Hamatocaulis vernicosus (Mitt.) Hedenäs (Slender Green feather-moss) in the Republic of Ireland

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Hamatocaulis vernicosus (Mitt.) Hedenäs (Slender Green feather-moss) in the Republic of Ireland

Synonyms

Amblystegium vernicosum (Lindb.) Lindb.
Drepanocladus vernicosus (Mitt.) Warnst.
Drepanocladus vernicosus var. *gracile* G. Roth
Harpidium vernicosum (Mitt.) C.E.O. Jensen
Hypnum aduncum var. *vernicosum* (Mitt.) Molendo
Hypnum lycopodioides var. *genuinum* Sanio
Hypnum lycopodioides var. *vernicosum* (Mitt.) Sanio
Hypnum pellucidum Wilson ex. Jur.
Hypnum vernicosum Lindb.
Hypnum vernicosum var. *fluitans* Warnst.
Limprichtia pellucida Wheld.
Limprichtia vernicosa Loeske
Scorpidium vernicosum (Mitt.) Tuom.
Stereodon vernicosus Mitt.

(Source: The Plant List: http://www.theplantlist.org/tpl/record/tro-35184127)

1. Introduction and status

Hamatocaulis vernicosus (Slender Green feather-moss) is a pleurocarpous moss of mesotrophic fens. It is a medium-sized perennial moss with pinnately branched shoots with branches that are held *circa* 90° to the stem (Atherton *et al*., 2010) that forms green to yellowish green patches. It has distinctive hooked shoot tips and the etymology of the genus name reflects this, as *hamatus* means 'hook-like' and *caulis* means 'stem' (Hedenäs, 1989a). The leaves are strongly falcate-secund, are often longitudinally plicate and frequently tinged with red at the bases (Smith, 2004). The function of the red pigmentation is thought to be protection against damaging levels of solar radiation (Hedenäs, 2003). There are two species in the genus, the other species being *H. lapponicus*, a Boreal species that does not occur in Ireland and differs from *H. vernicosus* mainly in its leaf morphology (Smith, 2004; Hedenäs, 2003).

H. vernicosus can appear similar to other fen species, such as *Warnstorfia exannulata,* but differs in the lack of a central strand and hyalodermis, lack of differentiated alar cells and distinctly plicate leaves (Hedenäs, 2003; 1989a). In the past, it has also been confused with other species, such as *Scorpidium cossonii* and *Palustriella commutata*, which led to many erroneously labelled herbarium specimens (Blockeel, 1997).

H. vernicosus is a dioicous species and sporophytes have never been recorded in Ireland (or Britain) and are very rare across its distribution, maturing in summer (Smith, 2004; Hedenäs, 1989a). Specialised vegetative propagules are unknown, thus asexual reproduction must be the means of propagation and dispersal through gametophytic fragmentation. Fragment dispersal is usually effective only over short distances, unless the fragments are spread by birds or large mammals (Štechová & Kučera, 2007; Hedenäs, 1989b).

Hedenäs & Eldenäs (2007) found two clades within the species from DNA sequence analysis. The first clade included specimens from southern Sweden, Denmark, Austria, Switzerland, N. Italy, central Spain, Britain, Russia and Peru, while the second clade was found in specimens from northern

Sweden, USA, Poland, S. Sweden, Denmark, Switzerland and Austria. No difference in morphology was discernible between the two clades. It is not known to which clade the Irish populations belong.

The species was known as *Drepanocladus vernicosus* (Mitt.) Warnst. before Hedenäs (1989a) transferred it to *Hamatocaulis*, a new genus. Because it has often been confused in the past with other species, notably *Scorpidium cossonii* and *Palustriella commutata*, it was listed as 'insufficiently known' in the *Red Data Book of European Bryophytes* (European Committee for the Conservation of Bryophytes, 1995). Since then, a better understanding of the plant has led to a better knowledge of its distribution in Europe. Furthermore, fieldwork on *H. vernicosus* across Europe has increased as a result of its inclusion on Appendix I of *The Convention on the Conservation of European Wildlife and Natural Habitats* (Bern Convention) in 1991, and Annex IIb of *The European Community Directive on the conservation of natural habitats and of wild fauna and flora* (the 'Habitats Directive'), which came into force in 1992 and which was transposed into Irish legislation in 1997 (Irish Statute Book, 1997). Special Areas of Conservation (SACs) must be designated for species listed on Annex II. *H. vernicosus* is now included on lists of specially protected species in all signatory countries to the Bern Convention and the Habitats Directive.

As a result of these factors, it is now clear that *H. vernicosus*, although rather rare and habitat-specific, is not as rare in Europe as was once thought. It is, for example, now regarded as *Nationally Scarce* in Britain (Church *et al*., 2001; Preston, 2006), rather than a Red Listed species. In Ireland, *H. vernicosus* is considered *Near Threatened* (Lockhart *et al*., 2012). Recent revision of herbarium specimens (Blockeel, 1997) and fieldwork has shown that it is certainly much rarer in Ireland than it is in Wales, for example, which appears to be its centre of distribution in Britain (Turner, 2003; Bosanquet *et al*., 2006).

2. International distribution of *H. vernicosus*

According to Hill *et al.* (1994), *H. vernicosus* is a circumboreal species ranging from the Arctic, south to western, central and eastern Europe, Turkey, Caucasus, central Asia and northern USA, with a disjunct occurrence in the Dominican Republic. Hill & Preston (1998) include *H. vernicosus* in the Circumpolar Boreal-montane element in their classification of floristic elements in Britain and Ireland.

According to Hedenäs (2003), *H. vernicosus* is widely distributed but rarely common in the northern temperate to arctic zones (his map shows it in most European countries), and scattered in the mountains of central and northern South America. He also includes Africa in parentheses and with a question-mark, having noted that it had been reported in Wijk *et al.* (1962). However, *H. vernicosus* is not included in the latest version of the African moss checklist (O'Shea, 2006), so it can probably be concluded that it has not definitely been recorded there. Hedenäs (1989a) shows *H. vernicosus* to be widely distributed in northern Europe, being especially frequent in southern Finland and southern Sweden, but much less so in Norway, where it appears on the national Red List as *Vulnerable* (Kålås *et al*., 2010).

There is now quite a large amount of information available on the distribution of *H. vernicosus* in individual European countries:

- Czech Republic: declined somewhat (Štechová, 2005) and as of 2012, *H. vernicosus* has been recorded at 54 localities in the Czech Republic, while its occurrence was not verified at 75

historical localities supported by specimens, nor at 14 unsupported localities (Štechová *et al*., 2012).

- France: several localities in the east and south, but has apparently disappeared from many other areas, particularly the west of the country. Declined greatly in the past century due to degradation of wetlands and changes in agricultural practice (e.g. abandonment of wet meadows) including intensification (Hugonnot *et al*., 2012).
- Germany: a range map shows *H. vernicosus* occurring in eastern and southern Germany, but not in the west (Walder, 2006).
- Spain: known from five localities, two in Ávila, one in Madrid and two in Zamora, all other specimens having been misidentified (Heras & Infante, 2000). Here, the species is decreasing "because of excessive cattle rearing. ...As a result of grazing and constant mechanical disturbance by the cattle, these areas become drained and eutrophicated, while the vegetation is gradually transformed into pasture".
- Switzerland: widely distributed but declined to some extent (Zusammengestellt von der Kartierkommission 'Naturräumliches Inventar der Schweizer Moosflora' NISM, 2003).
- United Kingdom: as of 2006, it was present in 13 10 km² squares in Scotland, 6 in England and 30 in Wales, where it is locally frequent (Joint Nature Conservation Committee, 2007). However it has declined substantially in some areas (notably northern and southern England), and is almost certainly extinct in East Anglia (British Bryological Society Threatened Bryophyte Database). In Northern Ireland there is an old record (1901) from Lisburn in Co. Down (Blockeel & Long, 1998) and in 2012, four new localities were found in Co. Antrim (Hodgetts, pers. comm.).

The EUNIS database (European Nature Information System) gave the following information on *H. vernicosus* in EU countries:

- Austria: present but no sites mentioned (11 sites listed in 2007)
- Belgium: 3 sites
- Bulgaria: 4 sites
- Czech Republic: 21 sites
- Denmark: 13 sites
- Estonia: 14 sites
- Finland: 54 sites
- France: 16 sites
- Germany: 60 sites
- Ireland: 8 sites
- Italy: 3 sites
- Latvia: 21 sites
- Lithuania: 27 sites
- Netherlands: 1 site
- Poland: 45 sites
- Romania: 8 sites
- Slovakia: 1 site
- Spain: 4 sites
- Sweden: 69 sites
- United Kingdom: 11 sites

(http://eunis.eea.europa.eu/species/3056/sites?tab=sites&tab=sites&tab=sites&d-4014547-p=1&d-4014547-o=2&idSpecies=3056&idSpecies=3056&idSpecies=3056&d-4014547-s=2)

Presumably these are 'key sites' and/or Special Areas of Conservation (SACs) for *H. vernicosus* in the Natura 2000 network, rather than a comprehensive population list for each country. However, different countries may have interpreted EUNIS criteria in different ways.

H. vernicosus is also known from Bosnia-Herzegovina, Croatia, Macedonia, Montenegro, Slovenia and Serbia (Sabovljević *et al*., 2008; Erzberger & Papp, 2007; Sabovljević, 2006; Sabovljević & Stevanović, 1999). *H. vernicosus* is extinct in Luxembourg (Werner, 2009) and is thought to have disappeared from Hungarian wet meadows due to eutrophication and drainage (Papp *et al*., 2002).
H. vernicosus has also been reported from the Faroe Islands (Boesen *et al*., 1975) and from Belarus, Ukraine, Georgia, Armenia, Kazakhstan, Kyrgyzstan and Russia (including Siberia) (Ignatov *et al*., 2006), as well as Turkey (Uyar & Çetin, 2004).

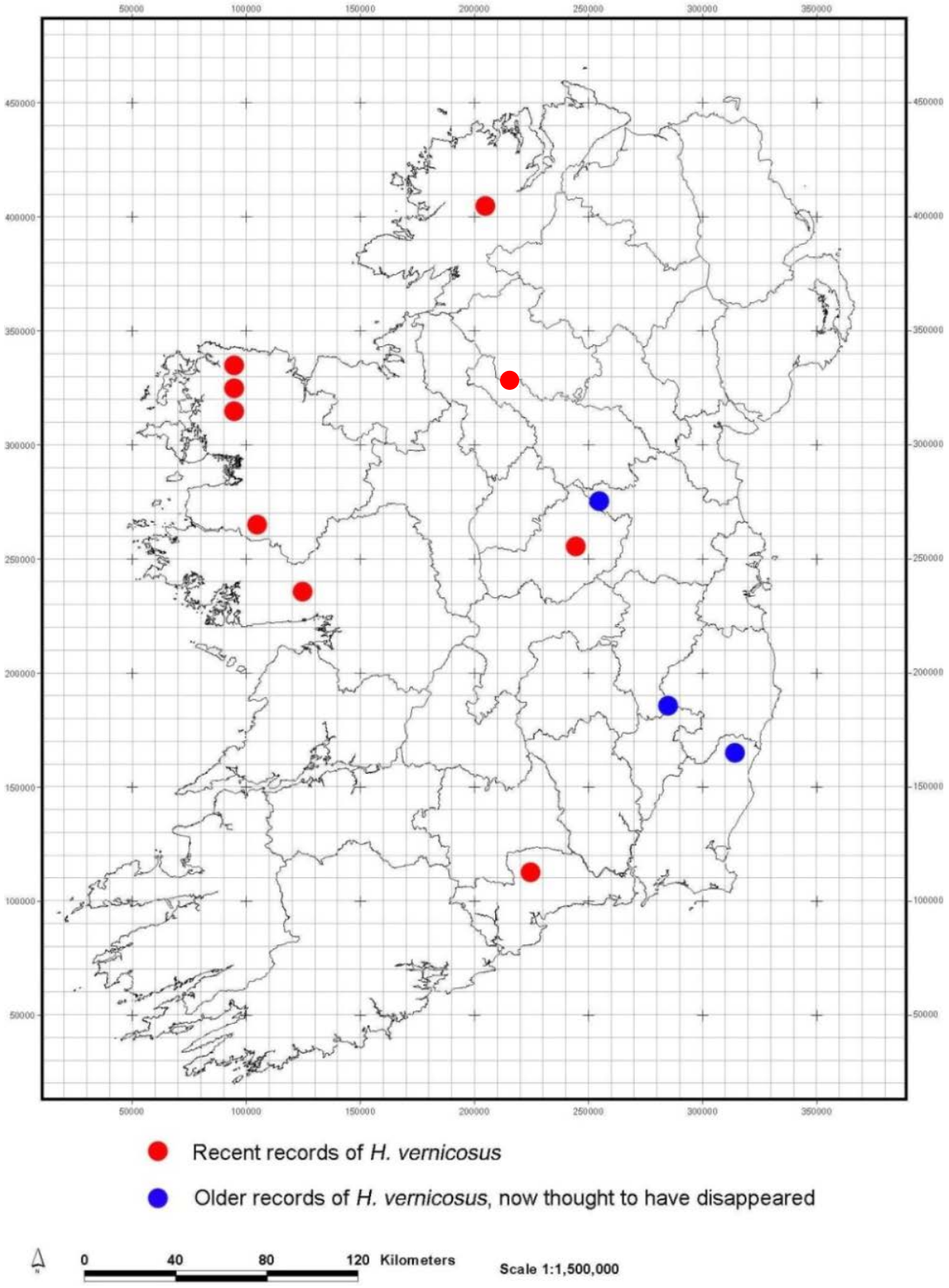
In North America, Crum & Anderson (1981) list *H. vernicosus* from Greenland to Alaska, south to Oregon, Montana, Iowa, Ohio, Pennsylvania and Connecticut. Lawton (1971) lists it from British Columbia, Washington, Idaho, Minnesota; Prince Edward Island and New England.

3. Distribution of *Hamatocaulis vernicosus* in the Republic of Ireland

H. vernicosus was first reported from Ireland in 1872 at Lough Bray by D. Moore (Moore, 1872). Unfortunately, this record is not supported by a specimen. The first record for the Republic of Ireland supported by a specimen was in 1946 at Portnashangan, Co. Westmeath, by K.C. Harris; this was presumably from the locality now known as Scragh Bog. It is scattered and rare in the Republic of Ireland, with records from the counties of Waterford, Galway, Wexford, Meath, Westmeath, Wicklow, Donegal, Cavan and Mayo. Wetlands in Cos. Mayo and Galway form the main stronghold for this species, with only scattered records elsewhere. There are a few places in the east of the country with only old records, not all of them confirmed, and it has probably disappeared from most of these. Many of the older records (and some of the recent ones) are errors. Blockeel (1997) revised herbarium material of *H. vernicosus* and found that a high proportion of Irish material was referable to *Scorpidium* (formerly *Drepanocladus*) *cossonii*, a related species that is, however, much more frequent and more strongly basiphilous than *H. vernicosus*. The Irish distribution of *S. cossonii* was further clarified by Blockeel (2000).

H. vernicosus has been recorded in recent (post-1998) fieldwork as part of the NPWS programme of rare and threatened bryophyte surveys in the following counties: Waterford (three populations); Galway (two populations); Westmeath (one population); Mayo (three populations); Donegal (one population) (Sources: NPWS database; Holyoak, 2002; Holyoak, 2003). An additional record in Cavan was discovered in 2012 by Dr Rory Hodd. The distribution of *H. vernicosus* in the Republic of Ireland, as currently understood, is shown in Figure 1. Only confirmed records are mapped.

Figure 1. Distribution map of *Hamatocaulis vernicosus* in the Republic of Ireland.



4. Range of *Hamatocaulis vernicosus* in the Republic of Ireland

According to the European Commission (1992), range is taken to be '*the outer limits of the overall area in which a habitat or species is found at present. It can be considered as an envelope within which areas actually occupied occur as in many cases not all the range will actually be occupied by the species or habitat*'.

This can be a difficult concept for bryophytes, which tend to occur in often very scattered or disjunct populations, the plants occupying small 'micro-habitats' within larger, more generally recognised habitats. *H. vernicosus* grows in at least two different, but rather poorly defined, habitats: upland transitional flushes and wet lowland sedge meadows and fens.

The range outline largely corresponds to the IUCN definition of 'extent of occurrence', taken as the '*area contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known, inferred or projected sites of present occurrence of a taxon, excluding cases of vagrancy*' (European Commission, 1992).

For the purposes of the conservation assessment under Article 17 of the EU Habitats Directive, the range of *H. vernicosus* is taken to be the area of the 10 km^2 grid cells overlain on the localities where *H. vernicosus* is currently known to occur. This leads to a fragmented range of *H. vernicosus*. The resultant map is shown in Figure 2.

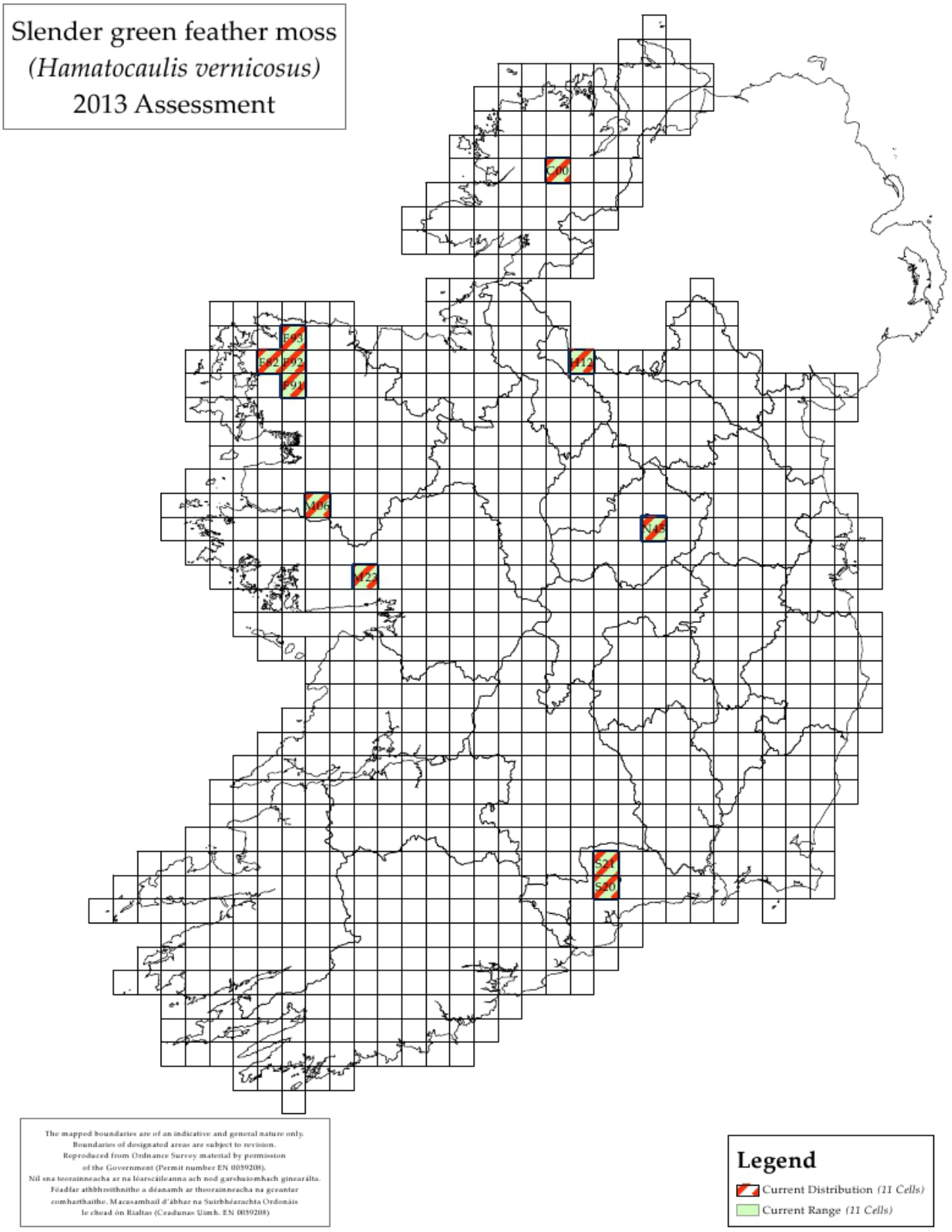
4.1 Range Conservation Status

The Favourable Reference Range (FRR) for *H. vernicosus* in the Republic of Ireland is taken to be its current range (i.e. a polygon containing all the 10 km^2 squares from which *H. vernicosus* has been recorded recently (1999-2012)). This is thought to encompass the known ecological range of variation for the species in the Republic of Ireland.

