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Results of a monitoring survey and assessment of the conservation status of *Hamatocaulis vernicosus* in Ireland 2023

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Front cover, small photographs from top row:

A deep water fly trap anemone *Phelliactis* sp., Yvonne Leahy; **Common Newt** *Lissotriton vulgaris*, Brian Nelson; **Limestone pavement**, Bricklieve Mountains, Co. Sligo, Andy Bleasdale; **Garden Tiger** *Arctia caja*, Brian Nelson; **Violet Crystalwort** *Riccia huebeneriana*, Robert Thompson; **Coastal heath**, Howth Head, Co. Dublin, Maurice Eakin; **Meadow Saffron** *Colchicum autumnale*, Lorcan Scott

Bottom photograph: **Shining Sickle-moss** *Hamatocaulis vernicosus*, Coomlumminy, Co. Kerry, Rory Hodd



Results of a monitoring survey and assessment of the conservation status of *Hamatocaulis vernicosus* in Ireland 2023

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Contents

Executive Summary	i
Acknowledgements.....	ii
1 Introduction	1
1.1 <i>Hamatocaulis vernicosus</i>	1
1.2 Survey rationale.....	1
2 Methodology.....	4
2.1 Fieldwork preparation	4
2.2 Field survey	5
2.2.1 Mapping of extent of occurrence.....	5
2.2.2 Monitoring stops	5
2.2.3 Site data	5
2.3 Conservation assessments.....	6
2.3.1 Population assessment.....	6
2.3.2 Habitat for the species assessment	6
2.3.3 Future prospects assessment.....	7
2.4 National Conservation Assessment	8
3 Results of the 2023 survey	10
3.1 Population	10
3.2 Habitat for the species	11
3.3 Impacting activities	12
3.4 Conservation measures.....	14
3.5 Future prospects.....	15
3.6 Overall site assessments.....	16
3.7 National Conservation Assessment	16
3.8 Populations within and outside the SAC network	18
4 Discussion.....	19
5 Conclusions and recommendations.....	20
6 References.....	21
7 Appendix 1 Site reports	23

Executive Summary

A survey was undertaken in 2023 to monitor selected populations of the moss *Hamatocaulis vernicosus* (Shining Sickle-moss) in the Republic of Ireland. This species is listed on Annex II of the EU Habitats Directive which, as well as requiring member states to designate protected areas for the species, also obliges them to monitor populations and report on their status on a six-yearly cycle. *H. vernicosus* grows in intermediate fens, transition mires and flushes and is currently known to occur at 19 sites in Ireland. Eleven of these sites have been monitored during previous monitoring surveys, with the remaining eight sites discovered since the last survey concluded in 2018. Four of these sites were visited during this round of monitoring, but the remaining four sites were discovered too late to include in this survey. In addition to the four sites included for survey for the first time, five sites that were previously assessed as being in unfavourable condition were revisited. The remaining six sites were not revisited, as they were assessed as being in favourable condition by the previous monitoring survey. The populations were surveyed according to the established methodology used in previous monitoring surveys and the conservation status of each population was assessed under the parameters of Population, Habitat for the species and Future prospects to derive an overall assessment of each population. A National Conservation Assessment (NCA) of *H. vernicosus* across the Republic of Ireland was also undertaken, to contribute to Ireland's reporting obligations under Article 17 of the EU Habitats Directive. This national assessment is based on the Range, Population, Habitat for the species and Future prospects of the species across the Republic of Ireland.

Of the nine populations surveyed, two were assessed as Unfavourable – Inadequate on the Population parameter, with a decline in population size indicated. The remaining seven sites were assessed as Favourable, although the population at one of the sites surveyed for the first time, Hv12 Ballinceddan, may have undergone a decline, as *H. vernicosus* was not found despite being observed in small amount in the preceding two years. However, as this site was not known prior to 2021, a trend cannot be determined. The Habitat at two sites was assessed as of Unfavourable – Inadequate Conservation Status, resulting from poor vegetation structure. The Future prospects of two sites were assessed as Unfavourable – Inadequate, with insufficient levels of grazing and poor hydrology, linked with potential climate change impacts and historical drainage, the main negative impacts. Despite these issues at individual sites, the National Conservation Assessment indicates that the Range, Population, Habitat for the species and Future prospects at a national level are all Favourable and show a stable trend.

The main conservation measure identified as required across most sites for *H. vernicosus* in Ireland is to maintain the grazing regime as is, to retain the suitability of the Habitat for the species. It should also be ensured that the hydrology of these sites is not altered, and investigations should be carried out to determine whether climate change is having an impact on this species, or will do so in the future. At sites that were determined as not being in good condition by this survey, grazing should be introduced or increased to ensure that suitable open habitat remains for *H. vernicosus* to occupy.

Acknowledgements

The fieldwork for this project was undertaken by Sharon Pilkington, Nick Hodgetts, George Smith, Joanne Denyer, Eliška Kolářová and Cian Ó Ceallaigh. Kate McNutt processed the GIS and mapping elements of the project. Neil Lockhart, the NPWS project officer, provided essential advice and guidance. Christina Campbell provided data and advice and thanks are also due to Cian Ó Ceallaigh, George Smith and Alexis Fitzgerald for providing locational data for a number of recently discovered populations and to John Brophy of BEC Consultants for providing data from the ongoing National Fen Survey (NFS).

1 Introduction

1.1 *Hamatocaulis vernicosus*

Hamatocaulis vernicosus Mitt. Hedenäs (Slender Green Feather-moss/Shining Sickie-moss) is a perennial pleurocarpous moss in the Scorpidiaceae family, with neatly hooked shoot tips and branches held at around 90° to the stem. Its longitudinally pleated leaves taper gradually from a broad base and are strongly curved from the middle. The leaf bases are often distinctively tinged red, with redness often concentrated in a patch at the top of the stem where it bends over (Atherton *et al.*, 2010; Smith, 2004). This species is dioecious (*i.e.* male and female reproductive organs occur on separate plants). Sporophytes, maturing in summer, are very rare across its global distribution and have never been recorded in Ireland. As specialised asexual propagules are unknown, reproduction and spread must occur by fragmentation (Campbell *et al.*, 2019).

This species was previously included within the genus *Drepanocladus*, as *D. vernicosus*, but was transferred to the newly created genus *Hamatocaulis* by Hedenäs (1989), within which there is one other species, *H. lapponicus*, occurring in Boreal areas. Genetic analysis has shown that *H. vernicosus* consists of two cryptic species in Europe, which are morphologically indistinguishable (Hedenäs & Eldenäs, 2007; Hedenäs, 2018; Hedenäs *et al.*, 2022). All Irish populations examined correspond to 'cryptic species 1', with four haplotypes present, including two which are unknown elsewhere in Europe (Hodgetts *et al.*, 2024).

Hamatocaulis vernicosus has a circumboreal distribution, and is widespread across Europe, although it is listed as Vulnerable on the European Red List of bryophytes (Hodgetts *et al.*, 2019), as many populations have been lost due to destruction of wetland habitats. It is included on Annex II of the EU Habitats Directive and is legally protected in Ireland under the Flora Protection Order, 2022 (S.I. No. 235/2022) and is listed as Near Threatened on the Red List of Irish bryophytes (Lockhart *et al.*, 2012a, b). It is currently known from 19 localities in the Republic of Ireland, eight of which have been discovered since the last reporting period (Table 1). These populations are scattered across Ireland, with large populations in the lowlands, and smaller, more scattered populations in the uplands. Confirmed records exist from four further sites, mainly in the east of Ireland, but it is now thought to be lost from these sites, having not been seen in more than 30 years, despite targeted searches (Campbell *et al.*, 2015). Due to confusion with other members of the Scorpidiaceae, many past records are likely to be erroneous.

The favoured habitats of *Hamatocaulis vernicosus* are transition mires (EU Annex I Habitat 7140), intermediate fens and flushes where there is an influence of mineral-rich groundwater. It does not occur in strongly calcareous habitats, preferring sites with a neutral to mildly basic pH. Most records of the species from alkaline fen sites have proved to be incorrect. More detailed information on the ecology of *H. vernicosus* in Ireland is contained in Campbell *et al.* 2015.

1.2 Survey rationale

As *H. vernicosus* is listed on Annex II of the EU Habitats Directive (92/43/EEC), Ireland is obliged to designate protected areas for this species, undertake surveillance of its populations under Article 11 of the Directive and report on its conservation status within the country under Article 17. Information is required on the parameters of Range, Population, Habitat for the species and Future prospects (DG Environment, 2023a), with field survey necessary to assess the last three parameters. Reports under Article 17 of the Directive are produced on a six-year cycle, with the current reporting period running from 2019 to 2024. This is the fourth cycle in which the conservation status of *H. vernicosus* has been reported, with much targeted fieldwork having been undertaken to search for and monitor *H. vernicosus* since 1998

(Campbell, 2013; Campbell *et al.*, 2015, 2019; Lockhart *et al.*, 2012a). For the previous reporting period of 2013–2018, the conservation status of *H. vernicosus* in Ireland was assessed as Favourable on all parameters (NPWS, 2019) and was considered to be stable.

The survey detailed in this report was commissioned by the National Parks and Wildlife Service (NPWS) to survey a subset of sites that were either discovered since the previous monitoring survey of Campbell *et al.* (2019) or were assessed as having Unfavourable Conservation Status during the previous monitoring period (Table 1). Four sites were included in the survey, as they were discovered in the period between the survey of Campbell *et al.* (2019) and the commissioning of this survey, two located in Co. Wicklow, a county where *H. vernicosus* had not been seen since 1975, one site in Co. Westmeath and another in the Slieve Aughty Mountains in southeast Co. Galway (Hodd *et al.*, 2021). A further five sites that were assessed as having Unfavourable Conservation Status by the survey of Campbell *et al.* (2019) were also included for survey, to give a total of nine survey sites in 2023 (see Figure 1) As the populations at the remaining six known sites were assessed as being of Favourable Conservation Status since baseline surveys were established and over the past two Article 17 reporting periods, and there being no evidence of a decline having taken place, these populations were not revisited in order to save resources. An additional four populations were discovered during survey work for the ongoing National Fen Survey (NFS; O'Neill *et al.*, 2023) in counties Mayo, Galway and Kerry in 2023 and 2024, but were discovered too late to be included within the present survey and assessment. Informed by the results of this survey, the project also aimed to create a National Conservation Status Assessment (NCA) for *H. vernicosus* in Ireland, to fulfil reporting obligations under Article 17 of the EU Habitats Directive.

Table 1 Details of each of the 19 known *Hamatocaulis vernicosus* sites in Ireland, the county, SAC and 1 km x 1 km grids in which they occur and year of most recent survey. Sites marked as 'Not Surveyed' were discovered by the National Fen Survey in 2023 or 2024.

Site code	Site name	County	SAC code and name	1 km x 1 km	Last survey
Hv01	Meentygrannagh	Donegal	IE0000173 Meentygrannagh Bog	C0205; C0206	2023
Hv02	Rathavisteen	Mayo	IE0000500 Glenamoy Bog Complex	F9837	2018
Hv03	Largan More	Mayo	IE0000476 Carrowmore Lake Complex	F8923; F9023; F9024	2018
Hv04	Uggool	Mayo	IE0000534 Owenduff/Nephin Complex	F9218	2018
Hv05	Owenbrin	Mayo	IE0001774 Lough Carra/Mask Complex	M0662; M0663	2018
Hv06	NW of Gortachalla Lough	Galway	IE0000297 Lough Corrib	M2237	2023
Hv07	Scragh Bog	Westmeath	IE0000692 Scragh Bog	N4258; N4259	2018
Hv08a	Below Sgilloge Loughs	Waterford	IE0001952 Comeragh Mountains	S2811; S2812	2023
Hv08b	Nier River Valley	Waterford	IE0001952 Comeragh Mountains	S2711	2023
Hv08c	Countay	Waterford	IE0001952 Comeragh Mountains	S2907; S2908	2023
Hv09	Commas	Cavan	IE0000584 Cuilcagh-Anierin Uplands	H1227; H1327	2018
Hv10	Derrygoolin South	Galway	IE000308 Loughatorick South Bog	R6993; R7093	2023
Hv11	Lough Patrick	Westmeath	N/A	N4263	2023
Hv12	Ballineddan	Wicklow	N/A	S9791	2023
Hv13	Ballyremon Commons	Wicklow	N/A	O2211; O2311	2023
Hv14	Leenaveesta	Mayo	IE0001932 Mweelrea/Sheefry/Erriff Complex	L8873	Not surveyed
Hv15	Derrinlough Bog	Galway	N/A	M6152	Not surveyed
Hv16	Coomlumminy	Kerry	IE000365 Killarney National Park, Macgillicuddy's Reeks and Caragh River catchment	V7376	Not surveyed
Hv17	Sheskin	Mayo	IE001922 Bellacorick Bog Complex	F9728	Not surveyed

