

## The status of the filmy fern (*Hymenophyllum wilsonii* Hook.) in the National Trust nature reserve Murlough Bay, Co. Antrim, Northern Ireland

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### Background to the study

The European Social Fund financed the training of six people in the field of ecological surveying at the University of Ulster (Department of Biological and Biomedical Sciences) from September, 1988 to August, 1989. As part of the training programme, the students had to complete an original ecological survey in the last five months - two trainees, Miss Gault and Miss Graham chose to examine the growth and distribution of the Wilson's Filmy Fern (*Hymenophyllum wilsonii* Hook.) in the Birch-Rowan-Hazel wood that nestles under the cliff at Fair Head, Murlough Bay, County Antrim. This report records the data generated as a result of the fieldwork and includes some initial data summaries and conclusions. It is anticipated that a fuller report might be produced at a later stage and that further fieldwork might be undertaken to remedy deficiencies in the present data set.

### Introduction

Murlough Bay is situated on the North Antrim coast, between Fair Head and Torr Head and approximately six kms from Ballycastle.

The Birch-Rowan-Hazel (*Betula pubescens* Ehrh., *Sorbus aucuparia* L., *Corylus avellana* L.) woodland at Murlough Bay, which lies under the cliff of Fair Head, is one of the few remaining natural woodlands in Northern Ireland, thus making it an area of scientific interest. It now forms part of the National Trust Nature Reserve. However, like many natural woodlands in Britain and Ireland, it is being invaded by the non-native Sycamore (*Acer pseudoplatanus* L.). The Sycamore is steadily increasing its hold in the woodland and in time will inevitably replace many of the Birch, Rowan and Hazel trees thus changing the character of the wood (Binggeli and Rushton, 1985).

Within the woodland, there exists the uncommon fern, *Hymenophyllum wilsonii* Hook. (Wilson's Filmy Fern).

This species is frequent in western Scotland, the English Lake District, north Wales and south-west Ireland (Page, 1982) and the main factor controlling its distribution appears to be the number of rainy days/year (Richards and Evans, 1972). Elsewhere, the species is more scattered and in Northern Ireland is found in only approximately 19 10-km squares (Jermy et al. 1978) - the occurrence of the fern in the Birch-Rowan-Hazel wood at Murlough Bay probably represents one of the larger concentration areas for the species in the north of Ireland. The species is tolerant of shade (Page, 1982) and sometimes spreads into very deep shade (Page, 1982). However, the estimated increase in canopy cover of the Sycamore in the wood (Binggeli and Rushton, 1985) will inevitably lead to an increase in deep shade conditions and this could result in long-term (or permanent) damage or possible extinction of the *H. wilsonii* population at Murlough Bay.

*H. wilsonii* is a gregarious species, found on outcrops of rocks, on large moss covered boulders, on the trunks of trees and in turf amongst grasses and mosses. In Murlough Bay, the plant is nearly exclusively confined to large moss covered boulders and has only been seen once as an epiphyte on the trees. The specific habitat requirements of the fern in the wood are unknown and the actual distribution and abundance of the species in the wood are similarly not recorded. This short report records the results and preliminary findings of an investigation into the status of the species in the wood.

### Survey area

The survey area at Murlough Bay was situated on a steep slope between 90 and 190 m above sea level and has an east/north-easterly aspect (Binggeli and Rushton, 1985). The wood itself is made up of a series of smaller slopes. The boulders on which the *H. wilsonii* colonies are found have fallen from the cliff above. Sampling was difficult in places either because boulders were too large to examine or localised areas were inaccessible; the lower, more easily

accessible parts of the wood were more intensively surveyed. Initially, it was thought that the whole of the wood could be surveyed; in the event, only about half of the wood was searched.

## Methods

On each field day, areas of the wood were searched for colonies of *H. wilsonii*. For each colony found, a number of characteristics of the colony, of the substrate, and of surrounding trees were recorded. These were as follows:

- the angle of the rock face on which the colony was growing;
- the height of the rock;
- the height of the top of the colony from the ground surface;
- the height of the bottom of the colony from the ground surface;
- the size of the colony;
- the depth of the colony on the rock surface (measured by inserting a graduated metal rod into the colony, ten measurements);
- the average frond density (estimated from a count of the number of fronds in three 4 cm x 4 cm quadrats randomly placed over the colony);
- the direction in which the colony was facing;
- a list of the other species growing inside (i.e. growing intermingled with the colony) and outside (i.e. surrounding and touching) the colony;
- for each tree over hanging a colony the following were noted:
  - the tree species;
  - the distance of the tree trunk from the colony;

- the compass bearing of the tree from the colony;
- the diameter of the tree canopy in that sector of the canopy that overlapped the colony.