As the current range of the species is the same as the Favourable Reference Range, it is allocated a Favourable Conservation Status in this respect.

- **Species Range Area:** Can be considered as either the area of the grid cells occupied by the habitat which is 1100 km^2 (11 grid cells x 100 km^2) or the area of the polygon which contains all of the grid cells, which is also 1100 km^2
- **Favourable Reference Range:** 1100 km^2 (11 grid cells x 100 km^2).

Figure 2. The distribution and range of *Hamatocaulis vernicosus* in the Republic of Ireland.



5. Populations of *H. vernicosus* in the Republic of Ireland

There are currently thought to be 11 extant populations of *Hamatocaulis vernicosus* in the Republic of Ireland, which occur within 9 SACs (Table 1). Each of the populations are described in some detail below (Section 5.1) and might usefully be read in conjunction with the appended distribution maps (Appendix I). There are four localities (Section 5.2) where confirmed records of *H. vernicosus* have been reported, but where it is now thought to be extinct, or not seen in over 25 years. A further two records remain unconfirmed in the absence of specimens, and at least 14 other reported finds are known to be errors of misidentification (Section 5.3 and 5.4).

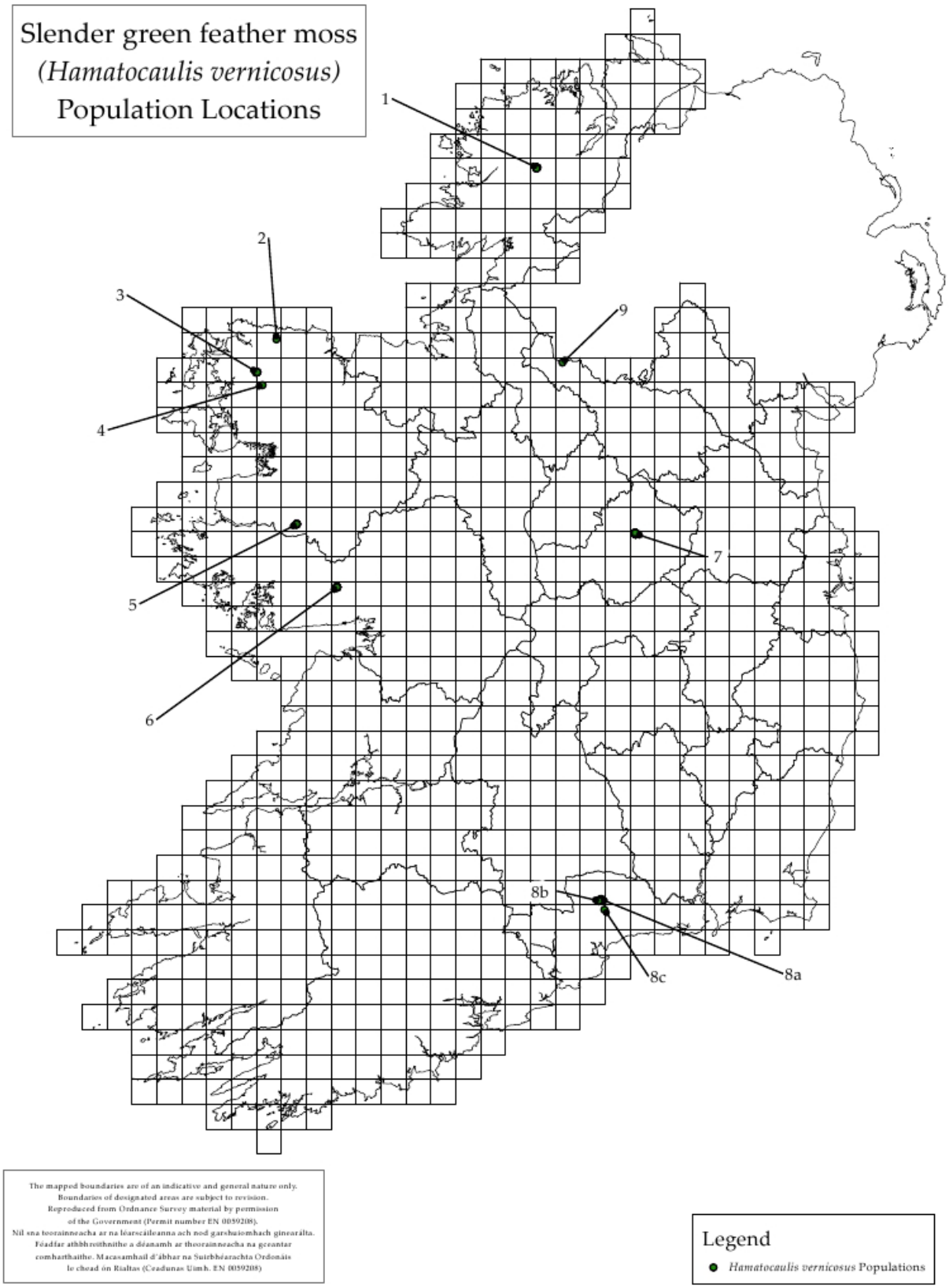
Table 1. Special Areas of Conservation (SACs) with extant populations of *Hamatocaulis vernicosus* in the Republic of Ireland.

Population	SAC Code	SAC Name	County
1. Meentygrannagh	000173	Meentygrannagh Bog	Donegal
2. Rathavisteen	000500	Glenamoy Bog Complex	Mayo
3. Largan More	000476	Carrowmore Lake Complex	Mayo
4. Uggool	000534	Owenduff/Nephin Complex	Mayo
5. Owenbrin, Lough Mask	001774	Lough Carra/Mask Complex	Mayo
6. NW of Gortachalla Lough	000297	Lough Corrib	Galway
7. Scragh Bog	000692	Scragh Bog	Westmeath
8a. Below Sgilloge Loughs	001952	Comeragh Mountains	Waterford
8b. Nier River Valley			
8c. Coumtay			
9. Commas*	000584	Cuilcagh-Anierin Uplands	Cavan

* Recent find of *H. vernicosus*; not yet selected as a qualifying interest for SAC 000584

The location of the numbered populations in the Republic of Ireland can be seen in Figure 3.

Figure 3. Locations of *Hamatocaulis vernicosus* populations in the Republic of Ireland (see Table 1 for key to population number locations).



5.1 Extant populations of *H. vernicosus* in the Republic of Ireland

For the recently-recorded (1999-2012) populations in the Republic of Ireland, the following ecological and population details have been collated from NPWS field notes and Campbell (2013):

5.1.1 Meentygrannagh Bog SAC (000173)

Population No. 1: Meentygrannagh, Co. Donegal, grid ref. C02_06_

Field notes from Neil Lockhart (26 January 1999):
Below rocky knoll, 7 m from its base. *H. vernicosus* forms a lawn at the edge of a water track in a mesotrophic mire, with *Carex rostrata*. Water table is more or less at the surface level of the fen and the ground is slightly quaking. Vegetation height: *ca.* 35 cm (herbs); *ca.* 10 cm (bryophytes).

Associates (with Braun-Blanquet cover):

[*Hamatocaulis vernicosus*	2]	*Pellia endiviifolia*	+
Calliergonella cuspidata	1	*Potamogeton polygonifolius*	1
Campylium stellatum	+	*Potentilla palustris*	1
Carex nigra	2	*Sphagnum contortum*	3
Carex rostrata	+	*Sphagnum teres*	1
Juncus acutiflorus	2	*Sphagnum warnstorfii*	1
Molinia caerulea	1	*Warnstorfia exannulata*	1

Field notes from Neil Lockhart (22 June 2004):
H. vernicosus found in several more places here:

1. The original location (*ca.* 7 m from knoll) contains a band or strip of *H. vernicosus* at the edge of the fen/mineral transition and runs for the entire length from the knoll to the forestry.
2. New populations found in association with *Carex paniculata* tussocks near the edge of the fen/mineral transition on the opposite side of the bog - very near the *Tomentypnum nitens* main population.
3. Further populations seen in the wet fields and drains to the north (above the forestry) - see map in Appendix I.

Associates (general list from area of fen where *H. vernicosus* was originally found):

Anagallis tenella	*Equisetum* cf. *palustre*	*Schoenus nigricans*
Aneura pinguis	*Festuca rubra*	*Scorpidium revolvens*
Anthoxanthum odoratum	*Galium palustre*	*Sphagnum contortum*
Brachythecium rivulare	*Holcus lanatus*	*Sphagnum fallax*
Bryum pseudotriquetrum	*Hylocomium splendens*	*Sphagnum inundatum*
Calliergonella cuspidata	*Hyocomium armoricum*	*Sphagnum palustre*
Cardamine pratensis	*Juncus acutifolius*	*Sphagnum squarrosum*
Carex curta	*Luzula multifolia*	*Sphagnum subnitens*
Carex dioica	*Menyanthes trifoliata*	*Sphagnum subsecundum*
Carex echinata	*Pedicularis palustris*	*Sphagnum teres*
Carex limosa	*Pellia endiviifolia*	*Sphagnum warnstorfii*
Carex nigra	*Polytrichum commune*	*Splachnum ampullaceum*
Carex panicea	*Potamogeton polygonifolius*	*Stellaria alsine*
Carex paniculata	*Potentilla erecta*	*Straminergon stramineum*
Carex pulicaris	*Potentilla palustris*	*Veronica anagallis-aquatica*
Carex rostrata	*Ranunculus flammula*	*Viola palustris*
Cirsium palustre	*Rhytidiadelphus loreus*	*Warnstorfia exannulata*
Drosera rotundifolia	*Rhytidiadelphus squarrosus*	

Field notes from Christina Campbell & Neil Lockhart (4 August 2009 [with Carl Byrne] & 24 August 2010):
Six plots (2 x 2 m) were recorded at this population. Plot 1 was recorded in a water track in aqueous peat in August 2009. Plot 2 was recorded in an area with a very scattered distribution of *H. vernicosus* on a quaking mesotrophic mire. The location of Plot 3 was on a firmer surface; not as quaking as the other locations. Plot 4 was recorded in an area of low density of *H. vernicosus* in local patches in very wet places. The rare moss

Sphagnum teres occurred in Plot 5. Plot 6 was dominated by *Carex limosa* and *H. vernicosus* occurred growing with *Warnstorfia exannulata*.

Meentygrannagh	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**	**Plot 6**
Year	2009	2010	2010	2010	2010	2010
Altitude (metres above sea level)	156	155	158	156	154	152
Slope (degrees)	10	0	0	3	2	0
Aspect	SSE	-	-	SSE	E	-
Surface water depth (cm)	2.0	3.2	1.6	3.4	2.0	4.0
Surface water pH	5.82	5.73	5.37	5.86	6.30	5.87
Surface water conductivity (µS/cm)	102.5	102.0	70.5	65.0	162.0	78.0
Ammonium (NH_4) (mg/l)	0.050	0.200	0.040	0.130	0.105	0.119
Nitrate (NO_3) (mg/l)	0.370	0.090	0.160	0.090	0.178	0.129
Orthophosphate (O-P) (mg/l)	0.012	0.025	0.015	0.005	0.014	0.015
Total phosphate (TP) (mg/l)	0.154	0.265	0.163	0.067	0.162	0.164
Peat depth (cm)	79	>240	>240	117.5	>240	>240
Shoots / 100 cm^2	386	19	4	12	172	19
H. vernicosus cover (%)	28.5	4	0.0025	8	55	24
Mean vegetation height (cm)	53.2	53.4	23.0	28.0	27.0	23.0
Max. vegetation height (cm)	77	101	82	53	78	74
Cover (Domin)						
Total	10	10	10	10	10	9
Grass	4	8	3	1	4	5
Rush	7	5	5	6	5	1
Sedge	8	4	6	8	8	7
Forb	8	4	5	5	4	5
Fern/ fern allies	0	2	1	1	1	1
Bryophyte	8	9	8	8	8	8
Litter	1	2	5	3	4	3
Surface water	6	1	3	4	1	5
Dung	0	0	0	+	0	0
Agrostis stolonifera	2	5	1	1	4	0
Anagallis tenella	3	0	0	0	0	0
Aneura pinguis	0	0	0	0	2	0
Anthoxanthum odoratum	2	1	0	0	1	0
Aulacomnium palustre	0	0	0	4	0	1
Brachythecium rivulare	0	0	0	0	2	0
Brachythecium rutabulum	0	0	0	1	0	0
Bryum pseudotriquetrum	2	0	0	1	1	0
Carex paniculata	0	0	6	0	6	0
Calliergonella cuspidata	3	2	3	4	4	0
Campylium stellatum	2	1	0	0	1	0
Cardamine pratensis	4	1	0	1	1	0
Carex demissa	7	4	0	0	0	0
Carex echinata	5	2	4	4	0	3
Carex lepidocarpa	2	0	0	0	5	0
Carex limosa	0	1	0	4	2	6
Carex nigra	1	2	0	6	0	0
Carex panicea	3	0	4	0	+	4
Carex pulicaris	0	0	1	1	0	0
Carex rostrata	6	0	0	4	0	1
Cerastium fontanum	0	0	0	0	2	0
Cirsium palustre	1	0	3	0	+	0
Cynosuros cristatus	2	0	0	0	0	0
Epilobium palustre	2	0	0	1	0	0
Equisetum fluviatile	0	2	1	1	0	1
Equisetum palustre	0	0	0	+	1	0
Festuca ovina	2	1	1	0	0	0
Fissidens adianthoides	1	0	0	0	0	0
Galium palustre	0	0	+	+	1	0
Holcus lanatus	4	2	0	1	1	0
Hylocomium splendens	4	2	0	4	0	0
Juncus acutiflorus	7	5	5	6	5	1
Juncus bulbosus	1	0	2	2	0	0

Meentygrannagh (continued)	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6
Leontodon autumnalis	0	+	2	1	0	0
Lophocolea bidentata	2	0	0	1	0	0
Luzula multiflora	0	0	1	1	0	0
Lychnis flos-cuculi	0	0	0	0	1	0
Menyanthes trifoliata	0	+	0	3	3	4
Mnium undulatum	2	0	0	0	0	0
Molinia caerulea	0	8	2	0	1	5
Pedicularis palustris	+	0	0	0	2	1
Philonotis fontana	3	0	0	0	2	0
Plantago lanceolata	3	0	0	0	0	0
Plagiomnium undulatum	1	0	0	0	0	0
Potentilla erecta	3	0	3	2	0	1
Potentilla palustris	0	2	2	4	0	2
Potamogeton polygonifolius	0	0	0	4	0	4
Pseudoscleropodium purum	3	0	0	0	0	0
Ranunculus flammula	5	3	3	4	1	2
Rhytidiadelphus squarrosus	4	2	4	4	0	0
Riccardia multifida	2	0	0	0	0	0
Rumex acetosa	0	0	0	0	1	0
Sagina nodosa	2	0	5	0	0	0
Sphagnum fallax	0	6	0	0	0	0
Sphagnum inundatum	0	0	8	0	0	4
Sphagnum palustre	0	6	2	0	0	1
Sphagnum papillosum	0	0	0	2	0	0
Sphagnum squarrosum	0	0	0	2	0	0
Sphagnum subsecundum	0	0	0	5	0	0
Sphagnum subnitens	0	4	0	0	0	4
Sphagnum teres	0	0	0	0	5	0
Straminergon stramineum	0	2	1	2	0	0
Triglochin palustris	1	0	0	0	2	0
Trifolium repens	3	0	2	0	0	0
Utricularia intermedia	0	1	0	0	0	0
Veronica scutellata	0	0	0	1	0	0
Viola palustris	0	0	3	1	0	0
Warnstorfia exannulata	0	2	2	3	0	4

5.1.2 Glenamoy Bog Complex SAC (000500)

Population No. 2: Rathavisteen, Co. Mayo, grid ref. F982371

Field notes from Neil Lockhart (10 June 1999):
A small patch (*ca.* 10 x 1 m) of *H. vernicosus* confined to the bases of *Carex paniculata* and other tussocky vegetation on the upper eastern margin of the fen. No threats at present. This part of the marsh/fen is a floating scragh, dominated mostly by *Sphagnum* spp. with lenses of tussocky sedges and grasses, open to grazing cattle, but not damaged from the botanical viewpoint at present.

Associates:

Carex dioica	*Eriophorum angustifolium*
Carex echinata	*Molinia caerulea*
Carex limosa	*Schoenus nigricans*
Carex panicea	*Sphagnum contortum*
Carex paniculata	*Sphagnum squarrosum*

5.1.3 Carrowmore Lake Complex SAC (000476)

Population No. 3: Largan More, Co. Mayo, grid ref. F902240

Field notes from Neil Lockhart (21 July 1999):
H. vernicosus abundant over a small area (*ca.* 10 x 5 m) in the vicinity of *Saxifraga hirculus* and mixed with *Scorpidium revolvens, Warnstorfia exannulata* and *Cratoneuron filicinum*. This area is quite heavily poached and grazed by cattle.

Associates:

Agrostis stolonifera	*Philonotis fontana*
Carex diandra	*Saxifraga hirculus*
Cratoneuron filicinum	*Scorpidium revolvens*
Dicranella palustris	*Sphagnum recurvum* s.l.
Juncus effusus	*Warnstorfia exannulata*

Field notes from Christina Campbell & Neil Lockhart (5 August 2009 & 25 August 2010):
Four plots (2 x 2 m) were recorded at this population. Plot 1 was recorded in a moss lawn in a flush surrounded by blanket bog. Plot 2 was recorded in a lawn at the edge of a water track that joined a stream, the flow through which was more perceptible in springtime. *Scorpidium cossonii* achieved high cover in this plot (Domin 8) indicating base-rich conditions. Plot 3 was recorded on a swelling mound on a spring head that sloped in all directions (but the plot sloped west). Plot 4 was taken in a very wet area on the edge of a stream with a perceptible flow of water through the plot where it was a bit deeper. Grazing during the summer at the locality appeared heavy.