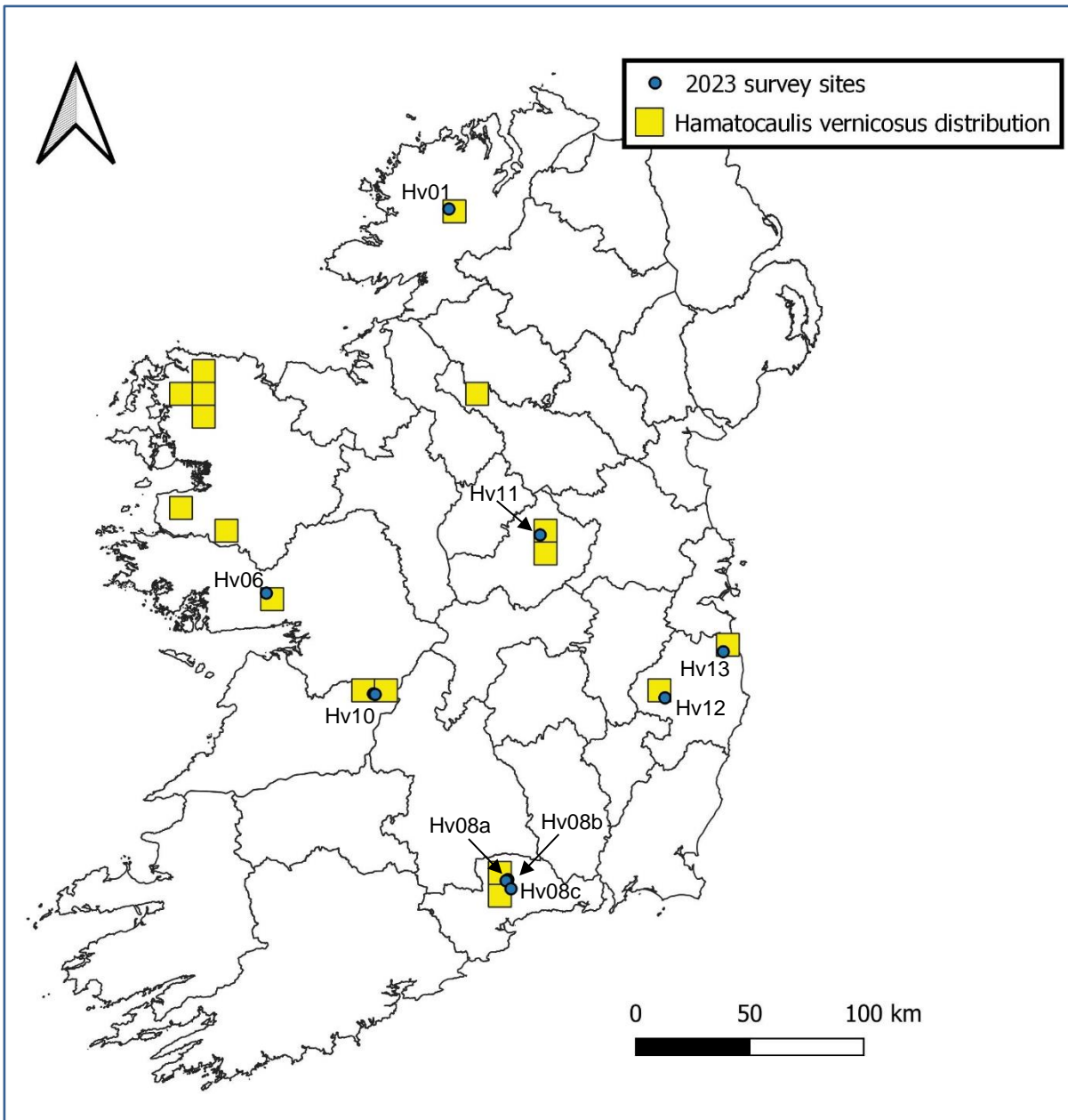


Figure 1 Locations of sites covered by the 2023 survey (blue dots) and known distribution of *Hamatocaulis vernicosus* up to the end of 2023 (yellow grid cells). See Table 1 for site details.

2 Methodology

2.1 Fieldwork preparation

Nine sites were selected for survey as per Section 1.2; see Figure 1 for site locations. The methodology used by Campbell *et al.* (2019) during the previous round of monitoring was reviewed, with no significant changes deemed necessary. Any minor changes or other observations on the methodology are included in the relevant place in the following section. As *H. vernicosus* is included on the Flora Protection Order, 2022, a licence was obtained from NPWS to enable the disturbance, in the form of light trampling, of the habitat of *H. vernicosus* and allow collection of specimens if required for positive identification. Local NPWS staff were contacted to inform them that the survey was taking place and for assistance with gaining access to sites, where necessary. The outputs of all previous surveys for *H. vernicosus* were collated and all previous records and extent polygons at the survey sites were mapped using

QGIS. For sites not previously surveyed, points for the locations where the species was found were obtained from the original finder. Maps of each survey site were printed for use in the field and a QField project was set up containing the data from previous surveys, as well as waypoint shapefiles for recording data on population extent, habitat condition, impacting activities and other notable species encountered. A site recording card was designed in Microsoft Word, to capture all relevant data about the site and to record monitoring stop data. These files were loaded onto a ruggedised handheld tablet for use in the field.

2.2 Field survey

The survey was carried out mainly between June and October 2023. *H. vernicosus* can be surveyed at any time of year, but summer is the optimal season, when water levels in the fens and flushes in which it occurs are not too high and associated vascular plant species, particularly sedges, are easier to identify. The survey was carried out following the methodology of Campbell *et al.* (2015, 2019). Two modifications were made to the methodology. Water chemistry was not analysed, and sex ratios of the population were not assessed, as this was deemed unnecessarily intrusive for a monitoring survey.

2.2.1 Mapping of extent of occurrence

At each survey site, all locations and polygons where *H. vernicosus* was previously recorded were searched carefully for its presence, as was any other suitable habitat in the vicinity. Where *H. vernicosus* was located, a target note was recorded and notes on the population at that location were recorded. Where the species occurred across a larger area, the extent of the area was marked by waypoints. Polygons were created later using QGIS, delineating the extent of occurrence.

2.2.2 Monitoring stops

Monitoring stops of 2 m x 2 m were recorded across each site, with a target of four monitoring stops per site, if population size were sufficiently large. The covers of all vascular plant and bryophyte species present within the 2 m x 2 m area were recorded, although these data did not feed into the site assessment. Hydrology was assessed by pressing a hand into the surface of the plot and noting whether the hand was covered by water and the water depth was measured, as was the vegetation height. The number of shoots of *H. vernicosus* was counted in a representative 10 cm x 10 cm area of the plot. The percentage cover of trees, shrubs, grasses and bryophytes was measured, as was the cover of *Calliergonella cuspidata*, the dominance of which would indicate excessive nutrient input. The location of the plot was recorded within QField and two photos were taken of each plot, showing both close up and context views.

2.2.3 Site data

A site recording form was completed for each survey site. A site description describing the physical attributes of the site, the habitats present, the population of *H. vernicosus* present and any other relevant information not included elsewhere within the form was compiled. Any changes to the site since the last time it was surveyed were noted, by comparison with the site reports of Campbell *et al.* (2019). Notes were taken on the current management taking place at the site and any recommended management actions that would be beneficial to *H. vernicosus* were also noted. General site photographs and close up photographs of *H. vernicosus* were taken and the location of any other notable species were recorded in QField. Impacting activities were recorded using the standard EU codes (DG Environment, 2023b), with the impact, intensity and percentage of habitat impacted noted. Conservation measures (DG Environment, 2023c) required at each site, to address impacting activities seen to be having a negative impact, were also recorded.

Further site summary information was derived from the GIS data recorded and the monitoring stop data. The total extent of occurrence within each site, in m² was calculated from the GIS data and the estimated area covered by the species within the extent of occurrence was calculated by multiplying the extent of occurrence by the mean percentage cover of *H. vernicosus* recorded in the monitoring stops. The mean density of shoots per m² across the plots was calculated for each site. Site summary reports are included as Appendix 1.

2.3 Conservation assessments

Based upon the data collected in the field, the conservation status of each of the nine sites was assessed under the categories of Population, Habitat for the species and Future prospects to give an overall site assessment.

2.3.1 Population assessment

The conservation status of the population at each site was assessed according to the criteria in Table 2.

Table 2 Criteria used in the Population assessment of *Hamatocaulis vernicosus* for the 2023 monitoring survey (as per Campbell *et al.*, 2015, 2019).

Attribute	Method of assessment	Target for pass at site level
Extent of occurrence (m ²)	Area of polygon(s) delineating the extent of occurrence	Site dependent; a minimum of 80% of the previously mapped extent at previously surveyed sites
Mean percent cover of <i>H. vernicosus</i>	Percent cover in a representative number of 2 m x 2 m monitoring plots	Site dependent; a minimum of 80% of the previously recorded mean cover at previously surveyed sites
Mean density of shoots/m ²	No. of shoots/100 cm ² extrapolated to per m ² in a representative number of 2 m x 2 m monitoring plots	Site dependent; a minimum of 80% of the previously recorded mean density at previously surveyed sites
Population assessment		Favourable = 2–3 attributes pass
		Unfavourable – Inadequate = 1 attribute passes
		Unfavourable – Bad = 0 attributes pass

No targets were set for sites that have not been previously surveyed, aside from the confirmed presence of *H. vernicosus* in the period from 2019 to 2024. For sites where previous survey data does exist, extent of occurrence, measured in m², was assessed against the results of the previous survey, with a target set of a minimum of 80% of the previously mapped extent, to take a margin of error into account for factors such as differences in survey conditions and GPS variability. Mean cover of *H. vernicosus* recorded across all plots was also assessed, with 80% again set as a threshold when comparing to previous surveys. The density of shoots per m², extrapolated from the mean number of shoots recorded in 10 cm x 10 cm area of each plot, was assessed against the results from the previous survey, where appropriate. The population was assessed against the results of the 2015–2018 survey, as opposed to the 2013 baseline, for the sites where these data exist. It was considered that partial recovery of populations that had previously shown declines may not be detected if the data were compared with the baseline figures.

2.3.2 Habitat for the species assessment

Attributes for assessing Habitat for the species (Table 3) were measured in the monitoring stops and are unchanged from those used by Campbell *et al.* (2019).

Table 3 Habitat for the species assessment criteria used for *Hamatocaulis vernicosus* during the 2023 survey (as per Campbell *et al.*, 2015, 2019).

Attribute	Method of assessment	Target for pass at site level
Area covered by the population (m ²)	Multiply extent of occurrence by mean % <i>H. vernicosus</i> cover in a representative number of monitoring plots	Site dependent; for sites with no previous surveys, presence of species is sufficient
Hydrology	Hand should be pressed into vegetation	Water level should cover hand when pressed into the vegetation
Tree cover (%)	Percent cover in a representative number of 2 m x 2 m monitoring plots	Mean percent tree cover should not exceed 15%
Shrub cover (%)	Percent cover in a representative number of 2 m x 2 m monitoring plots	Mean percent shrub cover should not exceed 20%
Grass cover (%)	Percent cover in a representative number of 2 m x 2 m monitoring plots	Mean percent grass cover should not exceed 25%
Bryophyte cover (%)	Percent cover in a representative number of 2 m x 2 m monitoring plots	Mean percent bryophyte cover should exceed 50%
Cover of <i>Calliergonella cuspidata</i> (%)	Percent cover in a representative number of 2 m x 2 m monitoring plots	Mean percent cover of <i>C. cuspidata</i> should not exceed 15%
Mean vegetation height (cm)	Height in centimetres in a representative number 2 m x 2 m monitoring plots	Mean vegetation height should not exceed 40 cm
		Favourable = 7–8 attributes pass
Habitat for the species assessment		Unfavourable – Inadequate = 5–6 attributes pass
		Unfavourable – Bad = 0–4 attributes pass

The area covered by the population was calculated by multiplying the extent of the population by the mean cover of *H. vernicosus* across the monitoring stops at each site, and compared with the value from the previous survey, where applicable. Hydrology was assessed by determining whether a hand pressed into the surface of the plot is covered by water. Cover of trees, shrubs, grass and *Calliergonella cuspidata* were assessed as negative indicators, while cover of bryophytes was assessed as a positive indicator. The vegetation height was also used as an assessment attribute, with a low sward height required to indicate relatively open habitat to allow the growth of *H. vernicosus*. The values obtained for these attributes were averaged across all monitoring stops at a site, with a pass or fail assigned for each attribute. The Habitat for the species was assessed as being in Favourable Conservation Status if seven or eight of these attributes passed, of Unfavourable – Inadequate Conservation Status if between five and six of these attributes passed and of Unfavourable – Bad Conservation Status if it passed on less than four attributes. Where a site only marginally failed on an attribute, and there was no obvious negative factor causing the failure, the attribute could be passed based on expert judgement.

2.3.3 Future prospects assessment

Future prospects at each site were evaluated with reference to the Population and Habitat for the species assessments, to determine if the conservation status of these sites is likely to change in the future. To enable this assessment, the current pressures, recorded using the standard codes of DG Environment (2023b), and threats that may cause an impact in the future were evaluated. Negative impacts were balanced against positive impacts and the current and

future management of the site was taken into consideration. Conservation measures (DG Environment, 2023c) currently in place or planned, and those required but not being carried out, were also factored into the assessment. In order for the Future prospects of a population to be assessed as Favourable, it was necessary that its prospects of survival in the long term should be judged as good and that the future trend of the Population and Habitat for the species are likely to be stable or improving. If it was deemed that severe impacts were expected in the future and that the Population and Habitat for the species were likely to significantly decline in the future, with eventual loss of the population, then the Future prospects were assessed as Unfavourable – Bad. An Unfavourable – Inadequate assessment was applied if the Future prospects were assessed as being between these two extremes.

