.D.

DAY	MONTH	YEAR	DAY2	MONTH2	YEAR2	VC	GRIDREF	LOCALITY	SOURCE	STAGE	NAME	Recorder name	Determiner name
16	6	1982				96	NH79-02-	Insh Marsh RSPB Reserve	Personal note	A	Hagenella clathrata	Ely, W.A.	Ely, W.A.
24	6	1982				40	SJ48-35-	Whixall Moss	Field notebook	A	Hagenella clathrata	Wallace, B. & I.D.	Wallace, B., or I.D.
23	3	1982				40	SJ48-35-	Whixall Moss	World Museum Liverpool	L	Hagenella clathrata	Wallace, I.D.	Wallace, B. & or I.D.
8	7	1984				40	SH48-35-	Whixall Moss	World Museum Liverpool	L	Hagenella clathrata	Wallace, B. & or I.D.	Wallace, B. & or I.D.
9	7	1986				50	SJ472355	Bettisfield Moss	Field notebook	P case	Hagenella clathrata	Wallace, family	Wallace, B. or I.D.
9	7	1986				40	SJ47-34-	Wem Moss	Field notebook	A	Hagenella clathrata	Wallace, family	Wallace, B. or I.D.
5	7	1987				50	SJ472355	Bettisfield Moss	Field notebook	A	Hagenella clathrata	Wallace, family	Wallace, B. or I.D.
3	7	1987					SK02-28-	Chartley Moss, Master site, Site A hollows	Staffordshire Record Centre		Hagenella clathrata	Proctor, Deborah, A.	not known
15	6	1988				50	SJ472355	Bettisfield Moss	Field notebook	A	Hagenella clathrata	Wallace, B. & I.D.	Wallace, B. or I.D.
		1988				17	SU90-41-	Thursley Common	Field notebook	A	Hagenella clathrata	Tagg, D.	Tagg, D.
15	6	1988				40	SJ48-35-	Whixall Moss	Field notebook	A	Hagenella clathrata	Wallace, B. & I.D.	Wallace, B. or I.D.



DAY	MONTH	YEAR	DAY2	MONTH2	YEAR2	VC	GRIDREF	LOCALITY	SOURCE	STAGE	NAME	Recorder name	Determiner name
28	5	1988				17	SU92-40-	Witley Common	Graham Vick Collection	A	Hagenella clathrata	Tagg, D.	Vick, Graham
26	6	1992				50	SJ473355	Bettisfield Moss	Field notebook	L	Hagenella clathrata	Wallace, B. & I.D.	Wallace, B. or I.D.
	6	1993				40	SJ48-35-	Whixall Moss	Field notebook	A	Hagenella clathrata	Wallace, B. & I.D.	Wallace, B. or I.D.
		1993				40	SJ4--3--	Whixall Moss	Liverpool Museum (1993)	L	Hagenella clathrata	Wallace, I.D.	Wallace, I.D.
3	7	1994				40	SJ48-35-	Whixall Moss	Field notebook	A	Hagenella clathrata	Wallace, family	Wallace, B. or I.D.
11	6	1995				17	SU989537	Whitmoor. Common	Halstead Collection	A	Hagenella clathrata	Halstead, A.	Wallace, B. & or I.D.
25	6	1995				40	SJ48-35-	Whixall Moss	Field notebook	P case	Hagenella clathrata	Wallace, family	Wallace, B. or I.D.
10	6	1995				40	SJ48-35-	Whixall Moss	Field notebook	A	Hagenella clathrata	Wallace, family	Wallace, B. or I.D.
12	6	1996				17	SU90-41-	Thursley Common	Field notebook	A	Hagenella clathrata	Tagg, D.	Tagg, D.
23	6	1996				40	SJ48-35-	Whixall Moss	Field notebook	A	Hagenella clathrata	Wallace, family	Wallace, B. or I.D.
28	6	1997				40	SJ48-35-	Whixall Moss	Field notebook	A	Hagenella clathrata	Wallace, family	Wallace, B. or I.D.
1	7	2002					SK023280	Chartley Moss, Master site,	Field notebook	P case	Hagenella clathrata	Wallace, I.D. & Boardman, Peter	Wallace, I.D.