Largan More	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**
Year	2009	2010	2010	2010
Altitude (metres above sea level)	159.3	165.6	164.1	162.1
Slope (degrees)	2	1	8	3
Aspect	W	N	W	W
Surface water depth (cm)	1.0	3.6	3.6	5.6
Surface water pH	6.29	5.77	5.21	6.06
Surface water conductivity (µS/cm)	243	71	60	126
Ammonium (NH_4) (mg/l)	0.04	0.10	0.10	0.08
Nitrate (NO_3) (mg/l)	0.09	0.09	0.09	0.09
Orthophosphate (O-P) (mg/l)	0.025	0.005	0.005	0.012
Total phosphate (TP) (mg/l)	0.408	0.023	0.020	0.150
Peat depth (cm)	240	98	240	240
Shoots / 100 cm^2	208	11	81	33
H. vernicosus cover (%)	55	1	27	35
Mean vegetation height (cm)	13.8	21.0	5.0	15.0
Max. vegetation height (cm)	31	34	16	33
Cover (Domin)				
Total	10	10	10	10
Grass	3	1	4	2
Rush	6	4	5	5
Sedge	5	7	1	7
Forb	5	5	9	4
Fern/ fern allies	0	2	0	0
Bryophyte	9	9	8	7
Litter	1	1	1	1
Bare soil	+	0	2	2
Surface water	5	2	2	4
Dung	2	2	0	0
Agrostis stolonifera	3	0	4	2
Anagallis tenella	4	0	0	0
Aneura pinguis	0	2	2	3
Aulacomnium palustre	1	0	0	0
Brachythecium rivulare	3	0	0	0
Bryum pseudotriquetrum	0	2	1	3
Calliergonella cuspidata	2	0	0	1
Caltha palustris	3	1	5	1

Largan More (continued)	Plot 1	Plot 2	Plot 3	Plot 4
Cardamine pratensis	2	0	0	1
Carex demissa	0	0	0	1
Carex diandra	0	0	0	2
Carex dioica	4	0	0	0
Carex echinata	4	0	1	0
Carex lepidocarpa	3	1	0	1
Carex limosa	0	0	0	6
Carex nigra	0	7	0	0
Carex panicea	0	1	0	0
Chiloscyphus polyanthos	0	0	4	0
Cratoneuron filicinum	1	0	0	0
Dicranella palustris	6	0	0	0
Drosera rotundifolia	0	1	0	0
Epilobium palustre	1	0	5	0
Equisetum palustre	0	2	0	0
Galium palustre	1	0	0	0
Galium saxatile	0	0	1	0
Holcus lanatus	+	1	0	0
Juncus acutiflorus	5	0	1	2
Juncus bulbosus	6	4	5	5
Linum catharticum	1	0	0	0
Menyanthes trifoliata	2	2	0	1
Montia fontana	0	0	4	0
Pellia endiviifolia	2	2	2	3
Philonotis fontana	5	1	2	3
Potentilla erecta	0	0	0	1
Potentilla palustris	0	0	1	0
Potamogeton polygonifolius	4	5	7	4
Ranunculus flammula	3	0	2	1
Rhizomnium pseudopunctatum	4	0	0	1
Riccardia multifida	1	0	0	0
Sagina nodosa	2	0	5	0
Saxifraga hirculus	5	0	0	0
Scapania undulatum	0	3	0	1
Scorpidium cossonii	0	8	0	0
Sphagnum denticulatum	0	2	0	2
Sphagnum inundatum	0	5	3	0
Sphagnum palustre	0	1	0	0
Sphagnum papillosum	0	0	0	2
Sphagnum teres	0	0	4	0
Straminergon stramineum	0	2	0	0
Triglochin palustris	0	1	0	0
Utricularia intermedia	0	1	0	0
Viola palustris	0	0	0	1
Warnstorfia exannulata	2	4	2	1

5.1.4 Owenduff/Nephin Complex SAC (000534)

Population No. 4: Uggool, Co. Mayo, grid ref. F927187

Field notes from Neil Lockhart (28 May 1999):
A small patch (< 20 x 20 cm) at the edge of more spring-dominated vegetation. i.e. *Cratoneuron* spp., *Warnstorfia exannulata*, etc. Only a very small patch seen, despite a careful search. This occurs at the edge of a swelling lawn of mosses, with *Saxifraga hirculus* about 5 m away. No threats at present, although the only other confirmed record in the flush to the south was destroyed by afforestation (i.e. Lough Nambrackkeagh).

Associates:

Aneura pinguis	*Palustriella commutata*
Carex limosa	*Philonotis fontana*
Cratoneuron filicinum	*Saxifraga hirculus*
Juncus bulbosus	*Scorpidium revolvens*

Montia fontana *Warnstorfia exannulata*

5.1.5 Lough Carra/Mask Complex SAC (001774)

Population No. 5: Owenbrin, Lough Mask, Co. Mayo, grid ref. M062628

Field notes from Neil Lockhart (28 March 2000):
H. vernicosus forming a more or less pure lawn over an area 10 x 20 m and mixed with *Calliergonella cuspidata* around the edges of open lawns in a *Juncus articulatus* sward. Extensive in patches over a wider area of *ca.* 1 ha. This is most likely the location of Jury *et al.*'s record of *H. vernicosus*. A report that the habitat has been destroyed (Mhic Daeid, 1995) is clearly not true. Main threat would be from land reclamation/re-seeding or land drainage. Continued management of light grazing is beneficial. Prospects for survival are good, but a watch needs to be kept on agricultural improvements.

Associates:

Agrostis stolonifera	*Juncus bulbosus*
Calliergonella cuspidata	*Ranunculus flammula*
Festuca rubra	*Sphagnum auriculatum*
Juncus articulatus	*Warnstorfia exannulata*

Field notes from Christina Campbell & Neil Lockhart (6 August 2009 [with Eoin McGreal], 26 August 2010 & 17 February 2011):
Four plots (2 x 2 m) were recorded at this population. Plot 1 was situated in an area of waterlogged silty loam that did not appear grazed at all. An algal scum was visible when the location was revisited in February 2010. Plot 2 was poached and grazed when recorded in August 2009 and it appeared that the area had been mown, removing a lot of litter and rushes, and keeping the area open. In August 2010, poaching by cattle was evident at this location and there were tractor marks through the plot that had compressed the vegetation. The location was very much drier and *Fossombronia* sp. was observed growing on a cattle hoof print beside plot 2. Plot 3 was recorded in a sedge meadow. Plot 4 was recorded in an area that appeared grazed. The water level in August 2010 was very low, in some cases *circa* 40 cm below the surface level of the soil. When the population was re-visited in February 2011 the population was inundated (mean water depth was 16.6 cm across the four plots).

Owenbrin, Lough Mask	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**
Year	2009	2009	2010	2010
Altitude (metres above sea level)	15.76	18.74	21.28	17.97
Slope (degrees)	0	0	0	4
Aspect	-	-	-	N
Surface water depth (cm)	6.4	8.8	-40.0	-40.0
Surface water pH	5.11	5.36	5.55	5.40
Surface water conductivity (µS/cm)	59.0	70.5	26.0	23.5
Ammonium (NH_4) (mg/l)	0.10	0.05	0.04	0.06
Nitrate (NO_3) (mg/l)	0.09	5.35	0.09	1.84
Orthophosphate (O-P) (mg/l)	0.005	0.005	0.005	0.005
Total phosphate (TP) (mg/l)	0.030	0.032	0.037	0.033
Peat depth (cm)	36	25	29	9
Shoots / 100 cm^2	82	243	234	194
H. vernicosus cover (%)	15	91	60	40
Mean vegetation height (cm)	37.4	36.3	26.0	28.6
Max. vegetation height (cm)	53	56	46	46
Cover (Domin)				
Total	10	10	10	10
Grass	4	4	4	5
Rush	5	8	4	6
Sedge	9	5	9	5
Forb	6	4	4	4
Bryophyte	5	9	8	8
Litter	2	2	2	5
Bare soil	0	1	0	2
Surface water	8	10	0	0
Achillea ptarmica	0	+	0	0

Owenbrin (continued)	Plot 1	Plot 2	Plot 3	Plot 4
Agrostis stolonifera	4	4	4	3
Calliergonella cuspidata	2	1	2	1
Calliergon giganteum	1	2	0	0
Cardamine pratensis	1	1	1	1
Carex echinata	1	2	0	4
Carex nigra	8	5	9	4
Carex panicea	2	1	0	2
Climacium dendroides	0	0	2	0
Epilobium palustre	0	0	3	2
Festuca rubra	3	1	4	5
Galium palustre	1	+	0	0
Galium saxatile	0	0	1	1
Hydrocotyle vulgaris	4	3	4	4
Juncus acutiflorus	4	8	1	5
Juncus bulbosus	3	4	3	3
Juncus effusus	0	+	0	1
Leontodon autumnalis	0	0	2	0
Lotus uliginosum	1	0	1	0
Mentha aquatica	2	0	0	0
Nardus stricta	2	0	2	0
Potentilla anserina	+	0	0	0
Potentilla erecta	0	0	1	1
Ranunculus flammula	4	3	3	2
Ranunculus repens	2	0	1	0
Sphagnum fallax	0	0	0	2
Sphagnum inundatum	0	0	0	2
Sphagnum palustre	0	1	0	0
Sphagnum squarrosum	1	0	0	0
Veronica scutellata	1	2	0	0
Warnstorfia exannulata	2	3	0	6

5.1.6 Lough Corrib SAC (000297)

Population No. 6: NW of Gortachalla Lough, Co. Galway, grid ref. M225375

Field notes from David Holyoak (25 June 2004, Holyoak 2004):
Extensive intermediate fen NW of Gortachalla Lough. Area bounded to the west by acid bog, with a variety of interesting transitional habitats along the boundary. Abundant *Calliergon trifarium*, recorded almost continuously from M22473740 to M22493763. Also (M22493763) *C. trifarium* growing among unshaded *Scorpidium scorpioides* and sparser *C. stellatum* in a mat in shallow water of intermediate fen, with rather sparse cover of *Carex lasiocarpa*, with *Eriophorum angustifolium*, *Carex viridula* ssp. *brachyrrhyncha*, *Equisetum palustre*, *Mentha aquatica*, *Ranunculus flammula*, *Carex panicea*, *Eleocharis multicaulis*.
Strong population of *H. vernicosus* at M22523753 at base of sparse sedges in unshaded wet intermediate fen. A varied flora of vascular plants in the fen and on the bog close by included *Rhynchospora fusca*.

Field notes from Neil Lockhart & David Holyoak (5 July 2004):
Vegetation is a tall (to 50 cm) sward of mainly *Carex nigra*, with lots of *Holcus* and *Equisetum palustre*. *H. vernicosus* is dominant in the moss layer over several 10s of m². Widespread around the margins of this fen - a very large and significant population in the national context.

Associates:

Anagallis tenella	*Eleocharis multicaulis*	*Juncus effusus*
Briza media	*Eleocharis palustris*	*Lythrum salicaria*
Calliergon giganteum	*Eleocharis quinqueflora*	*Mentha aquatica*
Calliergonella cuspidata	*Equisetum palustre*	*Myosotis laxa*
Campylium stellatum	*Eriophorum angustifolium*	*Poa trivialis*
Carex hostiana	*Galium palustre*	*Ranunculus flammula*
Carex nigra	*Holcus lanatus*	*Senecio aquaticus*
Carex panicea	*Hydrocotyle vulgaris*	*Succisa pratensis*
Carex pulicaris	*Juncus acutiflorus*	*Trifolium repens*

Cirsium palustre *Juncus bulbosus* *Triglochin palustris*
Cynosurus cristatus *Juncus conglomeratus*

Field notes from Christina Campbell & Neil Lockhart (7 August 2009 & 27 August 2010 [with Rebecca Teesdale]):
Light grazing occurs at the locality, mainly by rabbits. Four plots (2 x 2 m) were recorded at this population. Plot 1 was recorded in transition mire to the south of the area of occupancy. Plot 2 was very wet with a high cover of *Hippuris vulgaris* and *Equisetum palustre*. Plots 3 and 4 were recorded in transition mire.

NW of Gortachalla Lough	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**
Year	2009	2009	2010	2010
Altitude (metres above sea level)	6.54	13.92	8.49	9.05
Slope (degrees)	0	0	0	0
Aspect	0	0	0	0
Surface water depth (cm)	6.8	14.2	-1.0	1.5
Surface water pH	5.44	5.55	5.89	5.65
Surface water conductivity (µS/cm)	105.0	135.5	133.0	78.0
Ammonium (NH_4) (mg/l)	0.07	0.07	0.06	0.07
Nitrate (NO_3) (mg/l)	0.09	0.09	0.15	0.11
Orthophosphate (O-P) (mg/l)	0.005	0.005	0.005	0.005
Total phosphate (TP) (mg/l)	0.118	0.028	0.019	0.055
Peat depth (cm)	20	240	54	30.5
Shoots / 100 cm^2	873	491	229	54
H. vernicosus cover (%)	85	67	85	8
Mean vegetation height (cm)	60.4	50.7	23.8	25
Max. vegetation height (cm)	69	87	62	88
Cover (Domin)				
Total	10	10	10	10
Shrub	0	0	0	1
Grass	4	2	0	4
Rush	4	4	3	3
Sedge	7	3	8	8
Forb	5	8	2	3
Fern/ fern allies	0	7	1	1
Bryophyte	9	10	9	7
Litter	6	3	5	6
Surface water	4	4	0	+
Agrostis stolonifera	1	2	0	0
Anthoxanthum odoratum	2	0	0	0
Bryum pseudotriquetrum	0	0	2	1
Calliergonella cuspidata	3	0	0	0
Calliergon giganteum	4	6	2	3
Campylium stellatum	0	0	0	2
Cardamine pratensis	+	1	0	0
Carex echinata	0	2	8	7
Carex nigra	7	0	0	0
Carex panicea	2	0	3	4
Carex pulicaris	1	0	0	0
Cirsium dissectum	+	0	1	0
Eleocharis quinqueflora	2	0	3	3
Equisetum fluviatile	0	0	0	1
Equisetum palustre	0	7	1	1
Eriophorum angustifolium	4	3	2	4
Galium palustre	+	1	0	0
Hippuris vulgaris	0	6	0	0
Holcus lanatus	1	0	0	0
Hydrocotyle vulgaris	4	6	0	0
Hylocomium splendens	3	0	0	0
Juncus acutiflorus	4	4	1	0
Juncus bulbosus	0	0	1	3
Juncus effusus	1	0	0	0
Lythrum salicaria	1	1	0	0
Mentha aquatica	4	5	0	1

NW of Gortachalla Lough (continued)	Plot 1	Plot 2	Plot 3	Plot 4
Molinia caerulea	4	1	0	4
Myosotis laxa	0	2	0	0
Pedicularis palustris	0	5	2	2
Potamogeton polygonifolius	0	0	0	1
Ranunculus flammula	1	1	0	2
Salix cinerea	0	0	0	1
Schoenus nigricans	0	0	2	0
Scorpidium revolvens	0	0	3	2
Scorpidium scorpioides	0	0	3	5
Succisa pratensis	1	0	0	1
Triglochin palustris	0	0	0	2
Utricularia vulgaris	0	1	0	0
Veronica scutellata	1	2	0	0
Warnstorfia exannulata	0	4	0	0

5.1.7 Scragh Bog SAC (000692)

Population No. 7: Scragh Bog (Portnashangan), Co. Westmeath, grid ref. N423589

Field notes from Neil Lockhart (13 July 2004):
Tall *Carex appropinquata* sedge meadow. Very extensive population of *H. vernicosus* covering hectares of the fen and associated with the *C. appropinquata/C. lasiocarpa* zone. Possibly the largest population that I've seen.
Vegetation ungrazed, *ca*. 40 cm tall.
Herbs 100%
Bryophytes 60%

Associates (with Braun-Blanquet cover):

[*Hamatocaulis vernicosus*	3]	*Filipendula ulmaria*	2
Agrostis stolonifera	2	*Galium palustre*	1
Calliergon giganteum	2	*Galium uliginosum*	1
Calliergonella cuspidata	1	*Holcus lanatus*	1
Caltha palustris	2	*Lychnis flos-cuculi*	1
Carex appropinquata	2	*Menyanthes trifoliata*	4
Carex lasiocarpa	1	*Plagiomnium* sp.	1
Climacium dendroides	1	*Potentilla palustris*	2
Epilobium palustre	1	*Trifolium repens*	+
Equisetum fluviatile	1	*Valeriana officinalis*	1

Field notes from Nick Hodgetts, David Holyoak, Naomi Kingston & Neil Lockhart (10 September 2007):
H. vernicosus growing in shallow water in fen, amongst sedges and herbs and large patches at base of *Carex* and *Menyanthes* in wet fen. Locally plentiful, with patches extending over several m^2, e.g. at N4247/5900.

Associates:

Bryum pseudotriquetrum	*Carex* spp.
Calliergonella cuspidata	*Climacium dendroides*
Calliergon giganteum	*Menyanthes trifoliata*

Field notes from Christina Campbell, Neil Lockhart & Noeleen Smyth (26 August 2009 & 1 & 8 September 2010):
Seven plots (2 x 2 m) containing *H. vernicosus* were recorded at the population site, three in August 2009 and four in August 2010. All plots were recorded on a floating scraw with a peat depth of over 240 cm. (The maximum depth of peat at Scragh Bog found by O'Connell (1980) was 8.7 m.) Plot 1 was recorded in the north-eastern side of the fen in the vicinity of a *Salix aurita* shrub. Plot 2 was in the centre of the fen; *Calluna vulgaris* and *Erica tetralix* were recorded within it. Plot 3 was recorded near the boardwalk at the north-east end and contained *Salix cinerea* subsp. *oleifolia*. Plot 4 had the highest cover (Domin 7) of *Vaccinium oxycoccus* and also contained *Erica tetralix*. The highest cover of *Betula pubescens* was recorded in plot 5; plot 6 was recorded in more open conditions and had the highest cover of *H. vernicosus*. Plot 7 was also recorded near the centre of the fen, but not as many species of acidic bog were present as in Plot 2.