2.4 National Conservation Assessment

The National Conservation Assessment (NCA) was carried out using the assessment data collected in 2023, for sites that were included in this survey, and from 2015–2018 for sites that were not resurveyed in this round of monitoring. The conservation status was assessed based on the Range, Population, Habitat for the species and Future prospects on a national level (DG Environment, 2023a). All populations recorded up to the end of 2023 were included in the NCA, but newly discovered sites in 2024 were not included. Hv16 Leenaveesta, which was first recorded in 2023 was taken into account when calculating the Range and Population, but insufficient data exist for it to contribute to the Habitat for the species or Future prospects assessments.

The Range was calculated on a 10 km grid basis in TM75 Irish Grid projection, based on the national distribution. A distribution map was derived primarily from population envelope polygons recorded from the current monitoring survey, and from the 2015–2018 Rare Plants Monitoring Survey (Campbell *et al.*, 2019) for the sites not surveyed in 2023. The range was calculated based on these distribution data using ArcToolBox Range Tool and was refined using expert judgement. The Favourable Reference Range was taken as the current distribution, to take newly discovered, previously overlooked, populations into account.

The Population was reported using 1 km x 1 km grids as a reporting unit, as is recommended for non-vascular plants (DG Environment, 2023a). This is due to the difficulty involved in calculating populations of bryophytes, so that the number of individuals or extent of occupancy in m² is not an appropriate unit. The number of occupied grid cells was derived by intersecting the occurrence points and extent polygons from this and previous surveys with the Irish National Grid. The Favourable Reference Population was set as the population reported in 2019.

The Habitat for the species was assessed based on the habitat assessments for the sites surveyed in 2023, plus the results of the 2015–2018 survey for those sites not surveyed in 2023, to enable an overall assessment of the habitat across all sites where the species occurs. Informed by the current survey, current pressures and future threats, active at a national scale, and conservation measures, both in progress and required, were reported on. These then informed the Future prospects assessment. Both long-term and short-term trends were also reported for each parameter. The assessment results for each of the four parameters were combined to give an overall assessment of conservation status on a national level (Table 4).

Table 4 Evaluation matrix for the assessment of Conservation Status of Annex II species (adapted from DG Environment, 2023a).

Parameter	Conservation Status			
	Favourable ('green')	Unfavourable – Inadequate ('amber')	Unfavourable – Bad ('red')	Unknown
Range	Stable (loss and expansion in balance) or increasing <u>AND</u> not smaller than the 'favourable reference range'	Any other combination	Large decline: Equivalent to a loss of more than 1% per year within period specified by MS <u>OR</u> more than 10% below favourable reference range	No or insufficient reliable information available
Population	Population(s) not lower than 'favourable reference population' <u>AND</u> reproduction, mortality and age structure not deviating from normal (if data available)	Any other combination	Large decline: Equivalent to a loss of more than 1% per year within period specified by MS <u>AND</u> below 'favourable reference population' <u>OR</u> More than 25% below favourable reference population <u>OR</u> Reproduction, mortality and age structure strongly deviating from normal (if data available)	No or insufficient reliable information available
Habitat for the species	Area of habitat is sufficiently large (and stable or increasing) <u>AND</u> habitat quality is suitable for the long-term survival of the species	Any other combination	Area of habitat is clearly not sufficiently large to ensure the long-term survival of the species <u>OR</u> Habitat quality is bad, clearly not allowing long-term survival of the species	No or insufficient reliable information available
Future prospects	Main pressures and threats to the species not significant; species will remain viable on the long-term	Any other combination	Severe influence of pressures and threats to the species; very bad prospects for its future, long-term viability at risk.	No or insufficient reliable information available
Overall assessment of CS	All 'green' <u>OR</u> three 'green' and one 'unknown'	One or more 'amber' but no 'red'	One or more 'red'	Two or more 'unknown' combined with green or all 'unknown'

3 Results of the 2023 survey

3.1 Population

The Population at two sites was assessed as being of Unfavourable – Inadequate Conservation Status (Table 5). At Hv06 NW of Gortachalla Lough, the extent of occurrence and density of shoots per m² were 11% and 21% lower than the target, respectively. At Hv08b Nier River Valley, the mean percent cover of *Hamatocaulis vernicosus* and density of shoots per m² were 61% and 53% lower than the target, respectively. The decrease at Hv06 may be due to drainage and a lack of grazing keeping the habitat open. The Population was also assessed as Unfavourable – Inadequate in the previous monitoring period, suggesting that the decline has been ongoing long-term. The density of shoots per m² was significantly lower than the target at Hv08a below Sgilloge Loughs and Hv08c Coumtay, but the Population assessments were otherwise Favourable.

Table 5 Extent of occurrence (m²), mean % cover of *Hamatocaulis vernicosus* and density (shoots/m²) at the nine sites surveyed in 2023 and comparison with the targets set in Campbell *et al.* (2019); Favourable (Fav) = 2–3 attributes passed; Unfavourable – Inadequate (U–I) = 1 attribute passed.

Site code	Extent of occurrence (m ²)			Mean percent cover of <i>H. vernicosus</i> (%)			Density (shoots/m ²)			Pop. assmt.
	Target	2023 survey	Result	Target	2023 survey	Result	Target	2023 survey	Result	
Hv01	9,842	10,319	Pass	6.2	6.3	Pass	4,800	21,250	Pass	Fav
Hv06	4,680	4,154	Fail	28.8	43	Pass	19,120	15,180	Fail	U–I
Hv08a	5,695	6,163	Pass	28	30	Pass	11,520	5,980	Fail	Fav
Hv08b	1,245	1,233	Pass*	28	15	Fail	3,280	1,550	Fail	U–I
Hv08c	51	173	Pass	3.2	7.5	Pass	4,000	3,050	Fail	Fav
Hv10	1	1634	Pass	N/A	46.3	N/A	N/A	13880	N/A	Fav
Hv11	1	2,243	Pass	N/A	8.3	N/A	N/A	28330	N/A	Fav
Hv12	1	2**	Pass	N/A	0.7**	N/A	N/A	N/A	N/A	Fav
Hv13	1	16	Pass	N/A	8.6	N/A	N/A	15400	N/A	Fav

*Passed on expert judgment

***H. vernicosus* was not found during this survey, so data from NFS survey of 2022 was used

No *H. vernicosus* was found during the survey of Hv12 Ballineddan, likely due to the small size of the population there and the prevailing dry weather conditions at the time of survey. However, there is no reason to believe that this population is extinct at this location, as it was seen in small quantity on three occasions between 2020 and 2022, on the latter occasion during fieldwork for the National Fen Survey (NFS). One relevé containing *H. vernicosus* was recorded during the NFS survey, from which values for extent of occurrence and mean percent cover of *H. vernicosus* were derived, as well as data for the Habitat for the species assessment (Section 3.2). The population at Hv08c Coumtay showed a large increase of extent of occurrence since it was last surveyed in 2015–2018, with an increase in the area occupied of

almost three times that recorded previously. This may be due to the recording of additional areas not noted by the original surveyors or may indicate a genuine increase in the area occupied by the species. The Population at Hv01 Meentygrannagh was assessed as Unfavourable – Inadequate during the previous monitoring period, but was assessed here as Favourable on all attributes. This indicates that the possible decline that was detected in the 2015–2018 survey has at least been halted and possibly partially reversed.

3.2 Habitat for the species

Habitat for the species was assessed as being in Favourable condition at seven out of nine of the sites surveyed in 2023 (Table 6), with the two other sites surveyed assessed as Unfavourable – Inadequate.

Table 6 Results of the Habitat for the species assessment for the nine *Hamatocaulis vernicosus* sites surveyed in 2023; Favourable (Fav) = 7–8 attributes passed; Unfavourable – Inadequate (U-I) = 5–6 attributes passed; Unfavourable – Bad = 0–4 attributes passed.

Site code	Hv01	Hv06	Hv08a	Hv08b	Hv08c	Hv10	Hv11	Hv12**	Hv13
Area (m ²)	Pass*	Pass	Pass*	Fail	Pass	Pass	Pass	Pass	Pass
Hydrology	Pass	Fail	Pass	Pass	Pass*	Pass	Pass	Pass	Pass
Mean % tree cover	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Mean % shrub cover	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Mean % grass cover	Fail	Pass	Pass	Pass	Pass	Pass	Pass	Fail	Pass
Mean % bryophyte cover	Pass	Pass	Pass*	Fail	Pass*	Pass	Pass	Pass	Fail
Mean % <i>Calliargonella cuspidata</i> cover	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass*
Mean vegetation height (cm)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Fail	Pass
No. of passes	7	7	8	6	8	8	8	6	7
Habitat for the species assessment	Fav	Fav	Fav	U-I	Fav	Fav	Fav	U-I	Fav

*Passed on expert judgment

***H. vernicosus* was not found during this survey, so data from NFS survey of 2022 was used

One of these sites, Hv08b Nier River Valley, was assessed as Favourable in the previous monitoring period, but displayed a decline in extent of occupied habitat and low cover of bryophytes in the current survey. It is not clear what is the cause of this apparent decline, but as for the Population assessment, it may be due to insufficient grazing intensity. The other site that was assessed as Unfavourable – Inadequate was Hv12 Ballineddan, where *H. vernicosus* was not found during the current survey. Based on data collected for the NFS in 2022, the location where *H. vernicosus* was recorded has a higher cover of grass and taller vegetation height than is optimal. As this site was unknown until 2020, it is not possible to know how the habitat may have changed, and the condition of the site may be in decline, due to impacts on the hydrology from climate change or the adjacent forestry plantation, or due to lack of grazing. It may also be the case that this is a transient occurrence of the species in suboptimal habitat. The habitat at three other sites failed on one attribute, which indicates that their conservation status can be improved, but are currently assessed as Favourable. One site, Hv08c Countay,

appears to have improved in condition since the previous reporting period, and is now assessed as Favourable on all attributes.

3.3 Impacting activities

A range of pressures were detected by this survey, the majority of which are only acting on a small number of sites or having a low-level impact (Table 7). The most widespread impact noted is PA08 Extensive grazing or undergrazing by livestock. This was noted as a negative impact, at moderate intensity, at two sites, Hv10 Derrygoolin South and Hv12 Ballineddan, both of which were assessed as being undergrazed. Grazing at moderate levels is necessary to keep sufficiently open habitat for *H. vernicosus*, otherwise it will be outcompeted by more vigorous species, especially if the hydrology is suboptimal. PA05 Abandonment of Management was noted as a high-intensity negative impact at Hv06 NW of Gortachalla Lough. PA22 Drainage for use as agricultural land was also noted at this site, with evidence of hydrological alteration due to the digging of drains apparent. Drainage has previously negatively impacted the population at Hv01 Meentygrannagh, where the species has been lost from one area, but was not noted as having any further negative impact in this monitoring period. Nutrient enrichment due to runoff from adjacent agricultural fields may also be contributing to the loss of *H. vernicosus* in this location. However, a healthy population of the species still occurs elsewhere on the site. PJ03 Changes in precipitation regimes due to climate change was noted as a high intensity negative pressure at one site, Hv12 Ballineddan, where it may be leading to drying out of the site.

Table 7 List of impacts (n = 9), by intensity (high (H), medium (M), low (L)), % of the extent of occurrence affected and influence (positive (+), negative (-), neutral (0)), at the *Hamatocaulis vernicosus* sites surveyed in 2023.

Impact code	Impact description	Intensity			% extent of occurrence affected					Influence			Freq	
		H	M	L	<1	1-25	26-50	51-75	76-99	100	+	-		0
PA05	Abandonment of management/use of grasslands and other agricultural and agroforestry systems (e.g. cessation of grazing, mowing or traditional farming)	1							1		1		1	
PA06	Mowing or cutting of grasslands		1			1							1	
PA08	Extensive grazing or undergrazing by livestock		2	4			2		4	4	2		6	
PA13	Application of natural or synthetic fertilisers on agricultural land					1					1		1	
PA22	Drainage for use as agricultural land		1			1					1		1	
PG07	Freshwater fish and shellfish harvesting (recreational)			1		1						1	1	
PG09	Management of fishing stocks and game			1		1						1	1	
PH07	Intrusive and destructive research and monitoring activities			3		3					3		3	
PJ03	Changes in precipitation regimes due to climate change	1							1		1		1	
PK04	Atmospheric N-deposition			2					3		3		3	
PM07	Natural processes without direct or indirect influence from human activities or climate change		1					1			1		1	
Number of sites		2	5	11	0	8	0	3	1	8	4	13	2	20

3.4 Conservation measures

No directly targeted conservation measures are currently being implemented that are influencing populations of *H. vernicosus* or will influence *H. vernicosus* populations in the future. Although it is mainly incidental, rather than a targeted measure, most populations of *H. vernicosus* are being maintained through MA03 Maintain existing extensive agricultural practices and agricultural landscape features, in the form of moderate levels of sheep and cattle grazing. At these populations, it should be actively ensured that the grazing regime remains appropriate and that under- or overgrazing do not occur. It is difficult to maintain an ideal balance in grazing levels, particularly where other impacts, such as drainage, both current and historical, are active. At sites where grazing levels are currently not appropriate for the species, MA05 Adapt mowing, grazing and other equivalent agricultural activities (e.g. burning) should be implemented, with a moderate increase in grazing required at a number of sites, to keep the sward sufficiently open for *H. vernicosus* to thrive. At Hv06 NW of Gortachalla Lough, conservation grazing with cattle or sheep, at appropriate intensity, should be implemented to control dense growth of *Molinia caerulea* resulting from lack of grazing. For sites located outside of the SAC network (see Section 3.8), it should be ensured that afforestation, land reclamation, drainage and other negative developments do not occur.