The data were encoded into a dBASE IV data base and a copy of this is available. It was not possible in the time available to compose an accurate map of all the colonies found since the exceptionally difficult terrain made mapping hazardous and prone to serious error; at a latter date, a mapping exercise might be initiated. Undoubtedly, colonies were missed by the exercise, particularly the smaller ones, but those found probably represent a reasonable picture of the status of the species in the woodland.

## Results

124 colonies were found and recorded. The majority of rocks had only one colony (96 rocks in all), though one rock had seven colonies and another five rocks had three colonies each. The results for individual colonies are tabulated in Appendices A and B.

Examination of the colonies under different tree canopies (Table 1) indicated that up to five trees could be found over hanging individual colonies. The nearest tree was nearly always a Birch, Rowan or a Hazel (98 colonies) whilst Sycamore was the nearest tree for only 18 colonies. When the second nearest tree was examined, Sycamore was better represented (30 colonies) but still the native trees accounted for 76 colonies. The fern was rarely found under Ash - only in seven cases was Ash the nearest tree and colonies were only found under eight Ash trees in total.

**Table 1.** The number of colonies of *Hymenophyllum wilsonii* under different tree canopies. \*

Tree**	Tree position					Tree density***
	1	2	3	4	5	
Birch	49	26	25	5	0	1016 trees/ha
Rowan	37	29	15	10	1	244 trees/ha
Hazel	12	21	9	4	1	236 trees/ha
Sycamore	18	30	9	10	0	21 trees/ha
Ash	7	1	0	0	0	15 trees/ha
Hawthorn	1	1	0	0	0	Not known

\*1 = tree nearest to the colony, 2 = tree next nearest the colony, etc.

\*\* Birch = *Betula pubescens*, Rowan = *Sorbus aucuparia*, Hazel = *Corylus avellana*, Sycamore = *Acer pseudoplatanus*, Hawthorn = *Crataegus monogyna*.

\*\*\* from Binggeli and Rushton (1985).

**Table 2.** Overall characteristics of the 124 *Hymenophyllum wilsonii* colonies.

	Mean	Maximum	Minimum
Angle of rock (°)	51	90	0
Height of rock (cm)	131	350	20
Height of top of colony (cm)	117	300	20
Height of bottom of colony (cm)	68	240	0
Colony size (cm <sup>2</sup> )	1813	15000	10
Depth of colony (cm)	4.3	13.0	1.0
FronD density (no. of fronds/cm <sup>2</sup> )	1.06	4.50	0.19

The colonies themselves were very variable, in terms of size, colony depth and frond density. Indeed, this latter characteristic was particularly variable there being between 0.19 and 4.50 fronds per cm<sup>2</sup>. The largest colony was approximately 70 cm. in radius. Richards and Evans (1972) suggest that Filmy Ferns grow at about 6 cm in 3 years i.e. 2 cm/year which would make such a colony about 35 years old if it is assumed to be a single plant, though Richards and Evans (1972) believe that some colonies may be centuries old.

When rock characteristics and colony characteristics were examined in relationship to the tree cover (Table 3) the most obvious difference between the colonies was that those colonies growing where a Sycamore was the closest tree (Table 3A) were smaller (1104 cm<sup>2</sup>) with a lower frond density (0.81 fronds/cm<sup>2</sup>) and a smaller colony depth (3.4 cm) when compared with colonies in which the closest tree was either a Birch, Rowan or Hazel. The same pattern was repeated when the colonies were examined in respect to the second closest tree (Table 3B).

**Table 3.** Characteristics of *Hymenophyllum wilsonii* colonies in respect of the nearest tree (A) and the next nearest tree (B). The seven characteristics are as listed in Table 2, and in the same units.**A. The nearest tree:**

	Birch	Rowan	Hazel	Sycamore	Ash	Hawthorn
No. of colonies	49	37	12	18	7	1
Angle of rock	53	48	47	57	44	46
Height of rock	126	150	145	117	97	80
Top of colony	112	127	138	111	84	80
Bottom of colony	68	68	82	67	60	30
Colony size	1763	2272	1775	1104	1165	5041
Depth of colony	4.1	4.9	3.8	3.4	5.0	8.5
Density of fronds	1.00	1.19	1.25	0.81	1.00	1.94

**B. The next nearest tree:**

	Birch	Rowan	Hazel	Sycamore	Ash	Hawthorn	None
No. of colonies	26	29	21	30	1	1	16
Angle of rock	50	44	57	55	60	46	46
Height of rock	115	154	143	131	200	110	101
Top of colony	109	128	129	118	175	110	91
Bottom of colony	69	75	81	64	125	25	45
Colony size	1656	2201	2207	1221	6000	4473	1529
Depth of colony	3.4	5.4	4.8	3.5	3	8	4.5
Density of fronds	0.94	1.13	1.69	0.75	1.88	1.25	0.81

The colonies showed a strong preference for growth on rocks facing north, north-west, and north-east (Table 4) - 81% of all colonies growing on these types of rocks. Very few colonies grew on rocks facing in a southerly or a south-easterly direction.