Scragh Bog	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**	**Plot 6**	**Plot 7**
Year	2009	2009	2009	2010	2010	2010	2010
Altitude (metres above sea level)	108.41	107.7	104.89	101.71	106.68	106.46	103.99
Slope (degrees)	0	0	0	0	0	0	0
Aspect	0	0	0	0	0	0	0
Surface water depth (cm)	13.5	27.0	14.3	7.1	17.8	20.0	19.8
Surface water pH	6.50	6.48	6.77	6.34	6.55	6.54	6.52
Surface water conductivity (µS/cm)	405.5	324.0	526.0	278.5	306.5	433.0	384.5
Ammonium (NH_4) (mg/l)	0.10	0.02	0.09	6.00	0.02	0.04	0.01
Nitrate (NO_3) (mg/l)	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Orthophosphate (O-P) (mg/l)	0.031	0.005	0.021	0.083	0.036	0.005	0.005
Total phosphate (TP) (mg/l)	0.067	0.015	0.144	0.109	0.059	0.017	0.012
Peat depth (cm)	240	240	240	240	240	240	240
Shoots / 100 cm^2	169	20	421	103	116	384	56
H. vernicosus cover (%)	20	3	12	8	70	85	3
Mean vegetation height (cm)	65.0	82.0	79.0	94.3	52.8	51.0	62.8
Max. vegetation height (cm)	95	130	220	114	225	75	118
Cover (Domin)							
Total	10	10	10	10	9	10	9
Tree	0	2	4	6	6	0	4
Shrub	5	6	0	7	4	0	4
Grass	5	4	5	3	4	0	0
Rush	0	0	4	8	5	1	1
Sedge	8	7	6	7	8	9	8
Forb	8	5	7	5	7	7	5
Fern/ fern allies	3	1	4	0	1	0	0
Bryophyte	9	9	8	10	9	10	9
Litter	4	4	3	5	2	2	2
Bare soil	0	0	0	5	0	0	0
Surface water	3	5	6	3	7	7	6
Agrostis stolonifera	4	0	4	3	1	0	0
Andromeda polifolia	0	0	0	1	0	0	0
Aneura pinguis	0	0	0	0	0	0	3
Angelica sylvestris	1	0	1	1	1	0	4
Apium nodiflorum	0	0	0	0	0	0	1
Aulacomnium palustre	4	5	0	3	0	0	0
Betula pubescens	0	2	1	0	5	0	0
Calliergonella cuspidata	7	2	8	9	9	8	5
Calliergon giganteum	2	4	4	6	5	5	8
Calypogeia muelleriana	0	2	0	0	0	0	0
Caltha palustris	0	0	0	0	0	2	2
Calluna vulgaris	0	4	0	0	0	0	0
Campylium stellatum	0	4	0	0	0	0	4
Cardamine pratensis	0	0	+	1	0	0	0
Carex appropinquata	5	0	5	0	0	0	0
Carex echinata	3	0	0	0	0	0	0
Carex lasiocarpa	5	7	4	7	8	8	7
Carex limosa	4	0	0	0	2	4	2
Carex nigra	0	0	1	0	0	0	0
Carex rostrata	0	0	0	0	0	2	0
Climacium dendroides	4	0	2	0	0	0	0
Drosera rotundifolia	0	3	0	0	0	0	0
Epilobium palustre	3	0	2	1	1	0	0
Equisetum fluviatile	3	1	4	0	1	0	0
Eriophorum angustifolium	0	0	0	1	0	1	1
Erica tetralix	0	4	0	1	0	0	0
Festuca rubra	4	0	0	0	0	0	0
Filipendula ulmaria	2	0	4	0	0	0	0
Galium aparine	0	0	0	1	0	0	0
Galium palustre	0	0	3	2	4	1	0
Galium uliginosum	4	0	0	0	0	0	0
Holcus lanatus	3	0	2	0	4	0	0
Hydrocotyle vulgaris	0	0	0	0	0	2	0
Hylocomium splendens	0	2	0	0	0	0	0

Scragh Bog (continued)	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7
Juncus acutiflorus	0	0	4	8	5	1	1
Lemna minor	0	0	3	0	0	0	0
Lemna trisulca	0	0	2	0	0	0	0
Lychnis flos-cuculi	6	0	0	0	0	0	0
Mentha aquatica	+	0	2	2	5	1	1
Menyanthes trifoliata	8	5	5	4	6	7	5
Molinia caerulea	0	4	0	0	0	0	0
Parnassia palustris	0	0	0	0	0	0	1
Pedicularis palustris	0	0	0	4	0	0	0
Plagiomnium elatum	1	0	0	0	0	0	0
Poa trivialis	1	0	3	0	0	0	0
Polytrichum strictum	0	5	0	0	0	0	0
Potentilla erecta	0	1	0	0	0	0	0
Potentilla palustris	6	0	4	3	4	0	0
Salix cinerea subsp. *oleifolia*	0	0	4	6	5	0	4
Salix repens	0	3	0	0	1	0	1
Schoenus nigricans	0	2	0	1	0	0	2
Scorpidium cossonii	0	4	0	0	0	0	0
Scorpidium revolvens	0	4	0	0	0	0	4
Scorpidium scorpioides	0	3	0	0	0	0	6
Sphagnum subnitens	0	7	0	0	0	0	0
Succisa pratensis	2	3	0	4	2	0	0
Trifolium repens	2	0	0	0	0	0	0
Vaccinium oxycoccus	5	4	0	7	4	0	4
Valeriana officinalis	1	0	0	1	3	0	0
Veronica scutellata	0	0	+	0	1	0	0
Viola palustris	0	0	0	0	1	0	0

5.1.8 Comeragh Mountains SAC (001952)

This SAC contains three populations:

Population No. 8a: Below Sgilloge Loughs, Co. Waterford, grid ref. S286123

Field notes from Neil Lockhart (16 September 1998):
H. vernicosus mixed with *Warnstorfia exannulata*, *Scorpidium revolvens* and other mosses at the edge of a large *Carex paniculata/Juncus effusus* flush extending for several hundred metres on the sloping bog below Sgilloge Loughs. Possibly the location of Appleyard's record in the National Museum of Wales (NMW) from 1966. No threats at present. The area is only moderately grazed as evidenced by the vigorous growth of *Calluna* in the general vicinity.

Field notes from Nick Hodgetts (12 September 2007):
H. vernicosus in flushes on north-facing slopes amongst wet heath, 320-370 m alt. Abundant over a large area, with many thousand shoots over several hectares. Westernmost ('new') colony in patch *ca.* 7 x 3 cm in diameter. No immediate threats identified; forestry and overgrazing are potential threats; sheep-grazed at present, but not too heavily.

Associates:

Brachythecium rivulare	*Juncus acutifolus*
Calliergonella cuspidata	*Juncus effusus*
Carex echinata	*Rhytidiadelphus squarrosus*
Carex lepidocarpa	*Scorpidium revolvens*
Carex paniculata	*Sphagnum contortum*
Chrysosplenium oppositifolium	*Warnstorfia exannulata*

Field notes from Christina Campbell & Neil Lockhart (11 August 2009 & 30 August 2010):
Four plots (2 x 2 m) were recorded from below Sgilloge Loughs. Plot 1 was recorded in an open lawn amongst *Carex paniculata* tussocks on aqueous peat. Plot 2 was taken in a moss-dominated lawn, with some tussocks of *Festuca ovina* present. Plot 3 was located in a similar flushed area with a perceptible flow through the plot. Plot

4 was recorded on a swelling, moss-dominated springhead in an open lawn, again amongst *C. paniculata* tussocks, beside a stream. There was evidence of low grazing at this locality.

Below Sgilloge Loughs	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**
Year	2010	2010	2010	2010
Altitude (metres above sea level)	322.0	331.9	330.2	298.3
Slope (degrees)	6	8	4	1
Aspect	1	1	1	1
Surface water depth (cm)	-3.5	-6.0	1.3	2.0
Surface water pH	5.79	5.98	6.07	6.63
Surface water conductivity (µS/cm)	119.5	162.5	81.0	210.5
Ammonium (NH_4) (mg/l)	0.06	0.02	0.01	0.02
Nitrate (NO_3) (mg/l)	0.11	0.20	0.09	0.09
Orthophosphate (O-P) (mg/l)	0.005	0.005	0.005	0.005
Total phosphate (TP) (mg/l)	0.017	0.033	0.011	0.014
Peat depth (cm)	151	94.5	90	36
Shoots / 100 cm^2	374	161	35	74
H. vernicosus cover (%)	85	18	14	8.5
Mean vegetation height (cm)	23.0	38.0	23.0	7.7
Max. vegetation height (cm)	49	111	70	12
Cover (Domin)				
Total	10	10	9	10
Shrub	0	1	0	0
Grass	2	5	3	4
Rush	6	5	4	4
Sedge	5	8	7	7
Forb	5	3	7	7
Bryophyte	10	7	8	8
Litter	1	2	4	4
Bare soil	0	4	4	0
Surface water	0	0	1	1
Dung	0	0	0	1
Agrostis stolonifera	0	0	3	4
Anagallis tenella	0	1	4	3
Angelica sylvestris	0	0	1	0
Anthoxanthum odoratum	1	2	2	0
Brachythecium rivulare	0	1	1	1
Bryum pseudotriquetrum	0	1	3	3
Calliergonella cuspidata	3	4	4	4
Calliergon giganteum	0	0	0	5
Calypogeia muelleriana	1	0	0	0
Calluna vulgaris	0	1	0	0
Campylium stellatum	0	2	0	0
Cardamine pratensis	2	1	0	2
Carex demissa	0	0	1	0
Carex dioica	4	1	1	0
Carex echinata	5	3	0	1
Carex flacca	0	5	0	0
Carex nigra	0	0	4	0
Carex panicea	0	3	1	2
Carex paniculata	0	5	4	7
Carex pulicaris	1	4	0	0
Carex rostrata	0	0	6	0
Cerastium fontanum	1	0	0	1
Chrysosplenium oppositifolium	0	0	0	4
Cirsium palustre	0	1	0	0
Cratoneuron filicinum	0	0	0	2
Cynosuros cristatus	0	1	1	0
Dactylorhiza maculata	0	0	0	4
Dicranella palustris	0	2	2	0
Epilobium palustre	0	1	0	0
Eriophorum angustifolium	3	3	2	0
Festuca ovina	0	4	0	0
Festuca rubra	2	0	0	1

Below Sgilloge Loughs (continued)	Plot 1	Plot 2	Plot 3	Plot 4
Galium palustre	1	0	1	1
Holcus lanatus	2	1	1	1
Hydrocotyle vulgaris	4	0	6	5
Hylocomium splendens	0	1	0	0
Isolepis setacea	1	0	0	0
Juncus acutiflorus	6	5	4	4
Juncus bulbosus	1	2	1	1
Leontodon autumnalis	2	1	2	0
Lysimachia nemorum	1	0	0	0
Marchantia polymorpha	0	0	0	4
Mentha aquatica	0	0	0	4
Montia fontana	0	0	0	4
Palustriella commutata	0	0	0	5
Pedicularis palustris	1	2	5	0
Pellia endiviifolia	0	3	1	0
Philonotis fontana	3	4	0	5
Plantago lanceolata	1	0	0	0
Plagiomnium undulatum	1	2	0	0
Potentilla erecta	0	1	1	0
Potamogeton polygonifolius	0	0	5	0
Pseudoscleropodium purum	0	4	0	0
Ranunculus ficaria	0	1	0	0
Ranunculus flammula	3	1	3	1
Ranunculus repens	3	0	0	0
Rhizomnium pseudopunctatum	2	0	0	0
Rhytidiadelphus squarrosus	1	4	0	0
Rumex acetosella	0	0	0	5
Sagina nodosa	0	0	0	2
Scorpidium revolvens	0	1	1	0
Sphagnum contortum	0	0	4	0
Sphagnum fallax	0	0	5	0
Succisa pratensis	0	1	1	0
Thuidium tamariscinum	0	2	0	0
Triglochin palustris	2	0	2	0
Viola palustris	0	1	4	0

Population No. 8b: Nier River Valley, Co. Waterford, grid ref. S279116

Field notes from Neil Lockhart (16 September 1998):
H. vernicosus forming pure swards and mixed with *Sphagnum fallax* over an area of *ca*. 1 ha, very abundant and dominant in places. This is probably the location of Derek Ratcliffe's record in 1963. The area where *H. vernicosus* occurs is very wet, lightly grazed. No threat at present - the flush has obviously survived since described in 1963 and has good prospects for the future, provided it remains free of forestry or other development.

Field notes from Nick Hodgetts (14 September 2007):
Flush on north-facing slope just above riverbank. Abundant over *ca*. 1 ha, locally dominant in the bryophyte layer: thousands of shoots. No immediate threats identified; forestry and overgrazing are potential threats; sheep-grazing at present, but not too heavily.

Associates:

Anagallis tenella
Aulacomnium palustre
Bryum pseudotriquetrum
Calliergonella cuspidata
Carex echinata
Cephaloziella hampeana
Chiloscyphus polyanthus
Chrysosplenium oppositifolium
Dicranella palustris
Fissidens adianthoides
Juncus acutiflorus
Juncus bulbosus
Juncus effusus
Lophocolea bidentata
Molinia caerulea
Myosotis sp.
Nardus stricta
Pellia neesiana
Ranunculus flammula
Rhizomnium pseudopunctatum
Rhytidiadelphus squarrosus
Sphagnum contortum
Sphagnum fallax
Sphagnum palustre
Sphagnum squarrosum
Sphagnum subnitens
Sphagnum teres

Eurhynchium praelongum *Philonotis fontana*

Field notes from Christina Campbell & Neil Lockhart (11 August 2009 & 30 August 2010):
The population at Nier River Valley is approximately 500 m away from the population below Sgilloge Loughs, in an adjacent valley. The locality appeared grazed by sheep, but not heavily. Two plots (2 x 2 m) were recorded at this population. Plot 1 was recorded on an aqueous root-mat on peat in August 2009. The following summer conditions were notably drier. Plot 2 was taken in a water runnel flowing into a tributary of the Nier River and *H. vernicosus* was confined in this plot to the areas where there was a water flow. The bank opposite this location to the west was searched as it looked potentially suitable, but *H. vernicosus* was not found there.

Nier River Valley	**Plot 1**	**Plot 2**
Year	2009	2010
Altitude (metres above sea level)	303	298
Slope (degrees)	5	5
Aspect	7	8
Surface water depth (cm)	5.9	-10.0
Surface water pH	5.37	5.29
Surface water conductivity (µS/cm)	50	62
Ammonium (NH_4) (mg/l)	0.03	0.03
Nitrate (NO_3) (mg/l)	0.09	0.09
Orthophosphate (O-P) (mg/l)	0.083	0.005
Total phosphate (TP) (mg/l)	0.110	0.022
Peat depth (cm)	156	41
Shoots / 100 cm^2	404	335
H. vernicosus cover (%)	80	30
Mean vegetation height (cm)	49.3	23.5
Max. vegetation height (cm)	133	69
Cover (Domin)		
Total	10	10
Grass	6	4
Rush	6	5
Sedge	5	6
Forb	5	4
Bryophyte	10	9
Algae	0	1
Litter	2	4
Bare soil	0	1
Surface water	1	0
Agrostis stolonifera	5	3
Anagallis tenella	1	4
Anthoxanthum odoratum	4	2
Aulacomnium palustre	0	1
Brachythecium rivulare	1	0
Bryum pseudotriquetrum	0	2
Carex paniculata	4	0
Calliergonella cuspidata	2	1
Calypogeia muelleriana	1	0
Cardamine pratensis	3	1
Carex echinata	4	5
Carex nigra	3	4
Carex panicea	0	1
Chrysosplenium oppositifolium	1	0
Cynosuros cristatus	4	2
Dicranella palustris	4	0
Drosera rotundifolia	0	1
Epilobium palustre	1	1
Eriophorum angustifolium	+	2
Festuca ovina	4	0
Galium palustre	2	1
Holcus lanatus	4	0
Hydrocotyle vulgaris	2	1
Juncus acutiflorus	5	5
Juncus bulbosus	2	1

Nier River Valley (continued)	Plot 1	Plot 2
Juncus effusus	0	+
Leontodon autumnalis	1	2
Lophocolea bidentata	2	0
Luzula multiflora	+	0
Molinia caerulea	4	0
Myosotis laxa	+	0
Nardus stricta	3	3
Pedicularis palustris	0	1
Pellia endiviifolia	3	0
Philonotis fontana	2	1
Polytrichum strictum	0	4
Potentilla erecta	2	2
Ranunculus flammula	3	3
Ranunculus repens	0	1
Rhizomnium pseudopunctatum	2	0
Rhytidiadelphus squarrosus	0	2
Rumex acetosa	1	0
Scorpidium revolvens	0	1
Sphagnum contortum	0	1
Sphagnum fallax	4	5
Sphagnum palustre	0	5
Sphagnum papillosum	0	4
Sphagnum squarrosum	1	0
Sphagnum subnitens	1	0
Trifolium repens	4	0
Veronica scutellata	1	0
Viola palustris	1	1
Warnstorfia exannulata	3	0

Population No. 8c: Coumtay, Co. Waterford, grid ref. S29850801

Field notes from Nick Hodgetts (18 September 2007):
A small colony, with several dozen shoots in an area of *circa* 1 m^2 on flush on south-facing slope. Site not immediately threatened. The area is overgrazed by sheep. Some nearby areas have been burned, and this might constitute a potential threat. Afforestation is another potential threat.

Associates:

Anagallis tenella
Bryum pseudotriquetrum
Campylium stellatum
Carex echinata
Juncus articulatus
Philonotis fontana
Ranunculus flammula
Sphagnum contortum
Warnstorfia exannulata

5.1.9 Cuilcagh-Anierin Uplands SAC (000584)

Population No. 8c: Commas, Co. Cavan, grid ref. H1296727857

Field notes by Rory Hodd (20 August 2012):
Found in springhead at top of rich flush, Commas, east of the summit of Cuilcagh, Co. Cavan, at *circa* 450 m altitude. Relatively abundant over an area of *ca*. 2 m^2. Threats appeared relatively minor; grazing pressure was not having any real impact, although there were signs of some bare soil and minor erosion on the sides of the small valley in which the flush occurred. The immediate surrounding vegetation was acid grassland, while the dominant vegetation type in the area was poor *Juncus* flush. There was a rich flush with *Scorpidium revolvens* and *Campylium stellatum* directly below the location of *H. vernicosus*.

Associates:

Calliergonella cuspidata

5.2 Extinct populations of *H. vernicosus* in the Republic of Ireland

The following details on four further localities from which *H. vernicosus* has been confirmed, but not seen recently, have also been taken from NPWS files:

Holdenstown Bog SAC (001757) (= nr. Yellowford crossroads), Co. Wicklow, grid. ref. S88_84_

This location appears to be the site of Roy Perry's record of *H. vernicosus* (small bog *ca.* ¼ mile east of Yellowford Crossroads, S8884, 24/8/1975) (Blockeel, 1997). However, it has not been seen since.

Notes from SAC Site Synopsis and Curtis & Harrington (1976):
This site consists of two kettleholes over which small raised bogs have developed. There is also a small area of open water along the western fringe of the southern kettlehole. Bog margins are dominated by alder and willow. Under the trees, *Menyanthes trifoliata* and *Caltha palustris* are found on the soft mud, with some *Carex hirta*. There are also areas of scraw on the bog margins dominated by rushes (*Juncus subnodulosus, J. effusus* and *J. articulatus*). Other species present: *Hydrocotyle vulgaris, Lathyrus pratensis, Ranunculus flammula, Cirsium palustre, Scutellaria galericulata, Mentha aquatica, Potentilla palustris, Carex nigra, C. otrubae, C. diandra, C. hirta, C. echinata*. Bog surfaces are dominated by hummocks of *Calluna vulgaris* and *Vaccinium oxycoccus*, with *Sphagnum* spp. Alternating with these hummocks are hollows dominated by *Sphagnum* spp., with *Molinia caerulea* and *Menyanthes trifoliata*. Young *Betula pubescens* is frequent in the raised bog.