Table 8 Conservation measures required or in progress at the *Hamatocaulis vernicosus* sites surveyed in 2023 and the pressures and threats addressed by these measures.

Measure code	Measure name	Number of sites	Pressure/threat addressed
MA03	Maintain existing extensive agricultural practices and agricultural landscape features	4	PA05, PM07
MA04	Reinstate appropriate agricultural practices to address abandonment, including mowing, grazing, burning or equivalent measures	1	PA05
MA05	Adapt mowing, grazing and other equivalent agricultural activities (e.g. burning)	3	PA08
MB01	Prevent conversion of (semi-) natural habitats into forests and of (semi-) natural forests into intensive forest plantation	1	PB01
MG02	Management of hunting, recreational fishing, and the recreational or commercial harvesting or collection of plants and fungi (incl. restoration of habitats)	1	PG07, PG09
MJ01	Implement climate change mitigation measures	1	PJ03
MM01	Management of habitats (others than agriculture and forest) to slow, stop or reverse natural processes that occur without direct or indirect influence from human activities or climate change	1	PM07
MS03	Restoration of habitat of species from the directives	1	PA22

3.5 Future prospects

The Future prospects assessment of each of the survey sites is detailed and justified in Table 9. Of the nine sites surveyed, six were deemed to have Favourable Future prospects. The Future prospects of Hv06 NW of Gortachalla Lough were deemed Unfavourable – Inadequate as, although there is a large population present, there is evidence of an ongoing decline, primarily due to a lack of grazing, as well as drainage. Hv08b Nier River Valley was also assessed as having Unfavourable – Inadequate Future prospects, as the population appears to be in decline and the habitat was assessed as being in poor condition, although no obvious significant threats or pressures were identified. As the habitat at Hv12 Ballineddan was assessed as being in unfavourable condition and the population there is very small and possibly in decline, with a number of pressures noted, the Future prospects were also assessed as Unfavourable – Inadequate.

Table 9 Details of the Future prospects assessments for *Hamatocaulis vernicosus* sites surveyed in 2023 and the rationale for the assessment.

Site no.	Site name	Future prospects assessment	Rationale for assessment
Hv01	Meentygrannagh	Favourable	Although <i>H. vernicosus</i> seems to be lost from one part of this site, the main part of the population is not being impacted negatively by any significant pressures.
Hv06	NW of Gortachalla Lough	Unfavourable – Inadequate	Although this is a large and extensive population that should persist in the future, there are multiple negative impacts and there is evidence that the population has become smaller, so an ongoing decline is expected.
Hv08a	Below Sgilloge Loughs	Favourable	This is an extensive population with no significant negative impacts recorded.
Hv08b	Nier River Valley	Unfavourable – Inadequate	Although there were no significant threats or pressures to this population recorded, the area covered by the population appears to have decreased significantly, suggesting that it is in decline, possibly due to inadequate grazing.
Hv08c	Coumtay	Favourable	The condition and extent of this population appear to be improving and all impacts are at low intensity.
Hv10	Derrygoolin South	Favourable	One area of the site may be undergrazed, but overall the population appears to be in good condition and is not threatened at present.
Hv11	Lough Patrick	Favourable	Large population with no pressing threats.
Hv12	Ballineddan	Unfavourable – Inadequate	Very small population that is likely declining due to insufficient grazing and drying of the site as a result of climate change or drainage.
Hv13	Ballyremon Commons	Favourable	No significant negative impacts were recorded.

3.6 Overall site assessments

Overall, as six of the nine sites surveyed in 2023 were assessed as Favourable on all three parameters, these sites were assessed as being of Favourable Conservation Status overall (Table 10). The three sites not assessed as being of overall Favourable Conservation Status, Hv06 NW of Gortachalla Lough, Hv08b Nier River Valley and Hv12 Ballineddan were assessed as Unfavourable – Inadequate on between one and three parameters, so were assigned an overall assessment of Unfavourable – Inadequate.

Table 10 Results of the overall site assessments of the nine sites surveyed for *Hamatocaulis vernicosus* in 2023, combining the assessments outlined above.

Site no.	Site name	Population	Habitat	Future prospects	Overall assessment
Hv01	Meentygrannagh	Favourable	Favourable	Favourable	Favourable
Hv06	NW of Gortachalla Lough	Unfavourable – Inadequate	Favourable	Unfavourable – Inadequate	Unfavourable – Inadequate
Hv08a	Below Sgilloge Loughs	Favourable	Favourable	Favourable	Favourable
Hv08b	Nier River Valley	Unfavourable – Inadequate	Unfavourable – Inadequate	Unfavourable – Inadequate	Unfavourable – Inadequate
Hv08c	Coumtay	Favourable	Favourable	Favourable	Favourable
Hv10	Derrygoolin south	Favourable	Favourable	Favourable	Favourable
Hv11	Lough Patrick	Favourable	Favourable	Favourable	Favourable
Hv12	Ballineddan	Favourable	Unfavourable – Inadequate	Unfavourable – Inadequate	Unfavourable – Inadequate
Hv13	Ballyremon Commons	Favourable	Favourable	Favourable	Favourable

3.7 National Conservation Assessment

The conservation status of *Hamatocaulis vernicosus* at a national level was considered to be unchanged from the previous two reporting periods and was assessed as Favourable on all parameters, with stable short-term and long-term trends (Table 11).

The Range (Figure 2) is reported as 19 occupied 10 km x 10 km grid cells. Due to the discovery of five new populations of *Hamatocaulis vernicosus* during the current reporting period, the range reported is greater than that reported for the previous reporting period. However, the short-term and long-term trends are assessed as stable, as it is not thought that these new populations represent new colonisations, but are previously overlooked populations of long standing. The Favourable Reference Range was set as the current range, which is considered sufficient to enable the long-term survival of the species.

Due to the discovery of five additional sites during the current reporting period, with no losses recorded, the Population is reported as 25 1 km x 1 km grid cells occupied across 14 localities, which is also set as the Favourable Reference Population, as conservation of all known populations is important to maintain genetic variation. The conservation status is assessed as Favourable on the Population parameter. Although there is an increase of six 1 km x 1 km grid cells since the previous reporting period, the trend in population is reported as stable, rather than increasing, as there is no evidence that the newly discovered populations represent new colonisations.

Although the habitat was assessed as being in poor condition at two sites, overall the habitat across the rest of the sites was deemed to be mainly in good condition. Therefore, the Habitat for the species was assessed as Favourable and shows stable short-term and long-term trends.

Similarly, the Future prospects were assessed as Favourable. Pressures and threats acting on the populations were not deemed to be having a significant impact on a national scale and the species is expected to remain viable in the future. If the impacts of climate change intensify in the future and significantly change the hydrology of the habitat of *H. vernicosus*, this assessment may change in future reporting periods.

Table 11 Summary of the conservation status assessment of *Hamatocaulis vernicosus* for the period 2019–2024.

Parameter	Conservation Status	Trend	Future prospects
Range	Favourable	Stable	Good
Habitat for the species	Favourable	Stable	Good
Population	Favourable	Stable	Good
Future prospects	Favourable		
Overall National Conservation Assessment	Favourable	Stable	

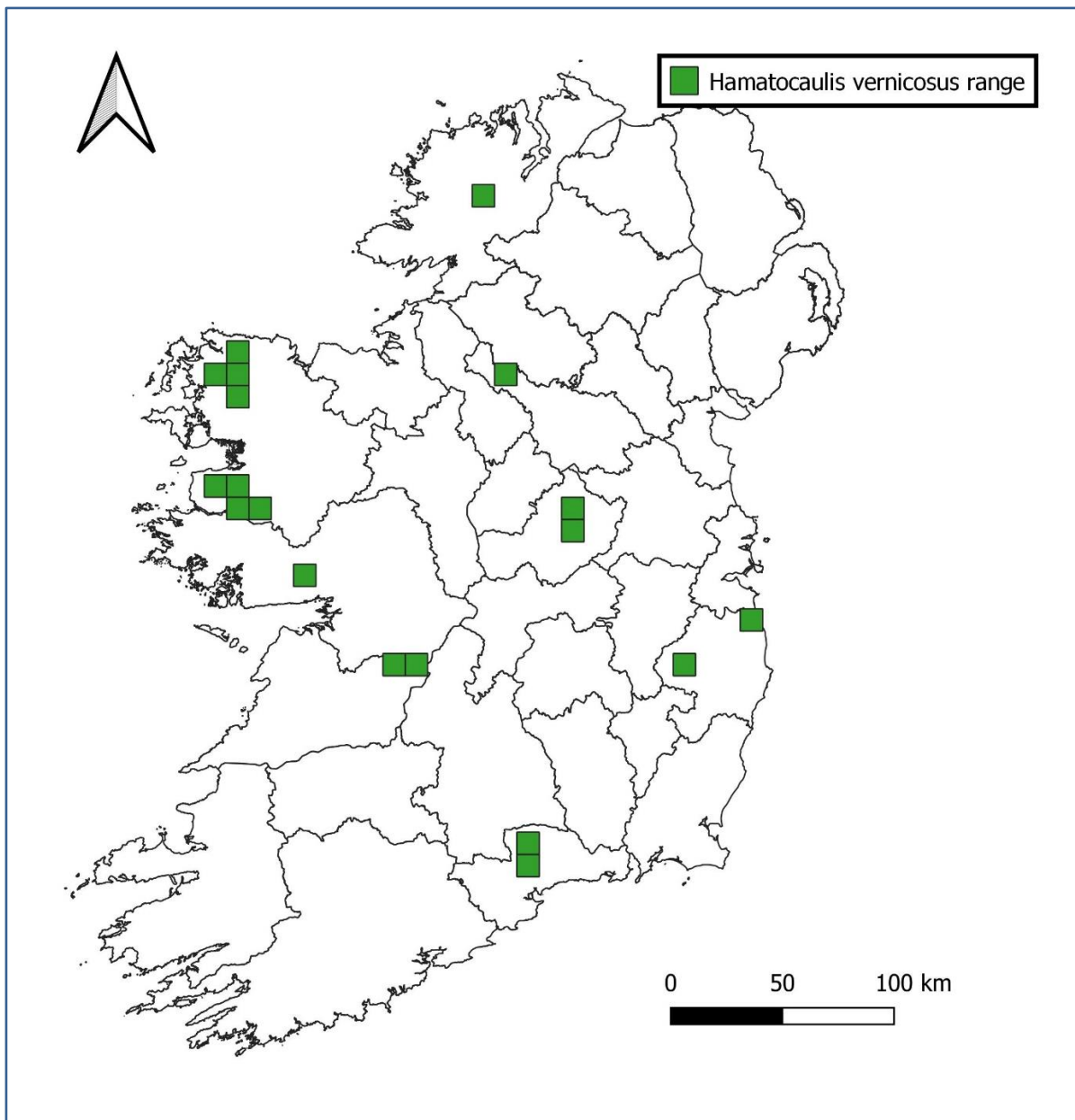


Figure 2 The Range of *Hamatocaulis vernicosus* in Ireland (green grid squares), as at the end of 2023.

3.8 Populations within and outside the SAC network

As populations of Annex II species within SACs, for which the species is listed as a Qualifying Interest (QI) have a greater level of protection than those outside SACs, or within SACs for which they are not listed as QIs, it is important to report on the proportion of the national population within SACs and for which the species is selected as a QI. Of the 16 known populations of *Hamatocaulis vernicosus* at the end of 2023, 13 are located within SACs (Table 1), and 11 of the populations are located within the nine SACs for which *H. vernicosus* is listed as a QI. The two population within SACs for which *H. vernicosus* is not a QI, Hv10 Derrygoolin South and Hv14 Leenaveesta, were both discovered during the current reporting period within SACs where *H. vernicosus* was not previously known to occur. Three populations, Hv11 Lough Patrick, Hv12 Ballyremon Common and Hv13 Ballineddan, are all located entirely outside of SACs. Of the three additional populations discovered in 2024, and not included within the National Conservation Assessment, two are located within SACs for which *H. vernicosus* is not listed as a QI, and the third is located outside of the SAC network.

4 Discussion

Nationally, the conservation status of *Hamatocaulis vernicosus* was assessed as Favourable and its prospects of survival in Ireland in the long-term are good. The populations at two sites, Hv06 NW of Gortachalla Lough and Hv08b Nier River Valley, show signs of decline since the previous monitoring period which, at Hv06, is ongoing since the preceding period, due to a lack of grazing and impacts from drainage. Conversely, a decline in the population at Hv01 Meentygrannagh appears to have halted, if not reversed. The Habitat for the species was assessed as Unfavourable – Inadequate at two sites, Hv08b Nier River Valley and Hv12 Ballineddan, with the cause of the poor quality of the habitat unclear at Hv08b. It may be that grazing levels within the flushes in which *H. vernicosus* grows are not sufficiently high, although grazing levels were assessed as sufficient, or it may also be that hydrological issues that are not immediately apparent are negatively impacting the population. At Hv12, insufficient grazing and drying out of the site due to either climate change or the adjacent forestry plantation are the likely causes for the poor suitability of the habitat. It is possible that the population at Hv12 is undergoing an ongoing decline, or it may be a transient occurrence in an area of habitat of only marginal suitability for the species. As no data exist for this site prior to 2021, it is not possible to be certain of the direction of change. The Habitat for the species at Hv08c Coumtay was assessed as Unfavourable – Inadequate during the previous monitoring period, but was assessed as Favourable by this survey, indicating that the condition of the site has improved. It is thought that the poor condition of the habitat previously may have been due to overgrazing on the surrounding slopes leading to eutrophication, the pressure of which appears to have eased and the size of the population has possibly increased.