DAY	MONTH	YEAR	DAY2	MONTH2	YEAR2	VC	GRIDREF	LOCALITY	SOURCE	STAGE	NAME	Recorder name	Determiner name
21	6	2002	27	6	2002	39	SK023282	Chartley Moss, Wood Pool	e mail record	A	Hagenella clathrata	Pryce, D.	Pryce, D.
4	7	2002				39	SK023282	Cotton Pool, Chartley Moss	e mail record	A	Hagenella clathrata	Pryce, D.	Pryce, D.
13	7	2002				40	SJ472343	Wem Moss	e mail record	A	Hagenella clathrata	Pryce, D.	Pryce, D.
6	7	2002				40	SJ471342	Wem Moss	7	A	Hagenella clathrata	Pryce, D.	Pryce, D.
13	7	2002				40	SJ472343	Wem Moss	7	A	Hagenella clathrata	Pryce, D.	Pryce, D.
6	7	2002				40	SJ471734	Wem Moss	7	A	Hagenella clathrata	Pryce, D.	Pryce, D.
6	7	2002				40	SJ472434	Wem Moss	7	A	Hagenella clathrata	Pryce, D.	Pryce, D.
6	7	2002				40	SJ472334	Wem Moss	7	A	Hagenella clathrata	Pryce, D.	Pryce, D.
30	6	2002				17	SU98-53-	Whitmoor Common	Field notebook	L	Hagenella clathrata	Wallace, I.D.	Wallace, I.D.
10	7	2004				39	SK022281	Chartley Moss	e mail record	A	Hagenella clathrata	Pryce, D.	Pryce, D.
	6	2009				17	SU97-53-	Whitmoor Common	Wallace (2009)	A	Hagenella clathrata	Vick, G.J.	Vick, Graham
28	4	2010				17	SU97-53-	Whitmoor Common	Wallace & Dodd (2010)	A, L, pupal cases	Hagenella clathrata	Wallace, I.D.	Wallace, I.D.
3	7	2010				40	SJ48-35-	Whixall Moss	Field notebook	P case	Hagenella clathrata	Wallace, family	Wallace, I.D.

DAY	MONTH	YEAR	DAY2	MONTH2	YEAR2	VC	GRIDREF	LOCALITY	SOURCE	STAGE	NAME	Recorder name	Determiner name
12	5	2011				17	SU98-53-	Whitmoor Common	e mail record	A	Hagenella clathrata	Dodd, S. <i>et al</i>	Dodd, S.
17	5	2011				17	SU969655	Chobham Common	e mail record	A	Hagenella clathrata	Buckland, N.	Dodd, S.
17	5	2011				17	SU968655	Chobham Common	e mail record	A	Hagenella clathrata	Dodd, S.	Dodd, S.

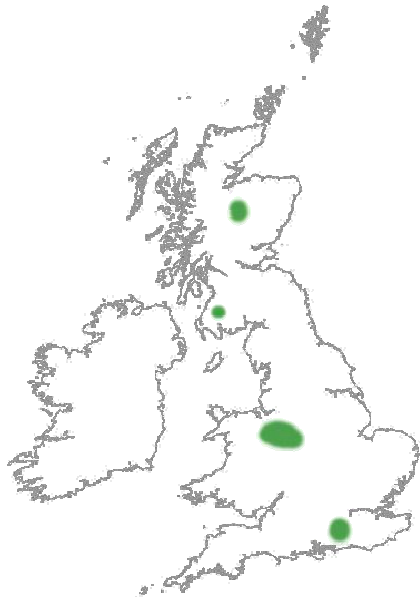


Fig. 1 Distribution of confirmed records in UK

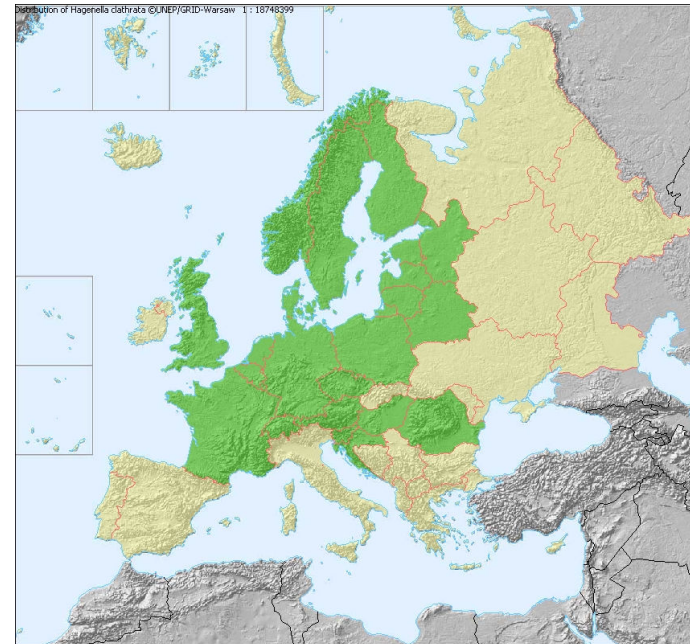


Fig. 2 Distribution of *H. clathrata* in Europe (from Fauna Europaea)  
(Green = Present Beige = No data)