The southern part of the site has open water surrounded by alder and willow. A floating mat of *Carex rostrata* and *Menyanthes trifoliata* occurs with *Lemna* spp., *Polygonum amphibium* and *Potamogeton natans*. Pastures fringing the area are separated from the bog by ditches with *Veronica scutellata, Myosotis secunda* agg., *Equisetum fluviatile* and *Menyanthes trifoliata*.

Damage: infilling at edge of wetland to provide a turning/parking area for trucks. Surrounding fields mainly improved grassland and used for grazing by cattle. The fields slope down towards the site. Continued agricultural improvement in the form of high fertiliser application or increased stocking rates could result in an increased nutrient content of the run-off which would flow towards the bog.

Field notes from Neil Lockhart & Mike Wyse Jackson (17 November 2000):
Searched here for *circa* 1 hour for *H. vernicosus* without success. *Calliergonella cuspidata*, *Aulacomnium palustre*, *Sphagnum teres* and *Straminergon stramineum* present.

Drumone-Lough Bane, Co. Meath, grid ref. N560743

H. vernicosus was recorded by D.M. Synnott, 13 September 1978, in 'cut-over bog' (Blockeel, 1997).

According to Mhic Daeid (1995), "it was discovered that it was not located at L. Bane, but at a site about 6 km to the north, near the village of Dromone. The site consisted of a small area of fen carr. It has since been destroyed by drainage and afforestation".

Pallis Bridge, Co. Wexford, grid ref. T1__6__

H. vernicosus was recorded by J.W. and R.D. Fitzgerald, 15 September 1969, in 'marshy ground' (Blockeel, 1997).

Field notes from Neil Lockhart & Mike Wyse Jackson (17 November 2000):
Only a very small amount of suitable ground seen here - 30 x 10 m, of which most is grasses. In the wettest parts there are *Salix* spp. & *Betula pubescens*. Various wetland plants here, but no *H. vernicosus* found.

Lough Nambrackkeagh, Co. Mayo, grid ref. F943154

Recorded by Neil Lockhart, 25 September 1987, "wet moss carpet with *Saxifraga hirculus* in an upland flush, *ca*. 480 ft" (Lockhart, 1989). Not refound during more recent survey (Holyoak, 2003). Site certainly destroyed by drainage and afforestation (N. Lockhart, pers. comm.).

5.3 Unconfirmed records of *H. vernicosus* in the Republic of Ireland

There are two further, unconfirmed, records of *H. vernicosus*:

Maam Cross, Bunscannive, Co. Galway, grid ref. L94_45_

Recorded by C. Douglas and H. Grogan in 1987, in a bog (NPWS files). A specimen apparently exists (NMK) but has not been re-examined. The locality was revisited recently by David Holyoak (Holyoak, 2004), but the site looked unlikely to support *H. vernicosus* anymore, if it ever did (D. Holyoak, pers. comm.).

Lough Bray, Co. Wicklow, grid ref. O1__1__

Recorded by D. Moore in 1872 but not supported by a specimen (Moore, 1872). No further information exists. The locality was surveyed on 26 June 2007 by N.G. Hodgetts, but *H. vernicosus* was not refound and the original record was noted as a probable error.

5.4 Erroneous records of *H. vernicosus* in the Republic of Ireland

Other records of *H. vernicosus* in the Republic of Ireland, including the one referred to by Wyse Jackson *et al.* (1995), are erroneous or have been disregarded because they are not supported by a specimen and are too vague for there to be any hope of relocating them (Blockeel, 1997). Briefly, these are:

Castlegregory dunes, Co. Kerry, grid. ref. Q6__1__: specimen is *Drepanocladus cossonii*; only *D. cossonii* seen in recent survey (Hodgetts, 2006a).

near **Killarney**, Co. Kerry, grid ref. V9__9__?: no specimen, vague record.

Lough Bunny, Co. Clare, grid ref. R3__9__: specimen is *Drepanocladus cossonii*; only *D. cossonii* seen in recent survey (Hodgetts, 2004).

Menlough, Co. Galway, grid ref. M2__2__: specimen is *Drepanocladus cossonii*; only *D. cossonii* seen in recent survey (Holyoak, 2004).

Newbridge Fen, Co. Kildare, grid ref. N7__1__: specimen is *Drepanocladus cossonii*.

Louisa Bridge, Leixlip, Co. Kildare, grid ref. N9__3__?: specimen is *Drepanocladus cossonii*.

Cloughran, Co. Dublin, grid ref. O1__4__: specimen is *Drepanocladus aduncus*.

Lough Ennell, Co. Westmeath, grid ref. N4__4__: no specimen; should be rejected according to an e-mail in NPWS files from Neil Lockhart to Ciaran O'Keeffe. Site visited by Mike Wyse Jackson in 1999, but only *Drepanocladus cossonii* was found.

Cashel Wood, Co. Longford, grid ref. N0__6__: specimen is *Drepanocladus cossonii*.

Barry Beg, Co. Roscommon, grid ref. N0__4__: specimen is *Drepanocladus cossonii*; only *D. cossonii* seen in recent survey (Hodgetts, 2002).

Benbulbin, Co. Sligo, grid ref. G6__4__: no specimen; only *Drepanocladus cossonii* seen in recent survey (Hodgetts, 2003).

Ballinlig, Co. Leitrim, grid ref. G7__4__: specimen is *Drepanocladus cossonii*; only *D. cossonii* seen in recent survey (Holyoak, 2001).

Malin Head, Co. Donegal, grid ref. C39_59_: recorded by Megaw (1933) and specimen apparently in BEL, but not examined by Blockeel (1997) – probable error; site visited by Neil Lockhart (2 March 1999) but no *H. vernicosus* found.

Mullaghderg Lough, The Rosses, Co. Donegal, grid ref. B7__2__: specimen is *Drepanocladus cossonii*; only *D. cossonii* seen in recent survey (Holyoak, 2002).

Further details of these records exist in the NPWS database.

5.5 Population estimation

There are a number of problems in estimating bryophyte populations, notably the difficulty in deciding what constitutes 'an individual'. On the one hand, 'an individual' could be defined as a single shoot, while on the other it might refer to a large genetically homogenous colony comprising thousands or even millions of individual shoots. In practice, a pragmatic solution is required, which often means a very rough estimation of the number of shoots or, more usually, an estimation of the area of ground covered by the plant at each site (Hallingbäck *et al.*, 1996).

For the 2001-2006 reporting period for Article 17 of the EU Habitats Directive, the measure of population estimation for *H. vernicosus* was 'number of localities' (Evans & Arvela, 2011). A locality is defined as a discrete location where a *H. vernicosus* population has been recorded. At that time there were 9 known localities, in 8 SACs, in the Republic of Ireland. Since then, two additional localities have been reported, so there are now 11 localities, in 9 SACs. For the 2007-2012 reporting period, and to facilitate comparison between EU Member States, the recommended unit for estimating population of *H. vernicosus* is now the 'area covered by the population in m^2' (Evans & Arvela, 2011). To measure this, Campbell (2013) delimited the extent of occupancy of 7 of the largest known populations by recording the GPS positions at the extent of where *H. vernicosus* occurred at these localities. The area covered by the population (m^2) within the area of extent of occupancy was then estimated from the mean cover of *H. vernicosus* in sample 2 x 2 m plots recorded in each population. The number of plots recorded depended on the area of the population and ranged from 2 to 7 per locality. The area covered by *H. vernicosus* in the 4 remaining populations, all of which were small in extent, was calculated from estimates made in the field from NPWS surveys.

Campbell (2013) also quantified shoot density (number of shoots per 100 cm^2) in sample 2 x 2 m plots at each of the 7 largest populations. The average number per population was extrapolated to an average number per m^2, and this figure then multiplied by the area covered by the population (m^2) to give a shoot count per population. Observations on the abundance of *H. vernicosus* at its other 4 localities were made from estimates made in the field from NPWS surveys. Overall calculations for the national population of *H. vernicosus*, in terms of individual shoots, is clearly only very approximate, but it seems that there must be millions of individual shoots covering several hectares of ground in total, with the largest population probably being at Scragh Bog (see Table 2). From NPWS surveys and the studies by Campbell (2013), mean number of shoots is estimated to be *ca.* 675,994,000 in total.

Location and population estimates (in terms of number of shoots and area covered by population (m^2)) for *Hamatocaulis vernicosus* at its 11 localities in the Republic of Ireland for the 2007 Conservation Assessment (Hodgetts, 2007) and for the 2013 Conservation Assessment, are listed in Table 2.

Table 2. Locations and population estimates in terms of number of shoots and area covered by the population for *Hamatocaulis vernicosus* populations (localities) in the Republic of Ireland.

Population (SAC)	**County**	**Grid ref.**	**First seen**	**Last seen**	**Population size – 2007 Assessment**	**Population size – 2013 Assessment**
1. Meentygrannagh (Meentygrannagh Bog)	Donegal	C02_06_	Lockhart 1999	Campbell & Lockhart 2011	'A number of colonies'	~6,314,000 shoots in 619 m^2
2. Rathavisteen (Glenamoy Bog Complex)	Mayo	F982371	Lockhart 1999	Lockhart 1999	Small patch *ca.* 10 x 1m	Small patch *ca.* 10 x 1 m (estimate of 1,000 shoots, N. Lockhart, pers. comm.)
3. Largan More (Carrowmore Lake Complex)	Mayo	F902240	Lockhart 1999	Campbell & Lockhart 2011	Abundant over *ca.* 10 x 5 m	~3,979,000 shoots in 478 m^2
4. Uggool (Owenduff/Nephin Complex)	Mayo	F927187	Lockhart 1999	Lockhart 1999	Small patch < 20 x 20 cm	Small patch < 20 x 20 cm (*ca*. 320 shoots, N. Lockhart, pers. comm.)
5. Owenbrin, Lough Mask (Lough Carra/Mask Complex)	Mayo	M062628	Jury, Rumsey & Webb 1983	Campbell & Lockhart 2011	Pure over *ca.* 10 x 20 m, extensive in patches over 1 ha	~106,117,000 shoots in 5,637 m^2
6. NW of Gortachalla Lough (Lough Corrib)	Galway	M225375	Holyoak 2004	Campbell & Lockhart 2011	'Strong population', dominant over several tens of m^2	~153,377,000 shoots in 3,725 m^2
7. Scragh Bog/Portnashangan (Scragh Bog)	Westmeath	N423589	Harris 1946	Campbell & Lockhart 2011	Very extensive, covering several hectares	~323,294,000 shoots in 17,833 m^2
8a. below Sgilloge Loughs (Comeragh Mountains)	Waterford	S286123	Appleyard 1966	Campbell & Lockhart 2011	In a flush extending for several hundred metres	~54,756,000 shoots in 3,401 m^2
8b. Nier River Valley (Comeragh Mountains)	Waterford	S279116	Ratcliffe 1963	Campbell & Lockhart 2011	Very abundant and dominant over *ca.* 1 ha	~28,156,000 shoots in 762 m^2
8c. Coumtay (Comeragh Mountains)	Waterford	S298080	Hodgetts 2007	Hodgetts 2007	-	A small colony, several dozen shoots (60) in an area of ~1 m^2
9. Commas (Cuilcagh-Anierin Uplands)	Cavan	H12967 27857	Hodd 2012	Hodd 2012	-	~2 m^2 (estimated to be <100 shoots)
TOTAL - Area						**32,468 m^2 i.e. circa 32,500 m^2**
TOTAL - Shoots						**675,994,480 i.e. *ca*. 675,994,000 shoots**

5.6 Population trends

Because of the lack of historical population estimates, it is impossible to assess population trends in individual colonies of *H. vernicosus* at this stage. It can however be inferred that the total population of this plant in Ireland has declined in historic times due to the loss of suitable habitat with the decline of intact peatlands. At present the population is considered stable however, as there is no evidence to suggest that there have been losses in area covered by the population or the number of localities since the EU Habitats Directive came into force.

5.7 Population Conservation Status

The Favourable Reference Population (FRP) is '*the population in a given biogeographical region considered the minimum necessary to ensure the long-term viability of the species'* (Evans & Arvela, 2011). Several of the populations are considered large, covering hundreds of metres squared, and these are thought to be robust and stable. The smaller populations, in the uplands, are in remote locations and are not considered threatened.

The area covered by population (m^2) calculated in the 2013 Conservation Assessment report to the EU is *circa* 32,500 m^2. At present there are at least eleven populations in the Republic of Ireland (see Table 2). This number of localities is considered adequate to ensure a favourable population conservation status in the future and should remain stable.
The area covered by the population of *ca*. 32,500 m^2 at the 11 localities is considered to represent the population baseline.

Following the General Evaluation Matrix for assessing the Conservation Status of Annex II Species (Evans & Arvela, 2011); because the Estimated Present Population is the same as the Favourable Reference Population, the Conservation Status of *H. vernicosus* in the Republic of Ireland is Favourable.

- **Species population:** 11 populations of *H. vernicosus* (covering 32,500 m^2)
- **Favourable Reference Population:** 11 populations of *H. vernicosus* (covering 32,500m^2)

6. Habitat

Hamatocaulis vernicosus grows in specific habitat niches, or micro-habitats, which occur within complexes of larger habitat units. Since the last Article 17 report in 2007, which attempted to crudely estimate the area of potentially suitable habitat by mapping from aerial photographs, it has been possible to more accurately delimit the extent of *H. vernicosus* micro-habitat niches by GPS from ground surveys (Campbell, 2013). Thus, the decline in potentially suitable habitat, estimated as 257 ha in 2007, to 3.25 ha in 2013 is a reflection of more accurate recording, rather than an actual decline.

6.1 Habitat Conservation Status

Although the historical decline in the area of intact peatlands must have caused a decline in the area of suitable habitat niches for *H. vernicosus*, the current area of habitat niche occupied by *H. vernicosus* is believed to be stable. Furthermore, the localities supporting *H. vernicosus*, several of which are large, are considered to be in good condition and are not considered under threat. Therefore it is inferred that the Conservation Status of Habitat is Favourable.

7. Future Prospects

7.1 Negative impacts and threats

With the recent decline in commercial afforestation on peatlands, the remote populations of *H. vernicosus* in the uplands are not thought to be currently threatened, except perhaps by wind farm developments. The large populations in the lowlands (at Lough Corrib, Lough Mask and Scragh Bog) are potentially at risk from agricultural activities, particularly eutrophication. However, all are within SACs and Scragh Bog is also a Nature Reserve. The main pressures and threats can be summarised as follows:

Threats to *H. vernicosus* in the Republic of Ireland

While recent (1999-2012) fieldwork at several of the populations of *H. vernicosus* revealed that there are no threats at present, it seems likely that this species was threatened at other localities in the past, and some populations have probably disappeared as a result of human activity. The main potential threats to *H. vernicosus* come under four broad headings:

- **Pollution**

  The main form of pollution affecting *H. vernicosus* is eutrophication from agricultural activities. The increased nutrient input resulting from high levels of nitrogen in the environment favours a few vigorous species at the expense of more ecologically demanding species. In the case of vascular plants, typical species favoured are nettles *Urtica dioica* and hogweed *Heracleum sphondylium*, which can smother less competitive but less nutrient-demanding species. In the case of bryophytes, *Calliergonella cuspidata* is the most common beneficiary of increased nutrient input in wet grassland and fens, particularly in conditions that are neither strongly acidic nor strongly basic (Hedenäs, 2003). Prime sources of eutrophication are agricultural run-off from adjacent fields, and over-stocking.

  Other forms of pollution may also adversely affect *H. vernicosus* flushes, but there has been little research into this. Dumping, a serious problem in some areas, may also be regarded as a form of pollution.

- **Land use**

  A number of land use changes threaten and have threatened *H. vernicosus* habitats in the past. Of these, the most important is drainage, which destroys the wetland as a precursor to conversion to agricultural use by re-seeding or to forestry.

Numerous other land use changes, any of which can threaten specific localities, include urbanisation, golf courses, development of wind farms and dumping. *H. vernicosus* populations may be at particular risk from wind farm developments, as they tend to occur on hillsides with little other obvious economic potential.

Commercial peat abstraction has destroyed huge swathes of peatlands in the Republic of Ireland. It is very likely that some undiscovered populations of *H. vernicosus* have been destroyed by this activity.

Management also comes under this broad heading. A regime of light seasonal grazing is appropriate for most wetland sites managed for nature conservation. If grazing is increased, this can result in changes in the vegetation structure, physical damage such as poaching, and eutrophication. If grazing is removed altogether, this may lead to a succession that ultimately results in woodland.

Removal of mosses for horticultural use could potentially affect *H. vernicosus*, as it tends to be an indiscriminate activity.

- **Climatic change**
  There is now little doubt that the climate is undergoing dramatic changes, and that this is at least partly due to human activities. The effects of this on individual species are unpredictable, but it is likely that the ranges of species will shift, and probably contract.

- **Invasive species**
  The accidental or deliberate introduction of invasive alien species is a general problem in many parts of the world. In Ireland, vigorous introductions such as Rhododendron (*Rhododendron ponticum*) constitute a major problem on acid soils, particularly in the uplands. While not a particular identified threat to *H. vernicosus* populations, it could become so at some localities. Invasion of wetlands by introduced conifers is often a serious problem, resulting in significant abstraction of water to the detriment of the populations.

7.2 Positive Impacts

A number of these threats are being addressed through national legislation. Some of the rarest plants in the Republic of Ireland, including *H. vernicosus*, are protected under the Flora (Protection) Order, 1999. It is an offence to cut, uproot or damage plants included in this list. The Habitats Directive (which specifically protects populations of *H. vernicosus* on Annex IIb) is transposed into Irish law in the European Communities (Natural Habitats) Regulations (Statutory Instrument 94 of 1997). The Habitats Directive provides protection for the habitats of listed plants as well as the plants themselves.

Under Annex IIb, each member state must designate Special Areas of Conservation for *H. vernicosus*. The Republic of Ireland to date has 8 SACs in which *H. vernicosus* is one of the key features (Table 1). An additional population at Commas, Co. Cavan, discovered in 2012, is within an SAC (Cuilcagh-Anierin Uplands), but not yet listed as a qualifying interest. On present knowledge, it appears that the entire known national population of *H. vernicosus* is protected within Special Areas of Conservation in the Republic of Ireland. However, it is perfectly possible that further populations may be discovered.

The Irish Government is a signatory to The Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention), 1982.

A number of other initiatives are underway in the Republic of Ireland that should have a positive impact on *H. vernicosus*. The EU LIFE initiative is funding a number of peatlands re-building projects. Scragh Bog is a nature reserve. The Irish Peatland Conservation Council has produced *Ireland's Peatlands Conservation Action Plan 2020* (Malone & O'Connell, 2009) designed to promote the conservation of Ireland's remaining peat bogs. One of the initiatives mentioned in this document is the Global Action Plan for Peatlands (GAPP), which has been developed by a wide partnership of organisations under the auspices of the Ramsar Convention on Wetlands.

An on-going monitoring programme of rare and threatened bryophytes, including *H. vernicosus,* has been established by the NPWS.

7.3 Future Prospects Conservation Status

Considering the positive impacts for the species protection, the fact that there are no high impacting pressures currently acting on the populations and that there is no reason to believe that any threats will present themselves in the future, the Future prospects are assessed as Favourable.