A suitable grazing regime and hydrology are of key importance to maintain favourable habitat for *H. vernicosus* and to maintain populations in good condition. In particular, a lack of grazing leads to the vegetation becoming too closed and dense for *H. vernicosus* to thrive, particularly if coupled with suboptimal hydrological conditions. Drainage of wetland areas has led to the loss of, or damage to, populations of *H. vernicosus* in the past, undoubtedly including populations that were never recorded before they were lost. The impacts of drainage are also ongoing in at least one site. Afforestation has also led to the loss of populations, including relatively recently at Muigaghel in Co. Mayo (Campbell *et al.*, 2015). Stands of forestry adjacent to populations, such as at Ballineddan and Derrygoolin South, are likely to be negatively impacting the populations through changes in hydrology. Populations located outside of SACs are vulnerable to afforestation in the future. Changes in precipitation regimes due to climate change was only noted as a pressure at one site during the 2023 survey, where it was thought to be having a significant negative impact. This can be considered as a potential threat to most populations of *H. vernicosus* in the future, as the impacts of climate change become more apparent. As seasonal patterns of rainfall change, longer spells of dry weather may impact populations negatively. The magnitude of the impact of this threat is not yet known at a national scale, but it may potentially be significant in the medium to long-term across many populations, particularly in tandem with other negative impacts.

Campbell (2013) demonstrated that the majority of genetic variation in *H. vernicosus* is within populations, and gene flow between populations is minimal, as they are geographically fragmented. Four different haplotypes, within one cryptic species, of *H. vernicosus* have been identified as occurring in Ireland, two of which are unknown outside of Ireland (Hodgetts *et al.*, 2024). Therefore, conservation of all populations is of high importance and if one population is lost, then the genetic diversity of *H. vernicosus* in Ireland is diminished.

The discovery of eight new sites since 2019 indicates that the knowledge of the distribution of *H. vernicosus* in Ireland is still not complete. This is partly due to confusion when identifying the species in the past, as a result of its superficial resemblance to related species, especially *Scorpidium cossonii*, which also means that it may easily be overlooked by surveyors who are unfamiliar with its features. In Wales, since surveyors have been more aware of its presence, and targeted fieldwork has been undertaken, *H. vernicosus* has been discovered to be widespread across the uplands in suitable habitat (Bosanquet *et al.*, 2006; Blockeel *et al.*,

2014). It is not thought that *H. vernicosus* is as frequent in Ireland as it is in Wales, and is likely genuinely scarce in this country, but further populations almost certainly exist in areas from which it is currently not known and await discovery. There is no evidence that the newly discovered populations are recently colonisations and are likely of long standing and previously overlooked.

5 Conclusions and recommendations

Although *H. vernicosus* is currently assessed as being of Favourable Conservation Status overall nationally, multiple threats exist and pressures are resulting in declines in populations and habitat quality at a number of sites. Based on the results of this survey and assessment, a number of recommendations can be made to ensure the long-term survival of *H. vernicosus* in good condition across its range in Ireland. For populations where the habitat is currently favourable and the management is considered suitable, it should be actively ensured that the management stays as is and the grazing regime does not change and no drainage or other modifications to the hydrology occur in the vicinity of the populations. In order for this to be successful, full cooperation and collaboration of landowners is required, to whom the importance of *H. vernicosus* and its particular requirements should be explained.

Sites that were last monitored during the 2015–2018 survey should be revisited and monitored during the next monitoring period, as should the sites that were discovered since site selection for the 2023 survey was carried out. Sites that were assessed as of Unfavourable Conservation Status or where significant negative impacts were noted should also be revisited.

Conservation measures should be put in place at the three sites that were assessed as having an Unfavourable – Inadequate Conservation Status based upon the results of this survey. At Hv06 Gortachalla Lough conservation grazing or mowing could be introduced to open up the habitat and increase its suitability for *H. vernicosus*. The hydrological status of the site should also be assessed, particularly close to the ditch adjacent to the site boundary, which should be blocked if it is found to be having a significant influence on drainage across the site. At Hv08b Nier River Valley, it is not clear what is causing the Unfavourable Conservation Status of the site and it may be that there are no appropriate conservation measures. However, this should be investigated further and, if feasible and appropriate, measures should be implemented. At Hv12 Ballinedan, the introduction of conservation grazing may benefit *H. vernicosus*.

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7 Appendix 1 Site reports

Site name	Meentygrannagh Bog	Site number	Hv01
County	Donegal (H35)	SAC site code	000173
Dates surveyed	07/10/2023	Surveyors	NGH
Area of occupancy (m²)	645	Density of shoots per m²	21,250
No. of monitoring stops	4		
Site description			
<p>This site is a mosaic of blanket bog, alkaline fen and transition mire; <i>H. vernicosus</i> occurs in a series of runnels running more or less from north-west to south-east on a shallow slope with a south-easterly aspect. Vegetation is varied but <i>Molinia caerulea</i>, <i>Carex</i> spp. and <i>Juncus acutiflorus</i> all prominent across the site.</p>			
Changes from baseline			
<p>The distribution and abundance of <i>H. vernicosus</i> in the larger part of site (north of main ditch) is about the same, although size and distribution of individual stands is probably different, as the habitat pattern appears to be dynamic within the site. No <i>H. vernicosus</i> could be found in the smaller part of the site, south of the main ditch. Here the vegetation is quite different to the northern part, being a wet meadow with tussocky <i>Juncus</i> and <i>Sphagnum fallax</i>, <i>S. inundatum</i> and <i>S. palustre</i>.</p>			
Management notes			
<p>The site is grazed by sheep, and presumably also deer, but at a fairly low level of intensity. Some of the site south of the main ditch appeared to have been mowed. It may also be that there has been an input of nutrients to the southern part of the site (runoff from the field above?), leading to a deterioration of the flora. There is no sign of any substantial damage or change in the main, northern, part of the site.</p>			
Management recommendations			
<p>No muck-spreading should take place in the southern field north of the road. The ditches in this part of the site should be filled in.</p>			
Other notable species			
<p><i>Sphagnum contortum</i>, <i>S. teres</i>, <i>S. warnstorffii</i>.</p>			

Impact Code/Description	Influence	Intensity	% Habitat impacted
PA06 mowing in southern part of site	Unknown	M	5
PA13 possible muck-spreading or over-stocking in southern part of site	-	Unknown	10
PK04 atmospheric N-deposition almost certainly occurring	-	Unknown	100

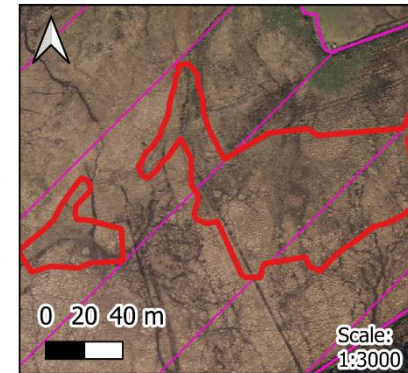
Conservation measure code	Conservation measure description
MA05	determine whether mowing has taken place and its likely effect and review grazing and muck-spreading regime





Figure 1 View across flushes at Meentygrannagh, within which *Hamatocaulis vernicosus* occurs.



Figure 2 Strong population of *Hamatocaulis vernicosus* in wet flush.



Legend:	
	Population extent
	Meentygrannagh Bog SAC
Project:	
Article 17 monitoring 2023	
Map Title:	
<i>Hamatocaulis vernicosus</i> population Hv01 Meentygrannagh	
Surveyor Initials:	
NGH	
Projection: IRENET95 / Irish Transverse Mercator	Scale of main map @ A4: 1:5,000
Drawn by: KMN	Date: 10/10/2024

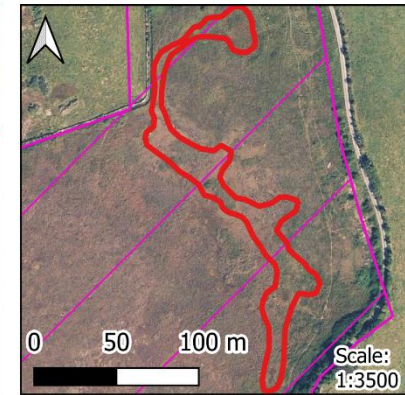
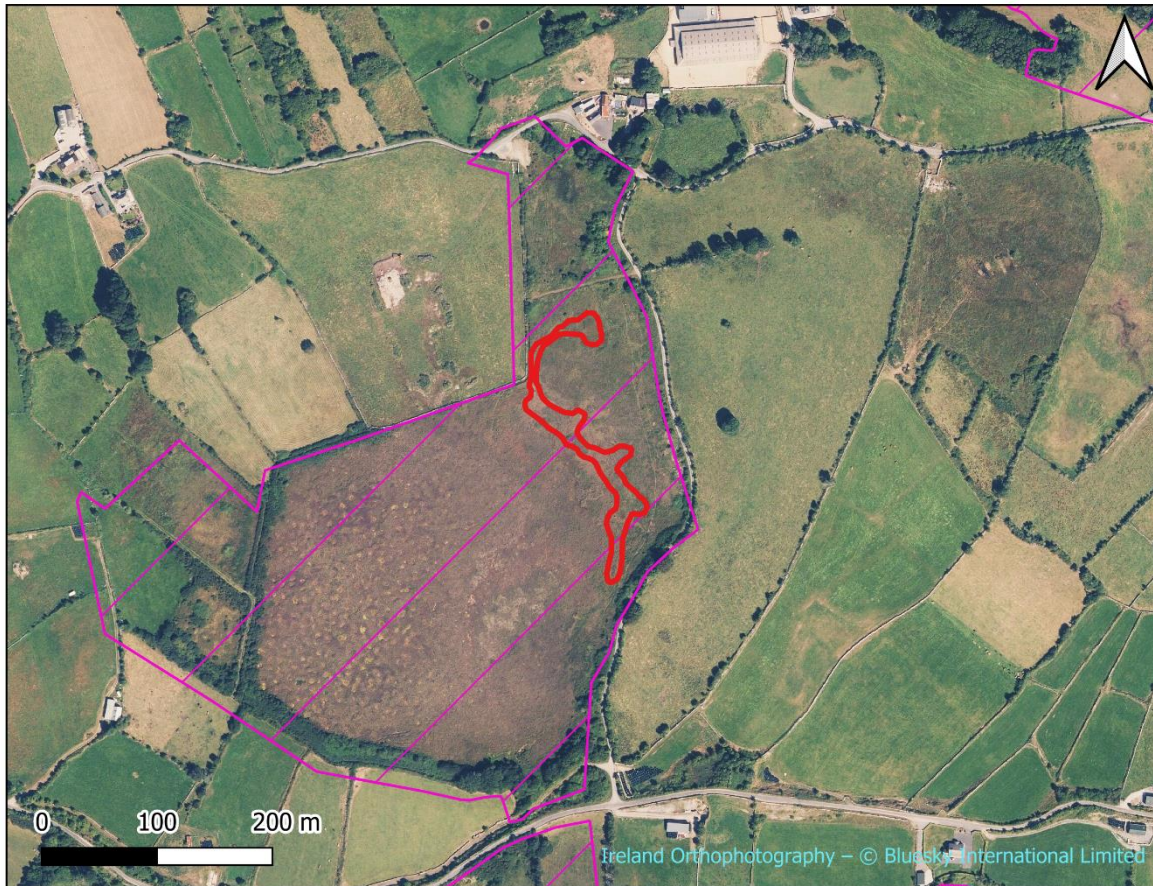
Site name	NW of Gortachalla lough	Site number	Hv06
County	Galway (H16)	SAC site code	000297
Dates surveyed	16/06/2023	Surveyors	EK, C�C
Area of occupancy (m²)	1,786	Density of shoots per m²	15,180
No. of monitoring stops	4		
Site description			
<p>This site is mostly rich (alkaline) fen (7230) with some area of transition mire (7140) and <i>Molinia</i> meadow in the driest parts. Little management is currently occurring and there is a large drainage ditch in the northwest of the site (alongside a stone wall). The largest <i>H. vernicosus</i> population occurs in transition mire in the north of the site, where there is a micropopulation of about 220–300 m² (of 100% <i>H. vernicosus</i> coverage). The second largest micropopulation is in the south of the site. Apart from that, <i>H. vernicosus</i> was found in another 24 places, in some areas as just a few stems, in others several cm² or dm² or rarely m². The total <i>H. vernicosus</i> population in the locality could be estimated on about 250–370m² of 100% <i>H. vernicosus</i> coverage.</p> <p>The locality was very dry. The water table was always below the surface and the pH and conductivity could be measured only in one place after severe trampling (pH 6,63; cond. 266). The dryness is caused by severe droughts in the last weeks but probably also due to insufficient surplus of underground water.</p>			
Changes from baseline			
Not enough information to say. <i>H. vernicosus</i> occurs in the area approximately corresponding with the 2019 monitoring.			
Management notes			
Little management is currently taking place. Conservation grazing or mowing is needed to decrease the expanding <i>Molinia</i> .			
Management recommendations			
Start sheep grazing.			
Other notable species			
<p><i>Drepanocladus trifarius</i> was found in the central part of the locality in relatively large population (at least several m² of 100% coverage).</p> <p><i>Drepanocladus lycopodioides</i> was found in the northern part of the locality in a population of at least 20 m² of 100% species coverage.</p>			
Impact Code/Description	Influence	Intensity	% Habitat impacted
PA05 cessation of management	-	H	100
PA22 drainage	-	M	10
Conservation measure code	Conservation measure description		
MA04	Conservation grazing of sheep or cattle to graze <i>Molinia</i> with high efficiency		





Figure 1 Site view of fen NW of Gortachalla Lough, with *Hamatocaulis vernicosus* occurring across a wide area.