**Table 4.** Number of *Hymenophyllum wilsonii* colonies on rocks of different aspect.

Aspect	Number of colonies	% of colonies
West	2	1.6
North West	38	30.7
North	13	10.5
North East	50	40.3
East	9	7.3
South East	3	2.4
South	3	2.4
South West	6	4.8

An analysis of the species (mainly Bryophytes) growing with the colonies and around the colonies is given in Table 5. Many species were only encountered on a few occasions but about nine species were found quite frequently with the fern. There seemed to be two types of associated species. Some species grew inside the colonies but were found less frequently growing outside the colonies by themselves i.e. they appear to have invaded the colonies with apparent ease, though of course it could be that the fern was the invader. Such species were *Dicranum majus*, *Polytrichum alpinum*, *Plagiothecium undulatum*, *Scapania nemorea* and *Thuidium tamariscinum*. The second group of species were less numerous and less well defined but essentially were more usually found either growing around the colony, but not in it, or both inside and outside the colonies but rarely only inside the colonies without being outside also. Such species were *Hylocomium splendens*, *Mnium hornum*, *Polytrichum commune* and *Oxalis acetosella*.

**Table 4.** Species associated with *Hymenophyllum wilsonii* colonies. Species are divided into the number of times they occur growing intermingled with the colony (inside); the number of times they grow touching the perimeter of the colony but not actually with the fern (outside); and the number of times they occur both outside and inside the colony.

Species	Inside only	Both inside and outside	Outside only
<i>Brachythecium rutabulum</i>	5	2	0
<i>Dicranella heteromalla</i>	0	1	0
<i>Dicranum majus</i>	17	11	10
<i>Hylocomium splendens</i>	0	6	4
<i>Hypnum cupressiforme</i>	17	28	28
<i>Hypnum jutlandicum</i>	1	0	1
<i>Isothecium myurum</i>	0	1	0
<i>Luzula sylvatica</i>	0	0	2
<i>Mnium hornum</i>	7	16	13
<i>Oxalis acetosella</i>	2	5	8
<i>Pellia epiphyllia</i>	2	1	0
<i>Plagiothecium undulatum</i>	21	20	4
<i>Pleurozium schreberi</i>	1	1	0
<i>Polypodium vulgare</i>	1	1	7
<i>Polytrichum alpinum</i>	26	17	4
<i>Polytrichum juniperum</i>	1	1	0
<i>Rubus sp.</i>	0	0	2
<i>Rhacomitrium heterostichum</i>	0	1	0
<i>Rhitiadelphus loreus</i>	4	4	2
<i>Rhitiadelphus squarrosus</i>	13	25	12
<i>Scapania nemorea</i>	3	11	1
<i>Thuidium tamariscinum</i>	21	45	12

Species nomenclature follows:

Smith (1980) for mosses

Watson (1981) for liverworts

Clapham, Tutin and Moore (1987) for vascular plants.

Some associated species have still to be positively identified from voucher material.

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## Conclusions

The following conclusions may be drawn from the above preliminary assessment of the data:

1. There are at least 124 colonies of the fern in the woodland and the distribution of these colonies would seem to be related to tree species, with fewer colonies being found under Sycamore trees than under the native species. However, it should be remembered that there are fewer Sycamore trees in the wood generally.
2. Under a Sycamore canopy, the fern has smaller colonies which have a lower frond density and are shallower. Whether this is due to poorer growth conditions under the Sycamore canopy or because the colonies under Sycamore are perhaps younger is unknown. If the former is the case, then increase of the Sycamore canopy over time will be highly detrimental to the continued presence of the fern in the wood. It should be remembered that, currently, most of the Sycamores in the wood are comparatively young and therefore their canopy is not too extensive thus allowing plenty of light (particularly obliquely from the side) to reach the ground. In these cases, the Sycamores have had little influence yet on the ground flora. However, the flora is dramatically impoverished under the very large Sycamores where only a few moss species survive.
3. The colonies prefer north, north-east and north-west facing rock and tend to grow on the top half of the rock faces.
4. Twenty one species of mainly Bryophytes were found growing in the colonies and a further two species, both vascular plants (*Luzula sylvatica* and *Rubus* sp.), were growing alongside the fern but not actually intermingled

with it. Some of these Bryophytes are very vigorous and probably represent competitors.

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## References

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