8. Overall Conservation Status

Although the range of *H. vernicosus* has declined historically, the current range is the same as the Favourable Reference Range. Therefore it has a Favourable Conservation Status.

The population of *H. vernicosus* in the Republic of Ireland has almost certainly declined in historic times due largely to the loss of suitable habitat through the decline of intact peatlands (see 7.2, above). However, it is still substantial, and the Estimated Present Population is the same as the Favourable Reference Population (see 7.3, above). Population therefore has a Favourable Conservation Status.

The area of suitable habitat niche for *H. vernicosus* in the Republic of Ireland is 3.25 ha. The habitats that support populations are considered to be in good condition and several hold extensive populations. Habitat therefore has a Favourable Conservation Status.

Considering the measures in place that will assist its protection, it is expected that *H. vernicosus* will survive in the Republic of Ireland. The overall Conservation Status for the Future Prospects of *H. vernicosus* is therefore Favourable.

Range of *Hamatocaulis vernicosus*:	**Favourable**
Population of *Hamatocaulis vernicosus*:	**Favourable**
Habitat for *Hamatocaulis vernicosus*:	**Favourable**
Future Prospects for *Hamatocaulis vernicosus*:	**Favourable**
Overall Assessment:	**Favourable Conservation Status**

9. Monitoring

9.1 Introduction

Under Article 17 of the EU Habitats Directive, each member state must report to the European Commission on the measures taken under the Directive and on the conservation status of the listed species and habitats every 6 years (Evans & Arvela, 2011; European Commission, 1992). The conservation status of a species is defined as the sum of influences acting on the target species that may affect the long-term distribution and abundance of its populations. There are four criteria (range, population, area of suitable habitat and future prospects) that must be met in a favourable way, i.e. given a classification of 'Favourable' or 'Good' for the conservation status to be given an overall classification of 'Favourable'. The criterion 'range' is the outer limits of the overall area in which a species is found at present and can be considered as an envelope within which areas actually occupied occur, as in many cases not all the range will actually be occupied by the species (Evans & Arvela, 2011; European Commission, 1992).

The criteria are considered Favourable when:

- the natural range of the target species is neither declining nor is likely to decline in the foreseeable future;
- population dynamics data suggest that the target species populations are maintaining themselves on a long-term basis as a viable component of its natural habitat;
- there is and will continue to be a sufficiently large habitat for the populations to maintain themselves into the long-term future and
- future prospects for their overall survival must also be deemed favourable.

If any of these criteria are not in favourable condition then an unfavourable status must be given. There are two categories of unfavourable status: 'Unfavourable - Inadequate' and 'Unfavourable - Bad'.

9.2 Monitoring

Article 11 of the EU Habitats Directive requires each Member State to undertake 'surveillance' of the conservation status of listed habitats and species. According to Jones *et al.* (2006), "The overall purpose of surveillance and reporting is to identify, and draw attention to, weaknesses in the state of the environment which will need to be addressed if the vision and strategic goals are to be achieved". This document goes on to say that surveillance, which is considered an essential companion to monitoring, is "systematic sampling designed to produce a series of measurements in time and the term is used here to encompass monitoring when the need is to know whether a particular state or standard is being achieved".
According to the Joint Nature Conservation Committee's *Common Standards Monitoring for Designated Sites: First Six Year Report* (JNCC, 2006), monitoring performs the following functions:

- it indicates the degree to which current conservation measures are proving effective in achieving the objectives of the designation at site level, and identifies any need for further measures;
- it indicates the effectiveness of current conservation action and investment at country level, and identifies priorities for future action;

- it enables Government to undertake its national and international reporting commitments in relation to designated sites, and more widely, and helps identify any areas of shortfall in implementation.

9.2.1 Broad-scale monitoring

The Joint Nature Conservation Committee (JNCC) consider monitoring to be a 'quick and dirty' exercise that can be done frequently, by non-specialists, to provide an early warning of designated features on sites slipping into an Unfavourable conservation status. It does not require specialist knowledge of taxa, so tends to use a series of 'indirect attributes'. For example, a quick visit to a woodland to monitor the state of bryophytes might have to ascertain (a) that the trees have not been felled, (b) that the canopy structure is still more or less intact, and (c) that there is still a dominance of bryophytes on wet ground, rocks, banks and trees.

For *Hamatocaulis vernicosus*, Table 3 (adapted by N. Hodgetts) might be a guide to broad-scale monitoring.

Table 3. Proposed guide to broad-scale monitoring of *Hamatocaulis vernicosus* in the Republic of Ireland.

Attribute	Measure	Target	Comments
Hydrology	Visual assessment	High water table necessary all year round to support sedge-rich fen; springs and flushes.	*Fluctuations in water table can occur, particularly at lowland sites*
Shade	Visual assessment	Does not tolerate shading from woody species.	
Sward	Management	Summer grazing on lowland fens. All year grazing in uplands.	*Extensive grazing often practised on sites, apart from Scragh Bog*
Vegetation	Visual assessment	Maintain scrub-free fens and flushes.	
Eutrophication (negative attribute)	Visual assessment	No green algae; *Calliergonella cuspidata* not dominant in moss layer	

If one attribute fails, the population is not in favourable condition. Broad-scale monitoring of this sort should be done annually at each *H. vernicosus* population if possible, either by NPWS staff, other conservation professionals or volunteers.

9.2.2 Fine-scale monitoring

In tandem with broad-scale monitoring, there should be a supporting programme of fine-scale monitoring. Fine-scale monitoring is considered to be an activity that is done mainly by specialists, and less frequently than broad-scale monitoring.

For *H. vernicosus*, fine-scale monitoring should consist of a visit to its populations by a bryologist, at least once every six years, to check (a) that *H. vernicosus* is still present, and (b) the health and extent of its population, habitat and associates. Naturally, the fine-scale monitoring visit should double as a broad-scale monitoring visit. 'Nested' digital photographs should be taken, so that future monitoring can be compared with the baseline.

Following a study on *Hamatocaulis vernicosus* as part of a Ph.D. research project carried out by Campbell (2013) the above broad-scale monitoring guidelines were investigated and amended to provide fine-scale monitoring guidelines.

9.2.3 Preparation for fine-scale monitoring visit

Prior to the fine-scale monitoring being carried out, training should take place to ensure that the surveyor has the necessary skills to identify *Hamatocaulis vernicosus* and similar species in the field, such as *Scorpidium scorpioides*, *Scorpidium revolvens*, *Warnstorfia exannulata* and *Palustriella commutata*.

Field equipment should include:

- An adequate number of population relevé and assessment sheets (see Appendix II)
- Maps showing location of populations (see Appendix I)
- A handheld GPS receiver capable of differential corrections accurate to 50 cm or less with post processing (e.g. Trimble GeoExplorer range)
- Photographs of locality and locations of target species
- 2 metre bamboo canes (approx. 10)
- Measuring tape to mark out 2 x 2 m plots in the field with bamboo canes
- Ruler
- Clinometer
- Compass
- Digital camera
- Plastic syringe & filter
- Filter papers
- Plastic containers for water samples
- Collection bags/envelopes/packets
- A waterproof field notebook
- Plant identification guides
- Thorough familiarisation with previous surveys of the population under investigation - this will highlight any changes in status or threats from the previous visits.

Note: Care should be taken during all visits to minimise impact on these populations. Many of the *H. vernicosus* flushes contain vulnerable and highly localised bryophyte and vascular plants, e.g. *Saxifraga hirculus*.

9.2.4 Area of extent of occupancy, area covered by the population & recording of relevé data

'Area covered by the population (m^2)' is an accepted method of assessing populations of bryophytes (Evans & Arvela, 2011) as it can be difficult to determine what constitutes an individual because of the clonal nature of many species (Hallingbäck *et al*., 1998). It is also used to assess the attribute of area of 'habitat for the species' in the EU Conservation Assessment report. Thus both area covered by the population and shoot counts (density) are to be assessed.

The first thing to be carried out during a fine-scale monitoring visit is to delimit the area of extent of occupancy of *H. vernicosus*. The methodology for mapping the extent of occupancy at (a) the lowland populations, where there is more continuity of suitable habitats, is somewhat different from mapping that of (b) the upland flush populations, which consist of discrete patches of suitable habitat within 'unsuitable' blanket bog. The two methods of area of extent of occupancy determination are outlined

below. One to five relevés of 2 x 2 m recording the parameters outlined below can then be recorded, again depending on the type of population ((a) or (b)).

Determining area of extent of occupancy and percentage cover of *H. vernicosus* in:

(a) Lowland fen populations

For the lowland fen *H. vernicosus* populations at Owenbrin, Gortachalla and Scragh Bog the limits of the extent of the occupancy of *H. vernicosus* should be outlined with bamboo sticks and then GPS points recorded. A polygon can subsequently be drawn around the GPS points and the area measured using GIS software such as ArcGIS.

Plots of 2 x 2 m (3-5 in number) should be placed randomly within the extent of occupancy, ensuring *H. vernicosus* is present in the plot. If the species is not present, a further random location should be selected until presence of *H. vernicosus* in the plot is determined. The GPS position of each plot should be recorded. The percentage cover of *H. vernicosus* should be determined to the nearest 1% within each plot. The mean percentage cover within the plots per population can then be used to estimate the area covered by the population within the extent of occupancy.

(b) Upland flush populations

At the populations at Meentygrannagh, Largan More, Uggool, Rathavisteen, Commas, Coumtay, Below Sgilloge Loughs and Nier River Valley, where the species occurs in discrete flushes/springheads and in areas of mesotrophic mire, these areas should be refound by GPS, marked and measured with further GPS points, and one to five relevé plots of 2 x 2 m per site should be located within them, ensuring that *H. vernicosus* is present within the plot area. The GPS position of each plot should be recorded. Any other flushes apparently suitable from aerial photography should also be examined. The percentage cover of *H. vernicosus* should be determined to the nearest 1% within each plot. The mean percentage cover within the plots per population can then be used to estimate the area covered by the population within the extent of occupancy.

9.2.5 Number of relevé plots

It is suggested that one-three 2 x 2 m relevé plots be recorded at the small upland populations at Uggool, Rathavisteen, Coumtay and Commas, that three to five 2 x 2 m plots be recorded at the upland populations of Meentygrannagh, Largan More, Below Sgilloge Loughs and Nier River Valley and that five plots be recorded at the localities with larger populations of *H. vernicosus* i.e. Scragh Bog, NW of Gortachalla Lough and Owenbrin.

9.2.6 Parameters to be recorded in relevé plots

- The GPS co-ordinates and altitude (in metres above sea level (m.s.l.)) of each plot should be recorded on the hand-held GPS device and also noted on the field sheet.
- The slope of the plot should be measured with a clinometer and the aspect with a compass.
- The surface water depth (cm) should be measured with a ruler at five points within the plot and the mean noted. A hand should also be pressed into the vegetation and a tick given on the field sheet (in the appropriate section) if the hand is covered with surface water.
- The cover of *H. vernicosus* should be estimated to the nearest 1% within each plot. The mean percentage cover obtained can then be compared with the target for the population (see individual locality Assessment Forms, Appendix II).
- In order to estimate density of *H. vernicosus* shoots, within each plot a 10 x 10 cm area containing *H. vernicosus* should be chosen and each shoot within that should be counted. The

density in the five plots can be averaged per population and extrapolated by the area covered by the population to give a final density estimate for the overall population. The mean percentage density obtained can then be compared with the target for the population (see individual locality Assessment Forms, Appendix II).

- The mean vegetation height (cm) should be calculated by averaging the length of 5 stems in the plot measured with a ruler or a measuring tape. The stem with the maximum vegetation height (chosen by eye) should also be measured and noted.
- Cover of trees, shrubs, grasses, rushes, sedges, forbs, bryophytes, lichens, algae and litter should be recorded to the nearest 5% as should cover of bare ground, surface water and dung within each 2 x 2 m plot.
- The cover of any other plant species present in the plot should also be recorded to the nearest 5%.
- Photographs should be taken of each plot from above, and from facing north, south, east and west.
- If availability of plant material allows, a shoot sample containing 100+ shoots should be collected from various points within each plot and placed in labelled plastic bags for examination in the laboratory for male and female gametangia (see Section 8.3.5 below).
- A water sample should be taken at 5 points within each 2 x 2 m plot using a plastic syringe. A plastic filter with a 55 mm filter paper inserted should be attached to the syringe and the water discharged through this into a labelled sealable plastic container. The syringe and filter should be rinsed with distilled water from a plastic bottle and the filter paper changed between each sample collection. Once sealed, the container should be covered with tinfoil and analysed as quickly as possible for pH, conductivity (µS/cm), ammonium (NH_4) (mg/l), nitrate (NO_3) (mg/l), ortho-phosphate (O-P) (mg/l) and total phosphate (TP) (mg/l).

9.2.7 Sampling & Laboratory work

When availability of plant material allowed, the shoot sample containing 100+ shoots should be examined in the laboratory for identification of male and female gametangia, if present. While the presence of gametangia on shoots can be determined in the field with a hand lens, whether or not they contained archegonia or antheridia can be better established through examination under a microscope. The determination of sex is also time-consuming and better undertaken in the laboratory. Perichaetical leaves should be removed to reveal red flask-shaped archegonia. Male gametangia may appear somewhat larger and rounder, and dissection under the microscope should uncover the presence of sac-like antheridia. In some cases, the gametangia may not be verified as male or female, particularly in cases where they occur further down the shoot, and so should be noted as indeterminate. Each shoot collected (to a maximum of 100 per sample) should be examined under the microscope, noted as male, female, indeterminate or infertile (no gametangia present) and percentages of each category should be calculated per sample and for the population overall. Results should be entered into the results table on the recording sheet for each population (see Appendix II). Table 4 shows an example determination of male and female shoots results table filled out for Scragh Bog.

Table 4. Results of determination of male and female shoots from Scragh Bog.

Population	Plot No.	Date	No. of male shoots	No. of female shoots	No. of indeterminate shoots	No. of infertile shoots	Total no. of shoots
Scragh Bog	1	10.08.11	21	60	0	19	n = 100
	2	10.08.11	13	27	1	59	n = 100
	3	10.08.11	11	21	2	66	n = 50
	4	10.08.11	24	31	4	41	n = 100
	5	10.08.11	15	8	2	75	n = 100

The water samples taken should be analysed as quickly as possible for pH, conductivity (µS/cm), ammonium (NH_4) (mg/l), nitrate (NO_3) (mg/l), ortho-phosphate (O-P) (mg/l) and total phosphate (TP) (mg/l). The results table on the recording sheet should be filled out for each population (see Appendix II). Table 5 shows an example surface water analysis results table filled out for Scragh Bog.

Table 5. Results of analysis of surface water sample from Scragh Bog.

Scragh Bog Plot Number:	1	2	3	4	5
Surface water pH	6.50	6.48	6.77	6.55	6.54
Surface water conductivity (µS/cm)	405.5	324.0	526.0	306.5	433.0
Ammonium (NH_4) (mg/l)	0.10	0.02	0.09	0.02	0.04
Nitrate (NO_3) (mg/l)	<0.09*	<0.09*	<0.09*	<0.09*	<0.09*
Orthophosphate (O-P) (mg/l)	0.031	0.005	0.021	0.036	0.005
Total phosphate (TP) (mg/l)	0.067	0.015	0.144	0.059	0.017

* Detection limit of the particular analysis technique used by the laboratory

9.3 Population Assessment

Area covered by the population (m^2) is an accepted method of assessing populations of bryophytes (Evans & Arvela, 2011) as it can be difficult to determine what constitutes an individual because of the clonal nature of many species (Hallingbäck *et al*., 1998). Results from a preliminary genetic fingerprinting (amplified fragment length polymorphism) analysis (Campbell, 2013) showed the range of genetic variation in Irish populations of *H. vernicosus* to be larger than could be hypothesised for a species that is not known to reproduce sexually.

Thus both area of extent of occupancy (from which area covered by the population can later be derived) and density of shoots are to be assessed in order to determine the status of each population. The details of how to assess both area of extent of occupancy for both upland and lowland habitats and how to assess cover and density were outlined above. The overall aim of these approaches is to generate a set of standardised and comparable data that can be used to determine trends in the area covered by the species and density of the shoots.

Table 6 shows an example of Population Assessment Indictor and Target numbers for Scragh Bog.

Table 6. Population Assessment indicators, methods of assessment and targets for Scragh Bog.

Indicator	Method of assessment	Target	Result	Pass/Fail
Total area of extent of occupancy (m^2)	Area of polygon around GPS points	> 47,550 m^2	55,000 m^2	Pass
Percent cover (%)	Mean percentage cover within 5 plots	≥ 25%	40%	Pass
Density	Mean number of shoots in 10 x 10 cm area in 5 plots	≥ 145 shoots	179 shoots	Pass

9.4 Habitat Assessment

Floristic work on the habitats of *H. vernicosus* by Campbell (2013) suggested positive and negative indictors to monitor. The indicators used to assess habitat quality are hydrology, tree cover, shrub cover, bryophyte cover, cover of *Calliergonella cuspidata* and mean vegetation height. These should be assessed within the 2 x 2 m plots. GPS positions and photographs of all plots and any other features of interest (e.g. illegal dumping) should be taken.

The indicators and how to assess them are outlined below.

Hydrology

From a study by Campbell (2013), it appears that *H. vernicosus* can withstand larger fluctuations in water table level than previously thought, particularly in the lowland localities where the most extensive populations of *H. vernicosus* occur. During dry spells, the water level can drop considerably below the surface level of the root mat vegetation (up to 40+ cm) in the lowland populations of Gortachalla, Scragh Bog, and particularly at the Owenbrin site on the Lough Mask floodplain. At the upland localities there may not be much discernible change in the water level, although it is suspected that the whole vegetation mat rises and falls with changes in the water level, particularly in the spring head flushes at Largan More. The change in level was greater at Nier River Valley where the water table fell below the surface of the root mat.

Measurements of water table level over a longer monitoring time-period (>10 years) will further elucidate temporal fluctuations (McBride *et al.*, 2011). The depth of surface water measurements are recorded in the relevé field sheet.

Sufficient moisture at the populations can be assessed by pressing a hand into the vegetation and the water level should cover it.

Tree cover and shrub cover

H. vernicosus does not tolerate shading from woody species so both tree cover and shrub cover should be monitored. Tree cover and shrub cover within each 2 x 2 m plot should be estimated to the nearest 5%. Mean tree cover over the five plots should not exceed 15% and mean shrub cover should not exceed 20%.

Grass cover

Increased nutrients and/or undergrazing can change the vegetation composition; tall-herbs and grasses can begin to dominate at the expense of brown mosses (McBride *et al.*, 2011). Grass cover should be estimated to the nearest 5% within each plot and mean grass cover should not exceed 25%.

Bryophyte cover

In a study by Campbell (2013) a statistically significant positive relationship was found between bryophyte cover and density of *H. vernicosus* suggesting that the species performs better in open conditions in moss-dominated carpets. Bryophyte cover should be estimated to the nearest 5% within each plot and a mean cover of >50% should be obtained.

Cover of *Calliergonella cuspidata*

C. cuspidata has been reported as becoming dominant when nutrient levels are elevated (Hedenäs, 2003; Kooijman, 1993). Cover of *C. cuspidata* should be estimated to the nearest 5% in each plot and a mean cover of *C. cuspidata* should not exceed 15% in all populations apart from Scragh Bog, where mean cover of *C. cuspidata* should not exceed 60%.