Figure 2 Habitat of *Hamatocaulis vernicosus* in transition mire NW of Gortachalla Lough.



Legend:	
	Population extent
	Lough Corrib SAC
Project:	
Article 17 monitoring 2023	
Map Title:	
<i>Hamatocaulis vernicosus</i> population Hv06 NW of Gortachalla Lough	
Surveyor Initials:	
EK C6C	
Projection: IRENET95 / Irish Transverse Mercator	Scale of main map @ A4: 1:5,000
Drawn by: KMN	Date: 10/10/2024

Site name	Below Sgilloge Loughs	Site number	Hv08a
County	Waterford (H6)	SAC site code	001952
Dates surveyed	16/08/2023	Surveyors	SP, GS
Area of occupancy (m²)	1,849	Density of shoots per m²	5,980
No. of monitoring stops	4		
Site description			
<p>This is a very substantial metapopulation of <i>Hamatocaulis vernicosus</i> found in a complex of neutral flushes on the northern slopes of the Comeragh Mountains. All of the flushes are located on a slope which is well away from any of the walker's paths in the area and so are relatively undisturbed. The metapopulation includes one particularly large flush where it is abundant and many other smaller ones nearby, often picked out by the presence of <i>Carex paniculata</i>. The smaller sub-populations are often associated with individual springheads and outlying flushed runnels.</p>			
Changes from baseline			
<p>The population envelope is significantly larger than previously identified, with many tens of thousands of shoots present at high density in a newly discovered arm of the main flush covering at least 50 m x 10 m. Unusually, some of the shoots had perigonia. Other, apparently new and far smaller sub-populations were discovered on the nearby hillside and it is likely yet others remain to be discovered.</p>			
Management notes			
<p>The hillside is grazed by sheep (but not excessively so) and the flush vegetation height is mostly short.</p>			
Management recommendations			
<p>The current light grazing regime is ideal and should be maintained.</p>			
Other notable species			
<p>None</p>			

Impact Code/Description	Influence	Intensity	% Habitat impacted
PH07 Intrusive and destructive research and monitoring activities	-	L	20
PA08 Extensive grazing by livestock	+	L	100

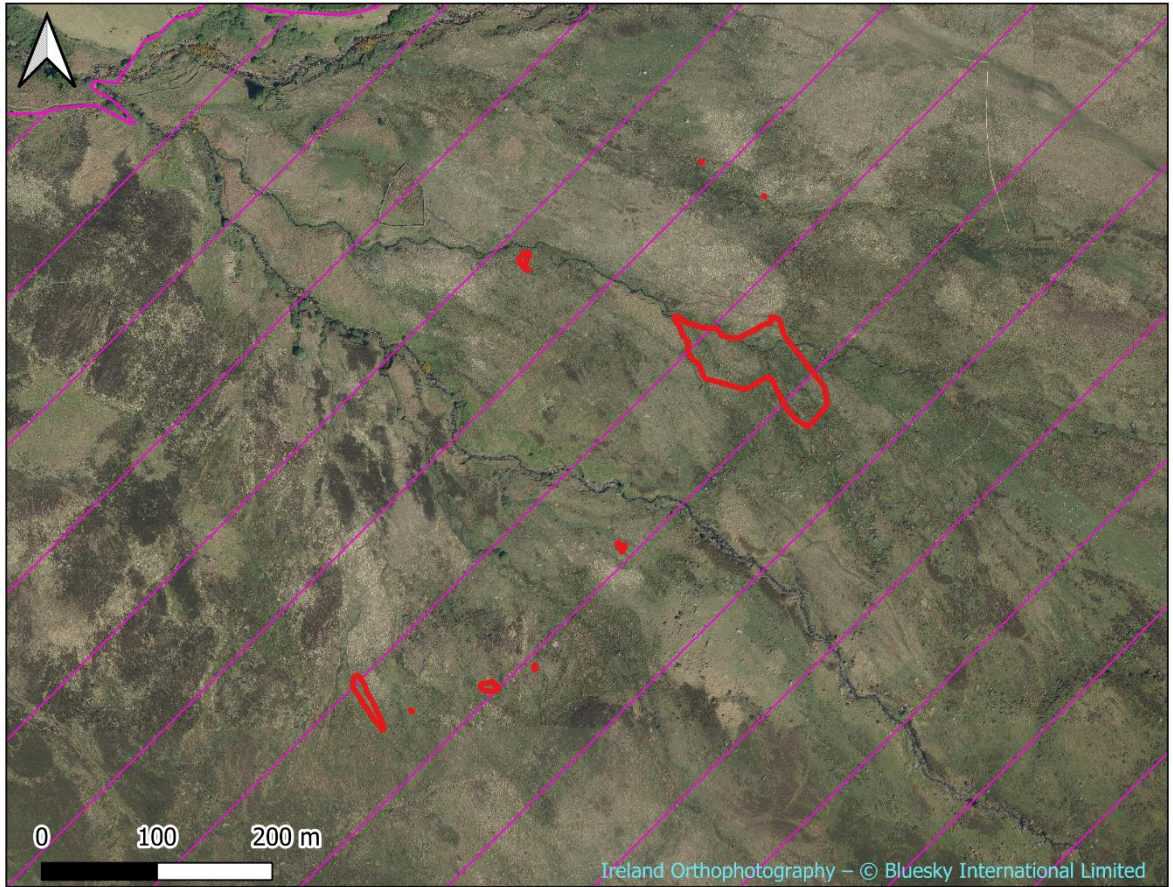
Conservation measure code	Conservation measure description
MA03	Maintain existing extensive agricultural practices



Figure 1 View of flush below Sgilloge Loughs, containing *Hamatocaulis vernicosus*.



Figure 2 Habitat of *Hamatocaulis vernicosus* in flushed runnel.



Legend:	
	Population extent
	Comeragh Mountains SAC
Project:	
Article 17 monitoring 2023	
Map Title:	
<i>Hamatocaulis vernicosus</i> population Hv08a Below Sgillige Loughs	
Surveyor Initials:	
SP GS	
Projection: IRENET95 / Irish Transverse Mercator	Scale of main map @ A4: 1:5,000
Drawn by: KMN	Date: 10/10/2024

Site name	Nier River Valley	Site number	Hv08b
County	Waterford (H6)	SAC site code	001952
Dates surveyed	17/08/2023	Surveyors	SP, GS
Area of occupancy (m²)	185	Density of shoots per m²	1,550
No. of monitoring stops	2		
Site description			
<p>This is a relatively dry, slightly sloping flush on the eastern bank of a hill stream. It has some patches of short, wet, sedge-dominated ground which supports <i>H. vernicosus</i> but much of it is too tall and dense. <i>Carex paniculata</i> is locally frequent. The highest numbers of shoots of <i>H. vernicosus</i> are in very wet ground at its northern end, which has little <i>C. paniculata</i>, <i>Molinia</i> and tall <i>Juncus</i>. Associated species include <i>Juncus acutiflorus</i>, <i>Carex echinata</i>, <i>Hydrocotyle vulgaris</i>, <i>Ranunculus flammula</i>, <i>Narthecium ossifragum</i>, <i>Succisa pratensis</i> and <i>Sphagnum contortum</i>. This part of the mountain is remote and has no walker's paths.</p>			
Changes from baseline			
No obvious changes observed in the field.			
Management notes			
The hillside is grazed by sheep (not excessively so) but they may not graze this flush much as it is surrounded by <i>Molinia</i> -dominated blanket bog.			
Management recommendations			
Higher levels of grazing would help to lower the flush vegetation height but this is unlikely to be a realistic aspiration for a relatively remote site.			
Other notable species			
None			

Impact Code/Description	Influence	Intensity	% Habitat impacted
PH07 Intrusive and destructive research and monitoring activities	Negative	Low	10
PA08 Extensive grazing by livestock	Positive	Low	100

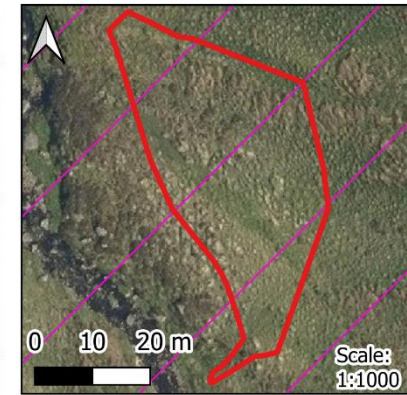
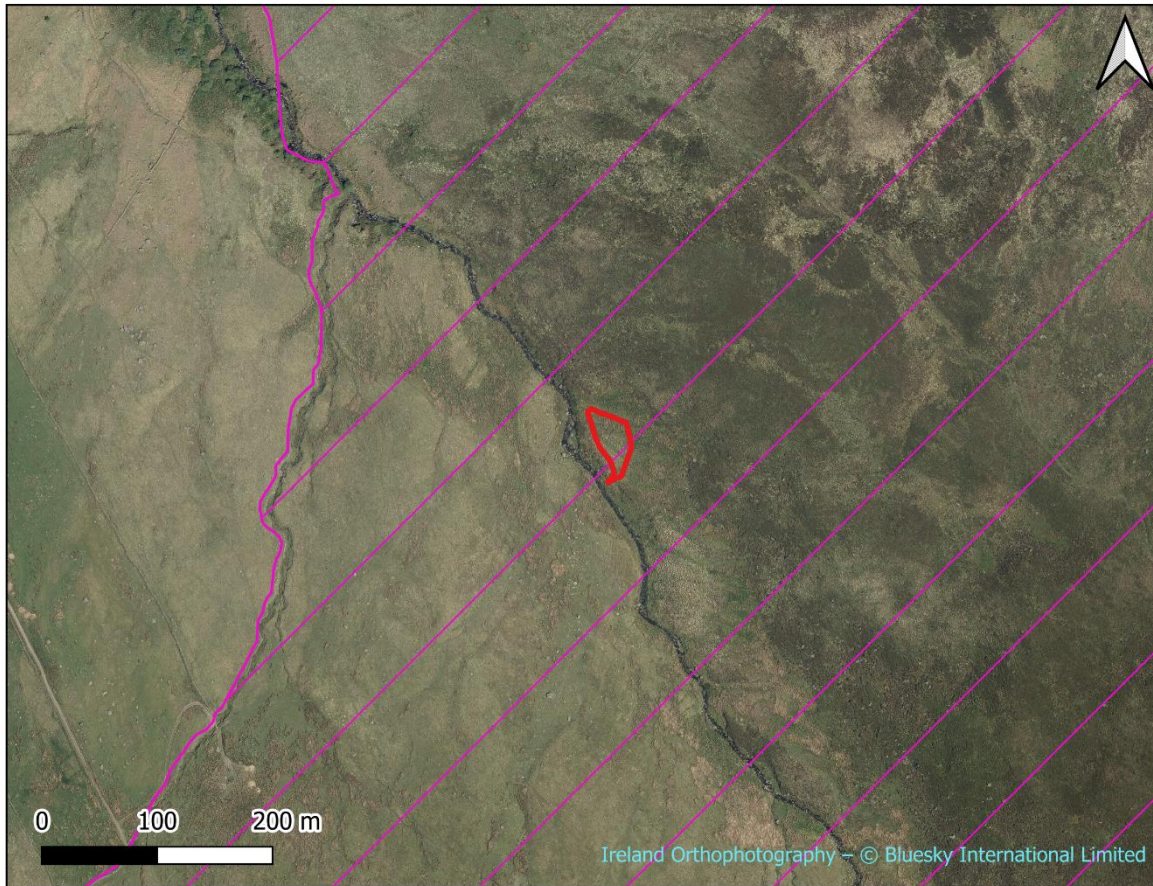
Conservation measure code	Conservation measure description
MA03	Maintain existing extensive agricultural practices





Figure 1 View of flush in the Nier River Valley, that contains *Hamatocaulis vernicosus*.



Figure 2 Habitat of *Hamatocaulis vernicosus* in open flush.