Mean vegetation height

Shading and/or competition from surrounding vegetation can have a negative effect on the cover of *H. vernicosus*, which is a poor competitor in tall vegetation (Turner, 2003).

The height of 5 shoots in each 2 x 2 m plot (including hummock-forming species) should be measured with a ruler or a measuring tape (cm) and averaged per plot. The mean vegetation height of the plots should not exceed 80 cm at Scragh Bog and should not exceed 40 cm at all the other populations.

Table 7 gives an example of a completed Habitat Assessment form for Scragh Bog.

Table 7. Habitat Assessment indicators, measures of assessment and targets for Scragh Bog.

Indicator	Method of assessment	Target	Result	Pass/Fail
Hydrology	Hand should be pressed into vegetation	Water level should cover hand when pressed into the vegetation	Hand covered	Pass
Tree cover	Estimation of tree cover to nearest 5% averaged over 5 plots	Mean percent tree cover should **not** exceed 15%	10%	Pass
Shrub cover	Estimation of shrub cover to nearest 5% averaged over 5 plots	Mean percent shrub cover should **not** exceed 20%	15%	Pass
Grass cover	Estimation of grass cover to nearest 5% averaged over 5 plots	Mean percent grass cover should **not** exceed 25%	10%	Pass
Bryophyte cover	Estimation of bryophyte cover to nearest 5% averaged over of 5 plots	Mean percent bryophyte cover should exceed 50%	80%	Pass
Cover of *Calliergonella cuspidata*	Estimation of *C. cuspidata* cover to nearest 5% averaged over 5 plots	Mean percent *C. cuspidata* cover should **not** exceed 60%	45%	Pass
Mean vegetation height	Mean height (cm) of 5 shoots per plot averaged over five plots	Mean vegetation height should **not** exceed 80 cm	69.5cm	Pass

9.5 Assessment of Future Prospects

The assessment sheet contains sections to record pressures and threats to the species at each population. Continued and standardised assessment of the local threat status will be important in monitoring trends over time, and will ultimately help inform management decisions. The future

prospects of *H. vernicosus* are believed to be stable in the short/medium term. Potentially threatening activities and their location, influence, intensity and area affected should be recorded (see Table 8).

Table 8. Potentially threatening activities (with their EU code), their location, influence, intensity and area affected for *Hamatocaulis vernicosus* localities Future Prospects Assessment.

Activity (EU code)	**Location (Inside/outside area of occupancy)**	**Influence (Positive/ Negative/ Neutral)**	**Intensity (High/ Medium/ Low)**	**Area affected (0-10m^2; 11-50m^2;51-100m^2; >100m^2)**
Intensive grazing (A04.01)				
Excessive poaching (Trampling, overuse G05.01)				
Lack of grazing (A04.03)				
Fertilisation (A08)				
Diffuse pollution to surface waters due to agricultural and forestry activities (H01.05)				
Water abstractions from groundwater (J02.07)				
Hand cutting of peat (C01.03.01)				
Mechanical removal of peat (C01.03.02)				
Forest planting on open ground (B01)				
Motorised vehicle damage (G01.03)				
Dumping (Discharges E03)				
Biocenotic evolution, succession (incl. enlargement of scrub vegetation area) (K02)				
Species composition change (succession) (K02.01)				
Other:				

9.6 Assessing Overall Conservation Status

To derive an overall assessment, the Population, Habitat and Future Prospect Assessments are combined. Following the completion of the all sections, an overall score of Favourable (Green), Unfavourable - Inadequate (Amber) or Unfavourable - Bad (Red) is assigned using the criteria below.

Population assessment

The data collected on the 7 populations studied by Campbell (2013) are used as the baseline data against which all future monitoring will be based. A 20% reduction from the baseline data in the area of extent of occupancy and shoot density numbers has been applied to allow for machine (GPS) and human error and observed recording variability over field sampling. A 10% reduction from the baseline data for *H. vernicosus* percentage cover has been applied to allow for machine error (GIS

mapping) and human error. For the overall population assessment the following criteria should be used:

- 2 passes = Favourable (Green)
- 1 pass = Unfavourable - Inadequate (Amber)
- 0 passes = Unfavourable - Bad (Red)

Targets for percentage cover and shoot density have not yet been set for Rathavisteen, Uggool, Coumtay and Commas and therefore if the target for area of extent of occupancy is met then the site can be given a Favourable status. Further monitoring will contribute to setting the targets for percentage cover and shoot density.

Habitat assessment
For the overall habitat assessment to indicate favourable conditions the following criteria should be used:

- 7 passes = Favourable (Green)
- 4 - 6 passes = Unfavourable - Inadequate (Amber)
- 0 - 3 passes = Unfavourable - Bad (Red)

Future prospects
The assessment of Future Prospects is more subjective. If there is no significant impact of the activities the Future Prospects should be assessed as Favourable (Green), moderate impact should be assessed as Unfavourable - Inadequate (Amber) and severe impact as Unfavourable - Bad (Red).

Overall Assessment
The overall assessment of the site is carried out by combining the results from all the other assessments and is assessed using the following criteria.

- All Green = Favourable (Green)
- 1 - 3 Amber = Unfavourable - Inadequate (Amber)
- 1 Red = Unfavourable - Bad (Red)

Targets for Population, Habitat for the species and Future prospects should be assessed at a site-by-site level. The raw data for each site assessment can then be used to derive a national assessment.

Table 9 shows an example of a completed Overall Assessment for Scragh Bog.

Table 9. Example of an Overall Assessment for Scragh Bog.

Attribute	**Assessment**
Population	Green
Habitat for the species	Green
Future Prospects	Green
Overall	Green

9.7 Timing of Assessment

The timing of visits should occur in late summer/early autumn, as associated species (sedges in particular) are easier to identify then and the water table is likely to be lower than in the spring, making excessive drainage easier to register. It also allows the extent of *H. vernicosus* to be seen more easily.

9. 8 Field Assessment

All questions on the field survey sheets should be filled in on site to the best ability of the surveyor. The aim is to record the extent of the moss and any pressures or threats on an individual population basis. It is recommended that the sheet containing the previous monitoring results be compared in the field with the latest monitoring results. This will enable the surveyor to ascertain if any changes have taken place between surveys.

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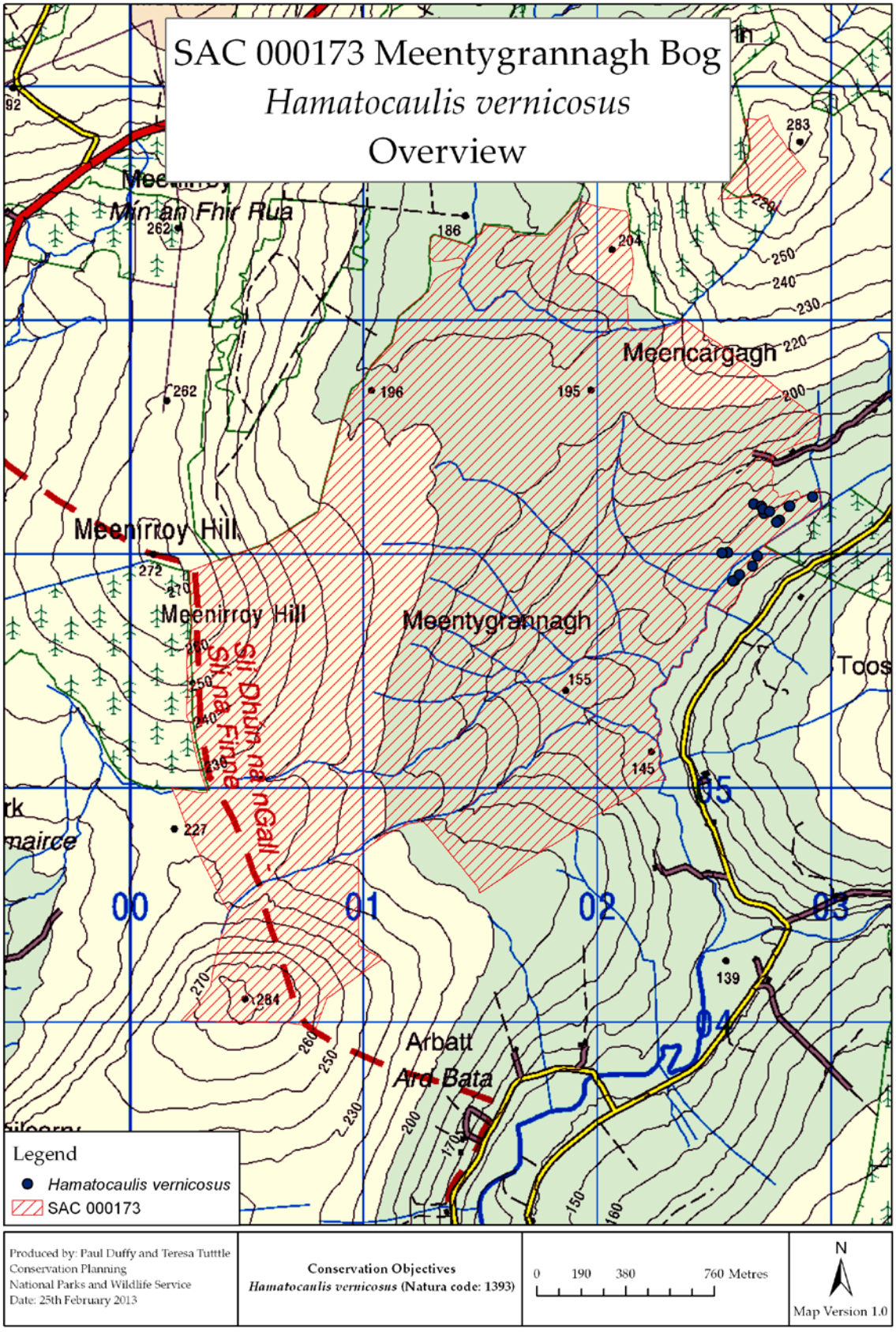
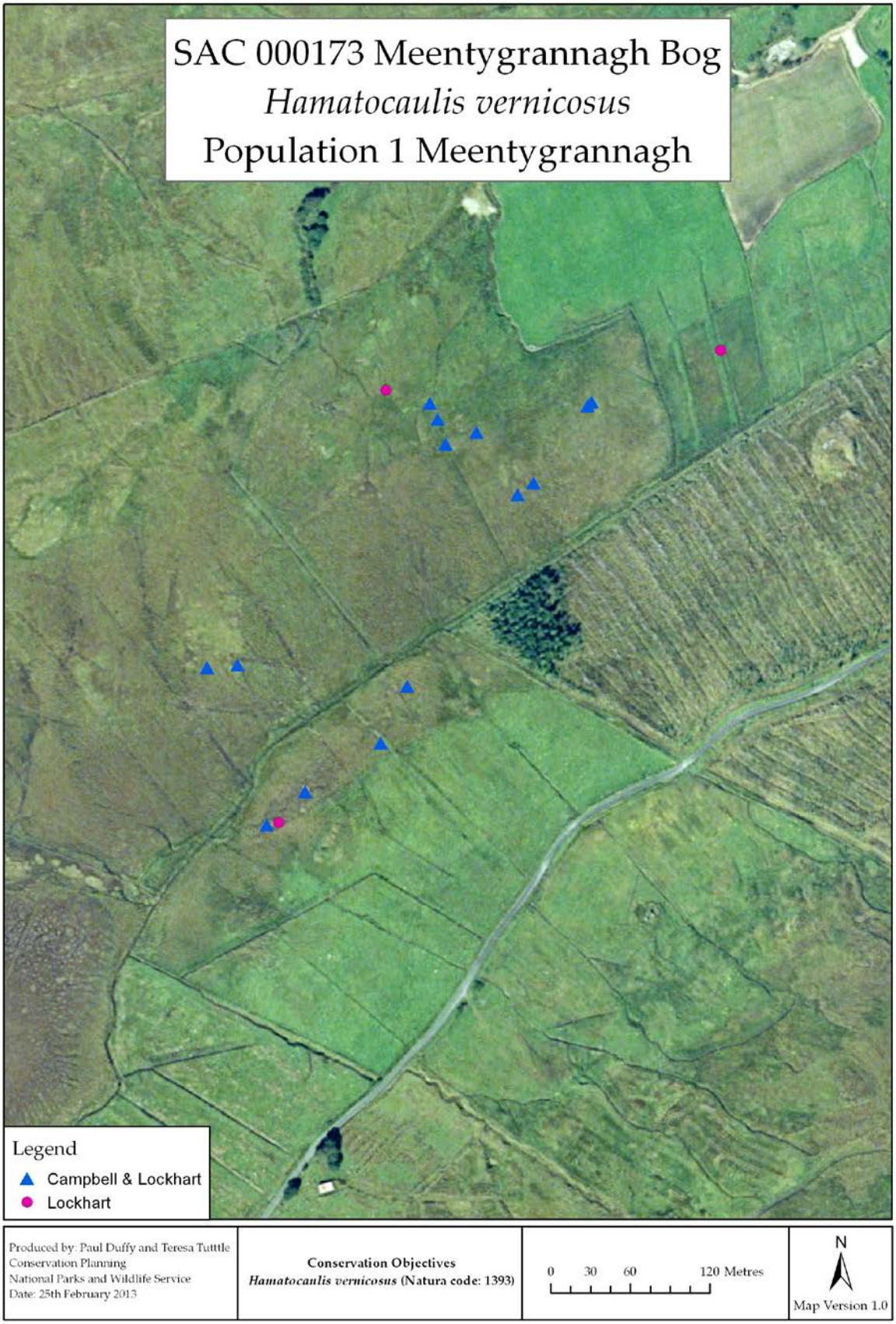
Appendix I. Maps and aerial photographs of *Hamatocaulis vernicosus* populations

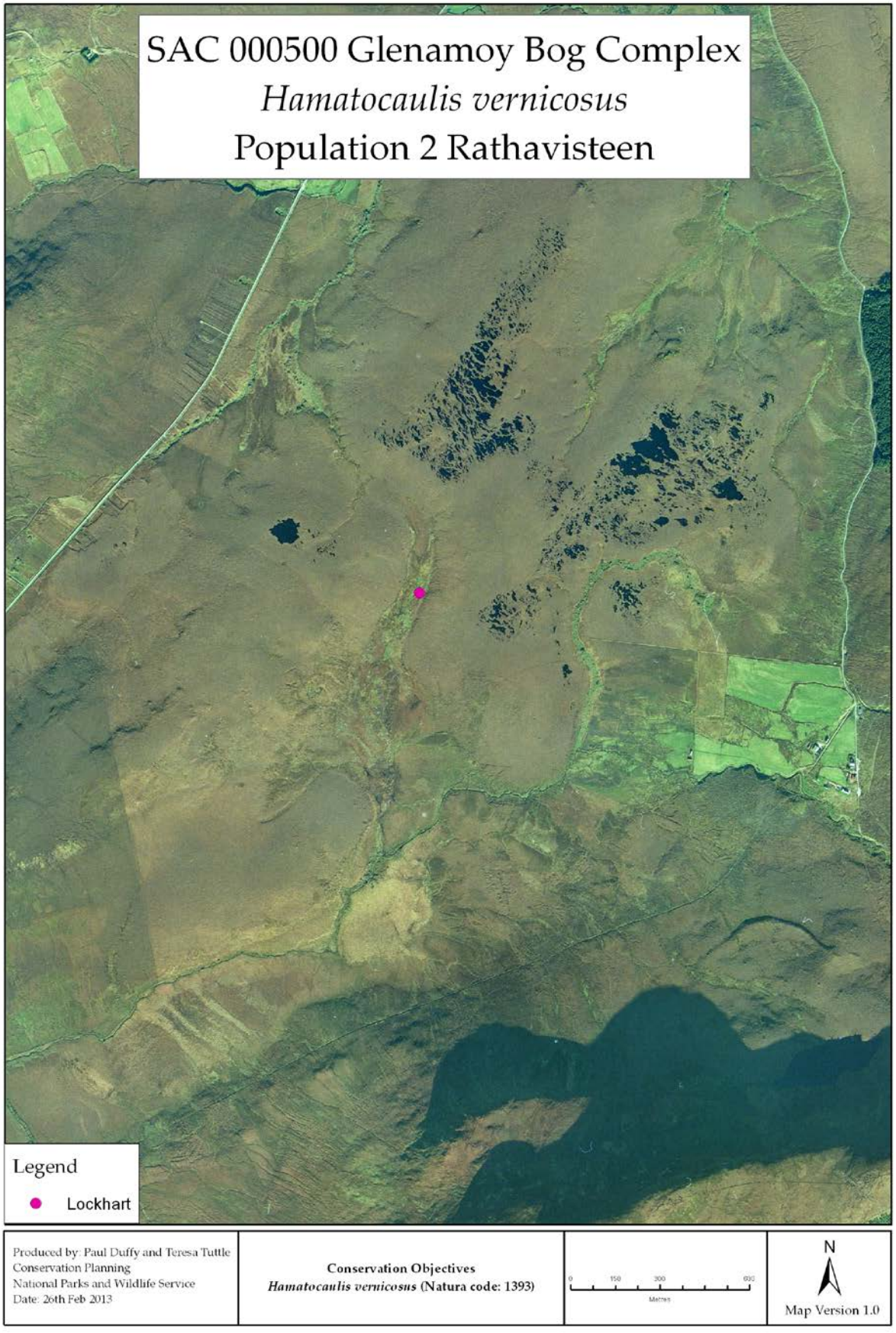
Overview of the GPS points mapped during previous surveys for the *Hamatocaulis vernicosus* populations overlaid on Discovery maps and on aerial photographs.