Legend:	
	Population extent
	Comeragh Mountains SAC
Project:	
Article 17 monitoring 2023	
Map Title:	
<i>Hamatocaulis vernicosus</i> population Hv08b Nier River Valley	
Surveyor Initials:	
SP GS	
Projection: IRENET95 / Irish Transverse Mercator	Scale of main map @ A4: 1:5,000
Drawn by: KMN	Date: 10/10/2024

Site name	County	Site number	Hv08c
County	Waterford (H6)	SAC site code	001952
Dates surveyed	17/08/2023	Surveyors	SP, GS
Area of occupancy (m²)	13	Density of shoots per m²	3,050
No. of monitoring stops	2		
Site description			
<p>This small, species-rich wet flush on a south-facing hillside is centred on several spongy upwellings (springheads) and is remote from any human paths. Its population of <i>H. vernicosus</i> is variably distributed across the flush, and densest in the vicinity of the springheads, with scattered shoots in short flushed ground between them.</p> <p>Vegetation across the flush is grazed very short and is rich in sedges and forbs. Typical associates include <i>Dichodontium palustre</i>, <i>Philonotis fontana</i>, <i>Saxifraga stellaris</i>, <i>Calliergonella cuspidata</i>, <i>Lysimachia tenella</i>, <i>Galium palustre</i> and <i>Carex echinata</i>. <i>Sphagnum contortum</i> and <i>Pinguicula lusitanica</i> are also present.</p>			
Changes from baseline			
<p>Previous population monitoring suggests that this population may be larger and more extensive than before, which may be a consequence of reduced and therefore more appropriate levels of sheep grazing on the surrounding hillside.</p> <p>Gelatinous patches of an alga were present and may be indicative of excessive deposition of atmospheric Nitrogen.</p>			
Management notes			
The hillside is lightly grazed by sheep (but not excessively so).			
Management recommendations			
None			
Other notable species			
None			

Impact Code/Description	Influence	Intensity	% Habitat impacted
PH07 Intrusive and destructive research and monitoring activities	-	L	10
PK04 Atmospheric N-deposition	-	L	100
PA08 Extensive grazing by livestock	+	L	100

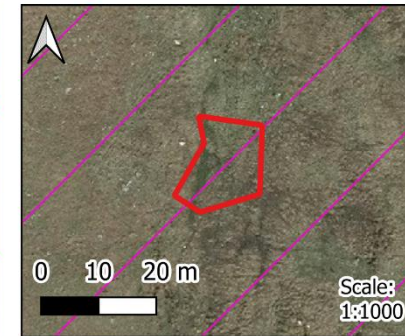
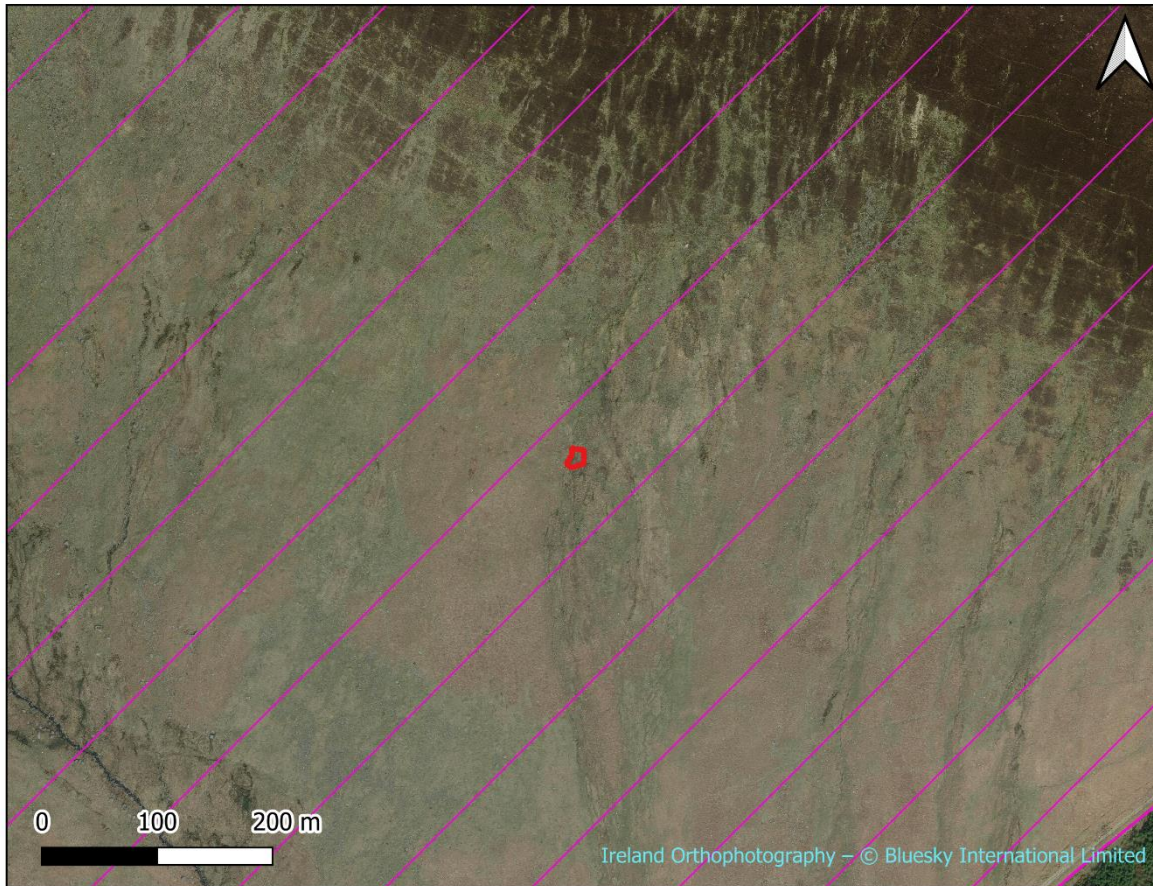
Conservation measure code	Conservation measure description
MA03	Maintain existing extensive agricultural practices





Figure 1 View across flush containing *Hamatocaulis vernicosus* at Countay.



Figure 2 Habitat of *Hamatocaulis vernicosus* in flush at Countay.



Legend:	
	Population extent
	Comeragh Mountains SAC
Project:	
Article 17 monitoring 2023	
Map Title:	
<i>Hamatocaulis vernicosus</i> population Hv08c County	
Surveyor Initials:	
SP GS	
Projection: IRENET95 / Irish Transverse Mercator	Scale of main map @ A4: 1:5,000
Drawn by: KMN	Date: 10/10/2024

Site name	Derrygoolin South	Site number	Hv10
County	Galway (H15)	SAC site code	000308
Dates surveyed	21/06/2023	Surveyors	EK, C�C
Area of occupancy (m²)	757	Density of shoots per m²	13,880
No. of monitoring stops	2		

Site description

Hamatocaulis vernicosus occurs at two separate locations on an undulating upland slope, separated by c 800 m. The easternmost site is a small transition mire (7140) surrounded by poor fen hummocks and grassland. The locality seems well supplied by groundwater as it was wet despite the droughts of the past two months. However, there are grasses (*Holcus lanatus*, *Anthoxantum odoratum*) invading into hummocks from surrounding habitats in rather large quantity. The vegetation of the transition mire is mostly dominated by sedges and *Sphagnum contortum* and *H. vernicosus* in the bryophyte layer.

H. vernicosus grows in 3 patches, with 5 m² of 100% *H. vernicosus* coverage in each of small patches and about 60 m² in the larger one.

The western location is within a degraded transition mire occupying a valley floor. There is high coverage of *Molinia* hummocks with *Holcus lanatus* and *Anthoxantum odoratum*. In parts there are no bryophytes in the ground layer, with *Calliergonella cuspidata* and *Calliergon giganteum* dominant in other places. There is a good supply of groundwater, but the water table might fluctuate during the year, which would not be ideal for *H. vernicosus* population.

H. vernicosus was found in 22 places, occurring in some as just few stems of *H. vernicosus*, and in others covering tens of centimetres.

The locality is extensively grazed by cattle and possibly sheep, which may be insufficient in some parts to maintain the *H. vernicosus* population.

Changes from baseline

No previous baseline data exists.

Management notes

The site is extensively grazed by cattle and sheep, but more intensive grazing may be needed in some areas. There is a large forestry plantation adjacent to the westernmost population, and historical drainage has occurred in the fen, both of which are likely to be negatively impacting hydrological conditions.

Management recommendations

Increase the grazing intensity in parts of the site. It may be useful to manually cut down *Molinia* hummocks and convert them to hollows which would be suitable for *H. vernicosus*.

Other notable species

None

Impact Code/Description	Influence	Intensity	% Habitat impacted
PA08 undergrazing by livestock	-	L	70

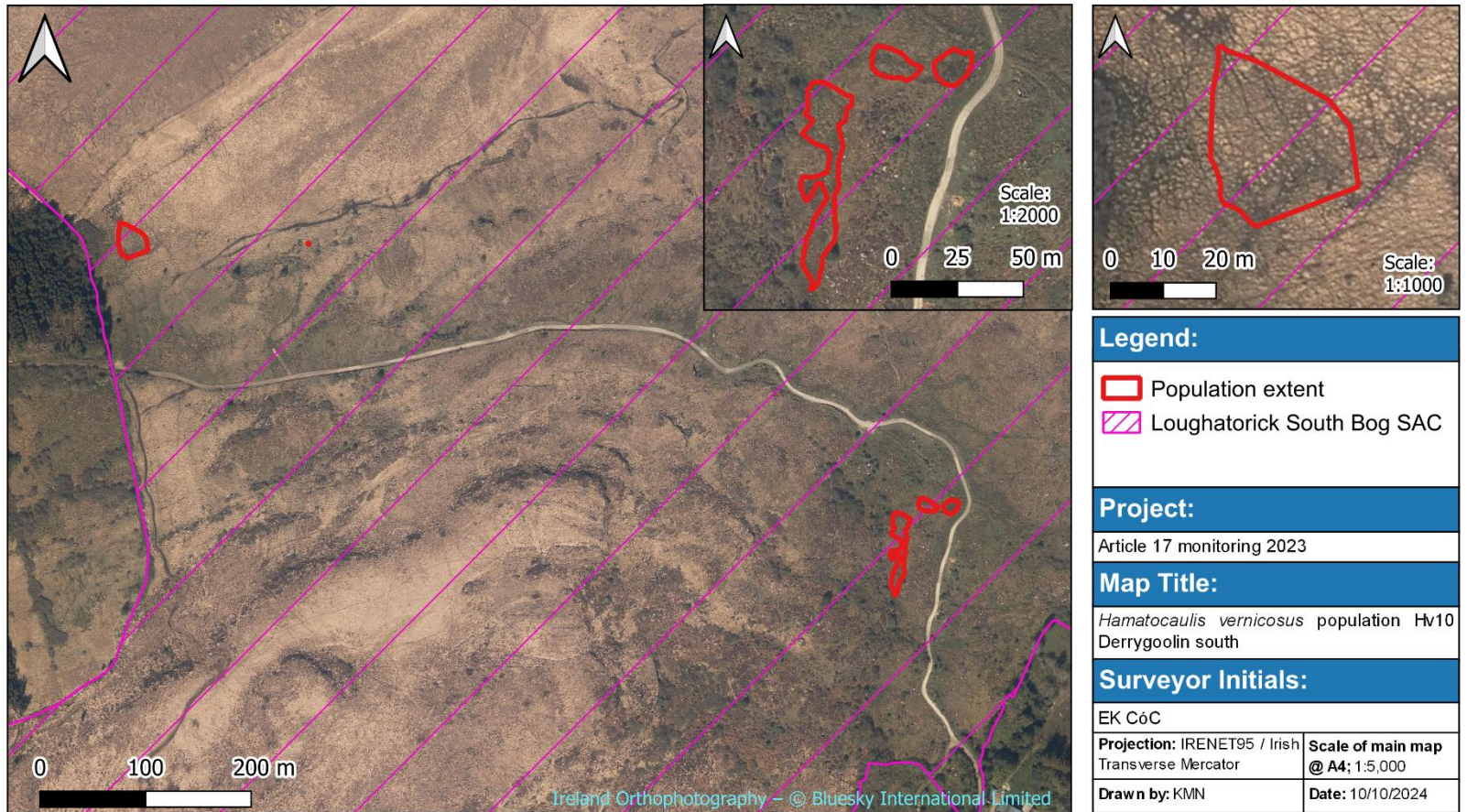
Conservation measure code	Conservation measure description
MA05	Adapt grazing – slightly increase the grazing intensity



Figure 1 General view of the westernmost location of *Hamatocaulis vernicosus* at Derrygoolin South.



Figure 2 Habitat of *Hamatocaulis vernicosus* at the eastern location.



Site name	Lough Patrick	Site number	Hv11
County	Westmeath (H23)	SAC site code	-
Dates surveyed	08/10/2023	Surveyors	CC, NGH, NL, GS
Area of occupancy (m²)	186	Density of shoots per m²	28,330
No. of monitoring stops	3		
Site description			
This is a basin mire at the margin of a small lough, which is very wet in places and dominated by <i>Carex rostrata</i> , with <i>C. paniculata</i> , <i>Potentilla palustris</i> , <i>Menyanthes trifoliata</i> and other typical transition mire species also present. <i>Hamatocaulis vernicosus</i> is locally abundant in runnels between <i>Carex</i> tussocks over a broad area. <i>Calliergonella cuspidata</i> is also present and abundant.			
Changes from baseline			
No previous baseline data exists.			
Management notes			
No active management is apparent. No agricultural runoff from surrounding fields is apparent. The lough is used for recreational fishing, but this is having little impact on the habitat.			
Management recommendations			
Continue to monitor the site.			
Other notable species			
<i>Calliergon cordifolium</i> , <i>C. giganteum</i> , <i>Plagiomnium ellipticum</i> .			

Impact Code/Description	Influence	Intensity	% Habitat impacted
PG07 fishing – probably insignificant impact	0	L	<5
PG09 restocking of fish – probably insignificant	0	Unknown	<5
PK04 atmospheric N-deposition	-	Unknown	100

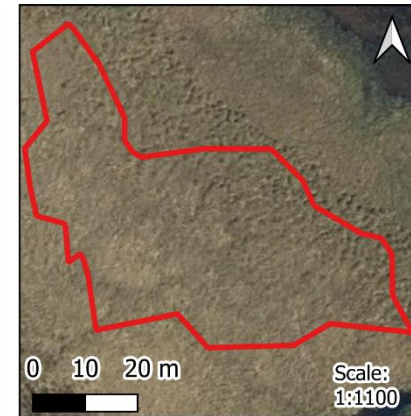
Conservation measure code	Conservation measure description
MG02	Continue to allow recreational fishing at a low level




Figure 1 Site view across mire at Lough Patrick, containing *Hamatocaulis vernicosus*.



Figure 2 Strong patch of *Hamatocaulis vernicosus* at Lough Patrick.



Legend:	
	Population extent
Project:	
Article 17 monitoring 2023	
Map Title:	
<i>Hamatocaulis vernicosus</i> population Hv11 Lough Patrick	
Surveyor Initials:	
CC NGH NL GS	
Projection: IRENET95 / Irish Transverse Mercator	Scale of main map @ A4: 1:5,000
Drawn by: KMN	Date: 10/10/2024

Site name	Ballineddan	Site number	Hv12
County	Wicklow (H20)	SAC site code	-
Dates surveyed	12/06/2023	Surveyors	JD, EK
Area of occupancy (m²)	1	Density of shoots per m²	Not recorded
No. of monitoring stops	0		
Site description			
<p>The site is a large field dominated by wet grassland (GS4) with <i>Molinia caerulea</i> as the main species. Small areas of poor fen (PF2) are present where the <i>Molinia</i> has a ground flora of <i>Sphagnum</i> and <i>Polytrichum commune</i> is present. At the south-western boundary of the site there are a number of places where groundwater seepages form transition mire (PF3/7140). These eventually flow into a ditch/ stream that runs along the border of the site. There is forestry on the southern border of the site, a small road to the north and wet grassland to the east and west. The site is grazed by a small number of sheep.</p> <p>The transition mire areas have habitat that is suitable for <i>Hamatocaulis vernicosus</i>. This was recorded from at least two locations previously. At each location the pH and conductivity were recorded. In the westerly transition mire area, the pH was 7.44 and EC 420 µS. In the easterly area of transition mire, the pH was 6.51 and EC 2250 µS (the latter reading is likely to be artificially high as it was hard to get a water sample without significant peat content as the flushes had no standing water in this area).</p> <p>Extensive searches of all transition mire habitat on the site for <i>Hamatocaulis vernicosus</i> were carried out but it was not re-found. The site was relatively dry and the flushes had little standing water. <i>Warnstorfia exannulata</i> was relatively frequent and <i>Sphagnum</i> (e.g. <i>Sphagnum contortum</i>, <i>S. subnitens</i>, <i>S. teres</i>, <i>S. warnstorffii</i>) was locally abundant. Additional species from the areas of transition mire considered suitable for <i>Hamatocaulis vernicosus</i> include: <i>Bryum pseudotriquetrum</i>, <i>Calliergonella cuspidata</i>, <i>Aneura pinguis</i>, <i>Aulacomnium palustre</i>, <i>Campylium stellatum</i>, <i>Riccardia chamedryfolia</i>, <i>R. multifida</i>, <i>Menyanthes trifoliata</i>, <i>Comarum palustre</i>, <i>Potamogeton polygonifolius</i>, <i>Carex echinata</i>, <i>C. panicea</i>, <i>C. pulicaris</i>, <i>C. rostrata</i>, <i>Eriophorum angustifolium</i>, <i>E. latifolium</i>, <i>Juncus articulatus</i>, <i>J. bulbosus</i> and <i>Ranunculus flammula</i>.</p>			
Changes from baseline			
<p>There is no detailed baseline data. The transition mire and <i>Hamatocaulis vernicosus</i> was first recorded in spring 2020. <i>Hamatocaulis vernicosus</i> was recorded as part of a habitat survey (not a dedicated survey for this species) and therefore it is assumed that it was at least frequent in the transition mire area. A site visit was made by NPWS, Joanne Denyer and the Forest Service in May 2021 and <i>Hamatocaulis vernicosus</i> was found in several areas. The site was surveyed for the National Fen Survey in August 2022 and again it was located in several areas although cover was low. It is likely therefore that there has been a slow decline in the cover of <i>Hamatocaulis vernicosus</i> and increase in <i>Sphagnum</i> and <i>Warnstorffii exannulata</i> over the last few years. <i>Hamatocaulis vernicosus</i> is likely to be still present on the site but perhaps as scattered stems which could not be re-found in the very dry conditions at the time of survey.</p>			
Management notes			
<p>A field visit for the National Fen Survey in August 2022 during a dry spell of weather found wetter conditions in the transition mire. It may be that dry weather in summer 2022, followed by the recent dry weather in early summer 2023 has had a negative impact on <i>Hamatocaulis vernicosus</i>. The flushes were damp to touch but standing water was very occasional.</p> <p>There is also the impact of undergrazing which leads to higher grass and sedge cover. In addition, it may be that there is a build-up of vegetation, raising the flushes from the influence of groundwater slightly. It is considered that the current extensive sheep grazing regime is insufficient to maintain the transition mire in optimal conditions.</p> <p>There were no other obvious causes of the low water levels in the local environment and no obvious drainage alterations on the site. The site has had a forestry application submitted in the past, but this was not approved.</p>			
Management recommendations			
<p>Increased grazing under advice from a wetland ecologist.</p> <p>Removal of <i>Sphagnum</i> and some vegetation from one of the transition mire areas to increase water levels and create open soil for regeneration of <i>Hamatocaulis vernicosus</i>. This has been trialled in other areas (e.g. Czech republic) with success at sites which are experiencing natural succession and/ or drying from climate related reduced rainfall etc.</p> <p>Investigate if there are any (off-site) anthropogenic impacts to the hydrogeological regime of the site.</p>			
Other notable species			

Sphagnum flexuosum (RDB VU); *Sphagnum teres* (RDB NT); *Sphagnum warnstorffii* (RDB VU). The site has had 14 species of *Sphagnum* recorded from it and it is one of the most important transition mire sites in Co. Wicklow.

Impact Code/Description	Influence	Intensity	% Habitat impacted
PA08 extensive grazing or undergrazing by livestock	-	M	60
PJ03 changes in precipitation regimes due to climate change	-	H	90
PM07 natural processes without direct or indirect influence from human activities or climate change	-	M	60

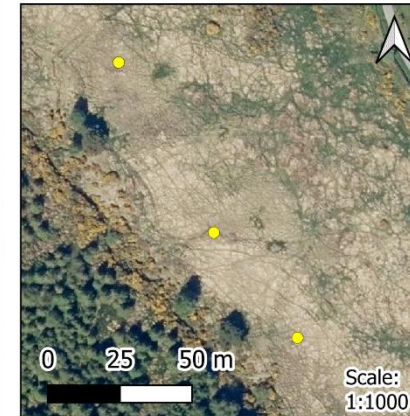
Conservation measure code	Conservation measure description
MA05	Adapt mowing, grazing and other equivalent agricultural activities
MB01	Prevent conversion of (semi-) natural habitats into forests and of (semi-) natural forests into intensive forest plantation
MM01	Management of habitats (others than agriculture and forest) to slow, stop or reverse natural processes
MJ01	Adopt climate change mitigation measures
MS03	Improvement of habitat of species from the directives



Figure 1 View of area in which *Hamatocaulis vernicosus* was found at Ballineddan.



Figure 2 Habitat where *Hamatocaulis vernicosus* was previously seen.



Legend:	
●	Previous records
Project:	
Article 17 monitoring 2023	
Map Title:	
<i>Hamatocaulis vernicosus</i> population Hv12 Ballineddan (none recorded in 2023)	
Surveyor Initials:	
EK JD	
Projection: IREN95 / Irish Transverse Mercator	Scale of main map @ A4: 1:5,000
Drawn by: KMN	Date: 10/10/2024

Site name	Ballyremon Commons	Site number	Hv13
County	Wicklow (H20)	SAC site code	-
Dates surveyed	09/06/2023	Surveyors	JD, EK
Area of occupancy (m²)	16	Density of shoots per m²	15,400
No. of monitoring stops	3		
Site description			
<p>The site is a large, fenced area, with no internal fencing. It is bordered on the north, south and western sides by roads and on the western side there is a forestry plantation. There was light sheep grazing at the time of survey.</p> <p>The drier areas around the edges and on higher ground are dominated by rush-dominated wet grassland (GS4) and poor fen (PF2). Transition mire (PF3) is present throughout the site and occupies around 40% of the site. There is some scrub (WS1) around the edges of the site but little in the central area. There are several areas where groundwater appears to arise and create transition mire conditions. In general, water flows from the north-east of the site to the south where it forms part of the headwaters of the River Vartry. In the central areas of the transition mires water levels are high in winter.</p> <p>1) Southern <i>Hamatocaulis vernicosus</i> area (Plot 2)</p> <p>The known location for <i>Hamatocaulis vernicosus</i> on the site is near the southern boundary. This population was relocated. In this area water levels are clearly much higher in winter. The vegetation is rush dominated with <i>Calliergon stramineum</i>, <i>Warnstorfia exannulata</i> and patches of <i>H. vernicosus</i>. It was more acidic than the transition mire in the north of the site and is not typical <i>H. vernicosus</i> habitat. <i>Sphagnum</i> was absent from the transition mire area, but present (<i>S. squarrosum</i> and <i>S. fallax</i>) in poor fen (PF2) around the edges, towards the road and forestry plantation. <i>H. vernicosus</i> was present in the 2 m x 2 m monitoring plot and also an adjacent 1 m x 1 m area to the east. It was not recorded elsewhere in this southern area. Overall, it covered an area of 40–60 cm² with 100% coverage in the eastern area and 60 cm² with 100% coverage in the monitoring plot.</p> <p>2) Northern central <i>Hamatocaulis vernicosus</i> area (Plot 1)</p> <p>This transition mire area is approximately 7 m x 30 m in area. The central area of the transition mire had low bryophyte cover and was dominated by <i>Potamogeton polygonifolius</i> and <i>Hypericum elodes</i>. <i>H. vernicosus</i> was recorded from 4 1 m x 1 m squares around the northern and western edges of the transition mire but absent from the wetter central area. There was approximately 600 cm² of <i>H. vernicosus</i> present. At the time of survey there had been an extended period of dry conditions, but this area of transition mire had standing water throughout, demonstrating the influence of groundwater in maintaining water levels.</p> <p>3) Northeastern potential <i>Hamatocaulis vernicosus</i> area (Plot 3, polygon 3) – <i>H. vernicosus</i> not found</p> <p>The north-eastern area of the site has a high cover of transition mire. The wetter central areas are dominated by <i>Potamogeton polygonifolius</i> and <i>Hypericum elodes</i>, bryophyte cover is low and bare peat cover is high. Water levels are likely to be high in winter here and some pools were present at the time of survey. The area suitable for <i>H. vernicosus</i> was on the edges of the transition mire, on slightly drier low hummocks formed by sedges and occupied by <i>Scorpidium cossonii</i>, <i>Warnstorfia exannulata</i> and <i>S. scorpioides</i>. However, it is possible that small micropopulations of <i>H. vernicosus</i> could be overlooked and the area should be re-checked in any future surveys. <i>S. cossonii</i> and <i>W. exannulata</i> were all browned from the recent dry weather and Plot 3 had no standing water. However, the central areas of the transition mire were still wet.</p>			
Changes from baseline			
<p>The northern population had not been recorded before. The southern population was first recorded on 17/11/2019. Additional species recorded from that area on that date include <i>Sphagnum squarrosum</i>, <i>S. fallax</i>, <i>Calliergon cordifolium</i> and <i>Calliergonella cuspidata</i> suggesting a similar flora was present. There is no population data available for <i>H. vernicosus</i>.</p>			
Management notes			
<p>The site currently has low level sheep grazing which appears to be at an appropriate level. The transition mire areas generally had a good vegetation height but with minimal trampling and dung levels. There was some dumping on the northern part of the site by the fenceline, but this was not in the transition mire. Subsequent to the survey, it was observed that a drainage ditch adjacent to the road along the eastern side of the site had been cleared, but it is not known whether this will impact the populations of <i>H. vernicosus</i> present. No other impacts were observed.</p>			
Management recommendations			
Continue current sheep grazing regime and stocking levels.			
Other notable species			

Calliargon giganteum was recorded from Plot 3 and was frequent in that area. This species is very rare in Co. Wicklow and the only other record is from Buckronev Marsh in 1949.

Impact Code/Description	Influence	Intensity	% Habitat impacted
PA08 Sheep grazing	+	L	100

Conservation measure code	Conservation measure description
MA03	Maintain existing extensive agricultural practices and agricultural landscape features



Figure 1 View of fen at Ballyremon Commons, with *Hamatocaulis vernicosus* growing in foreground.



Figure 2 Habitat of *Hamatocaulis vernicosus* at edge of transition mire at Ballyremon Commons.



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