Population 1: Meentygrannagh Bog, Co. Donegal (Meentygrannagh Bog SAC 000173)

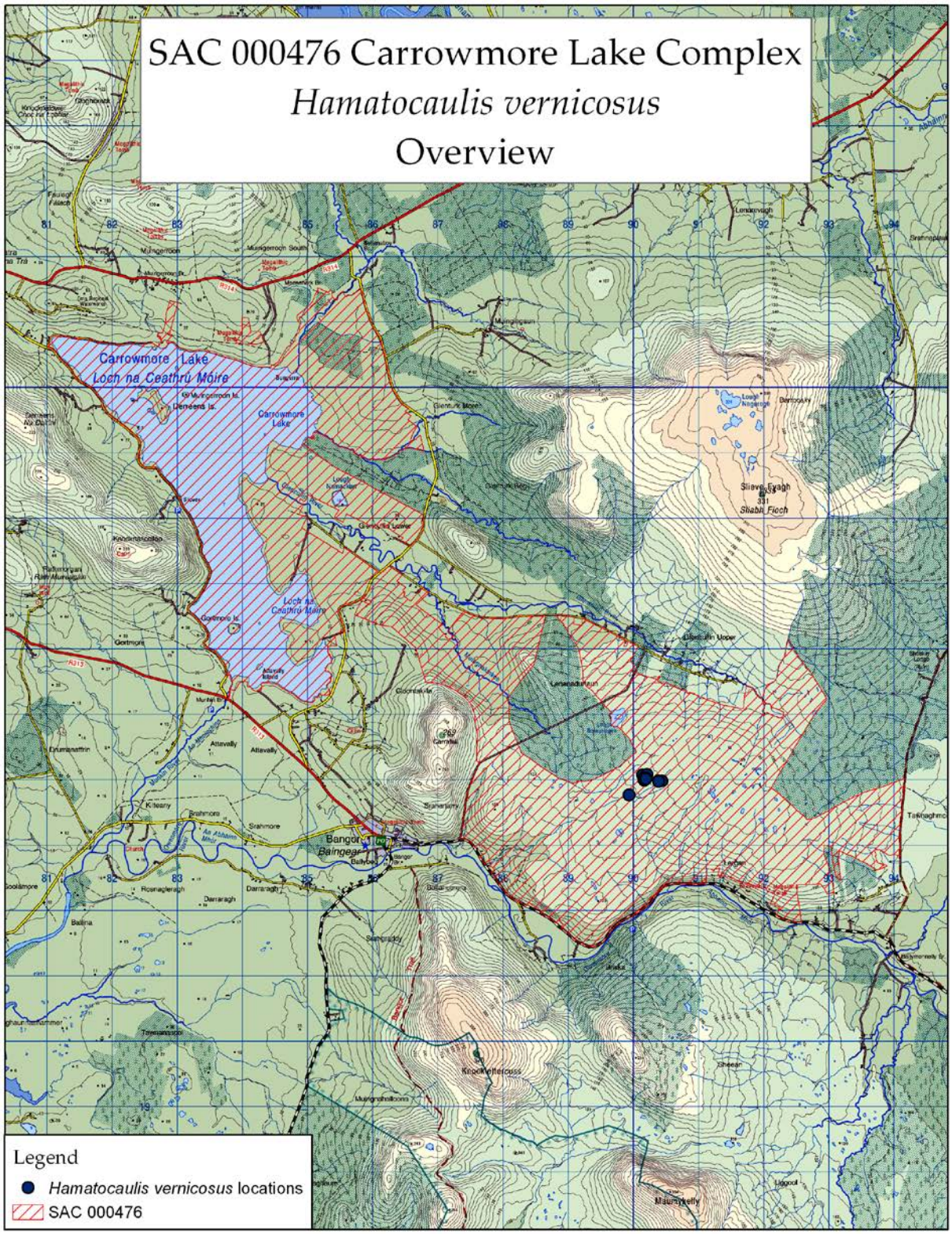


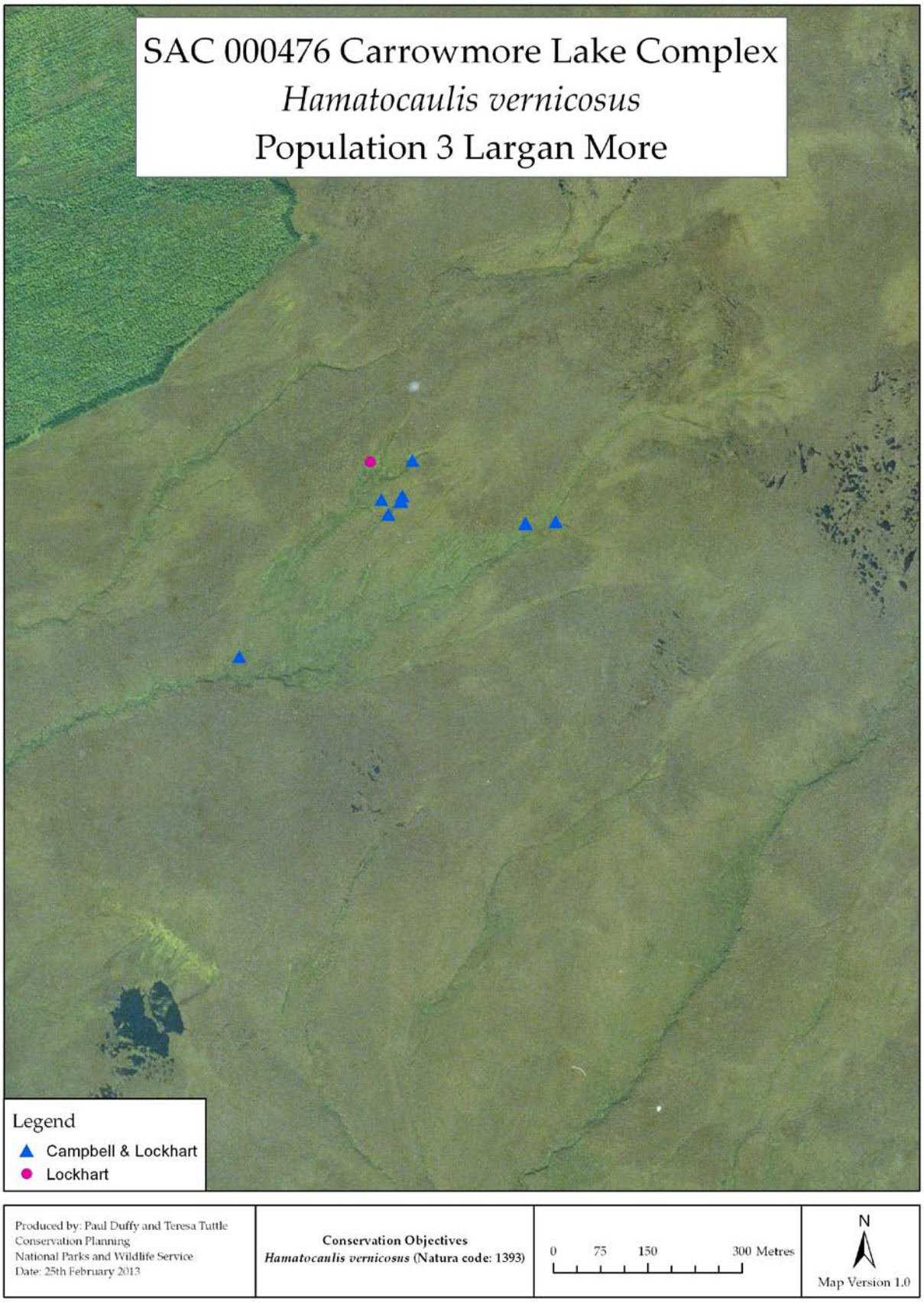

SAC 000173 Meentygrannagh Bog
Hamatocaulis vernicosus
Population 1 Meentygrannagh
Legend
Campbell & Lockhart
Lockhart
Produced by: Paul Duffy and Teresa Tutttle
Conservation Planning
National Parks and Wildlife Service
Date: 25th February 2013
Conservation Objectives
Hamatocaulis vernicosus (Natura code: 1393)
0 30 60 120 Metres
N
Map Version 1.0

Population 2: Rathavisteen, Co. Mayo (Glenamoy Bog Complex SAC 000500)


SAC 000500 Glenamoy Bog Complex
Hamatocaulis vernicosus
Population 2 Rathavisteen
Legend
Lockhart
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 26th Feb 2013
Conservation Objectives
Hamatocaulis vernicosus (Natura code: 1393)
0
150
300
600
Metres
N
Map Version 1.0

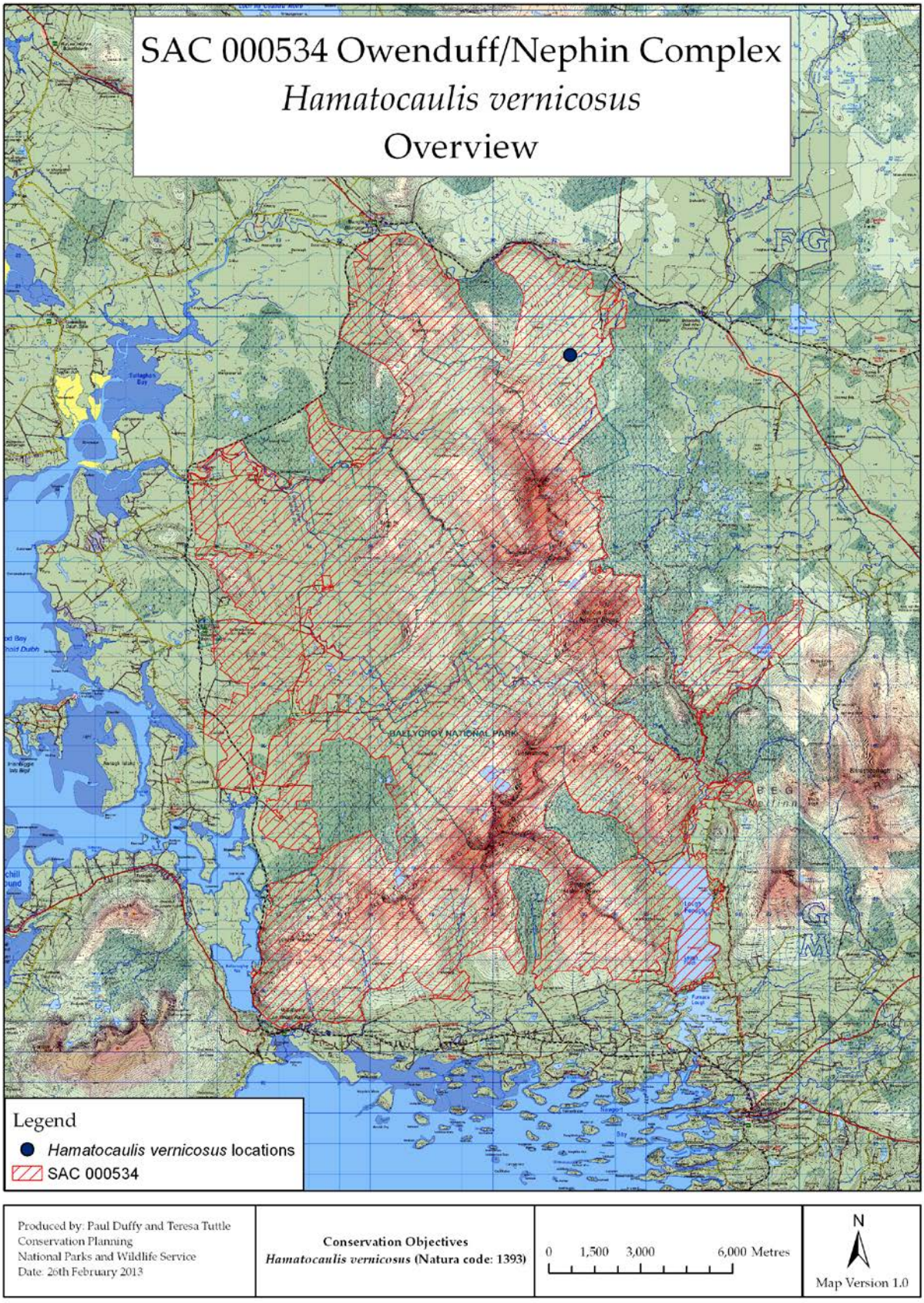
Population 3: Largan More, Co. Mayo (Carrowmore Lake Complex SAC 000476)

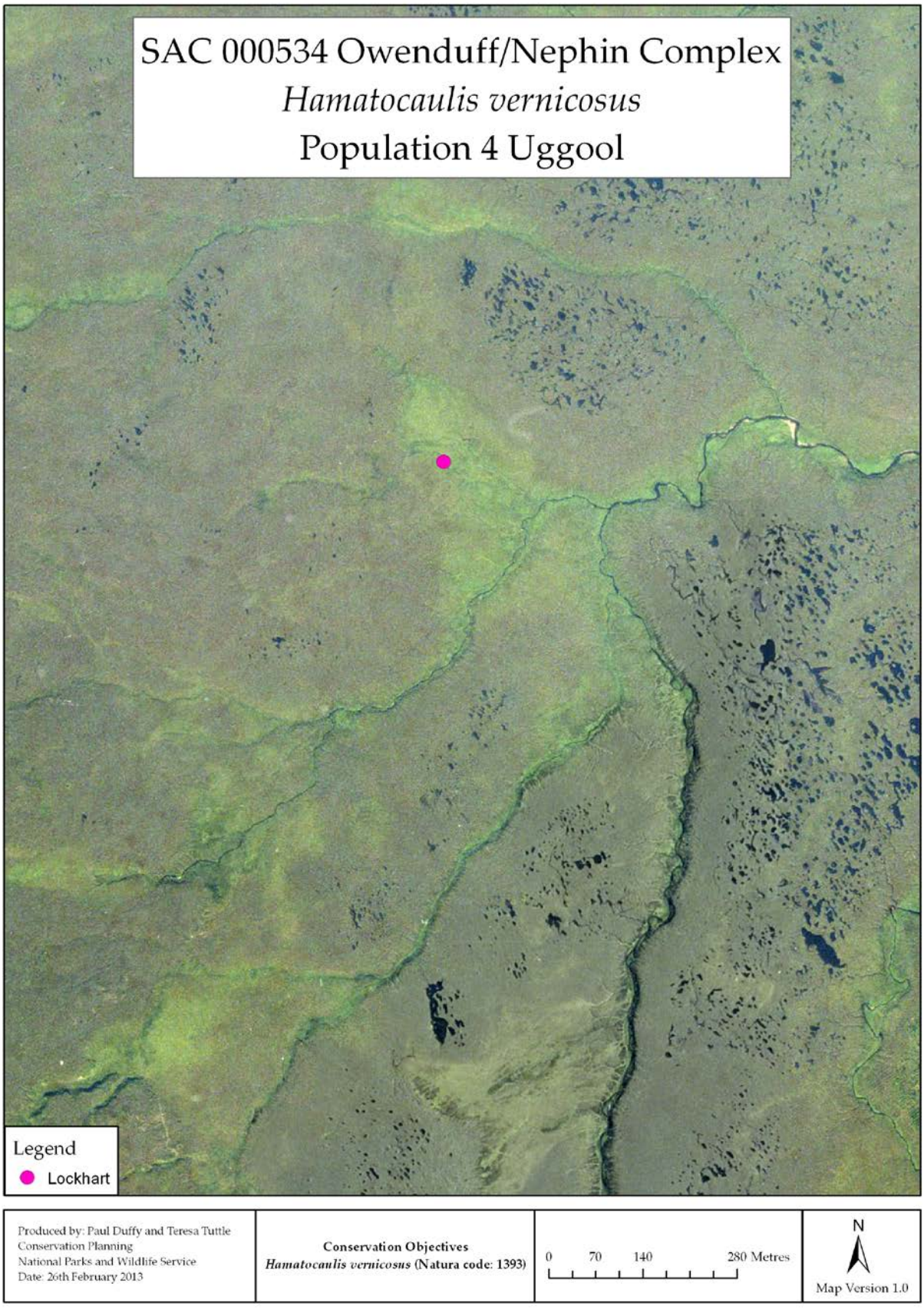




Produced by: Paul Duffy and Teresa Tuttle Conservation Planning National Parks and Wildlife Service Date: 25th February 2013	**Conservation Objectives** ***Hamatocaulis vernicosus*** **(Natura code: 1393)**	0 75 150 300 Metres	N Map Version 1.0

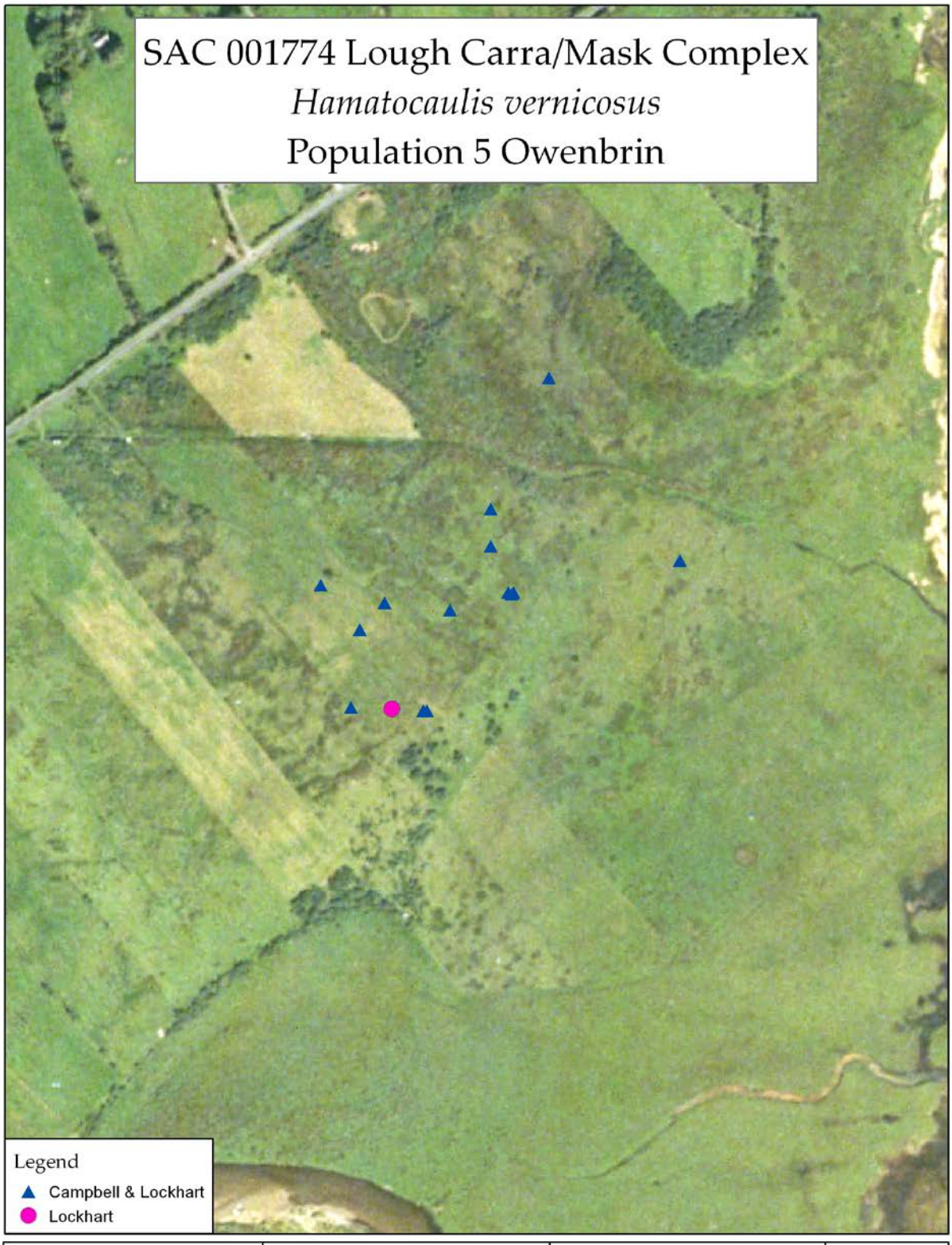
Population 4: Uggool, Co. Mayo (Owenduff/Nephin Complex SAC 000534)





Produced by: Paul Duffy and Teresa Tuttle Conservation Planning National Parks and Wildlife Service Date: 26th February 2013	**Conservation Objectives** ***Hamatocaulis vernicosus* (Natura code: 1393)**	0 70 140 280 Metres	N Map Version 1.0

Population 5: Owenbrin, Co. Mayo (Lough Carra/Mask Complex SAC 001774)



Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 26th February 2013

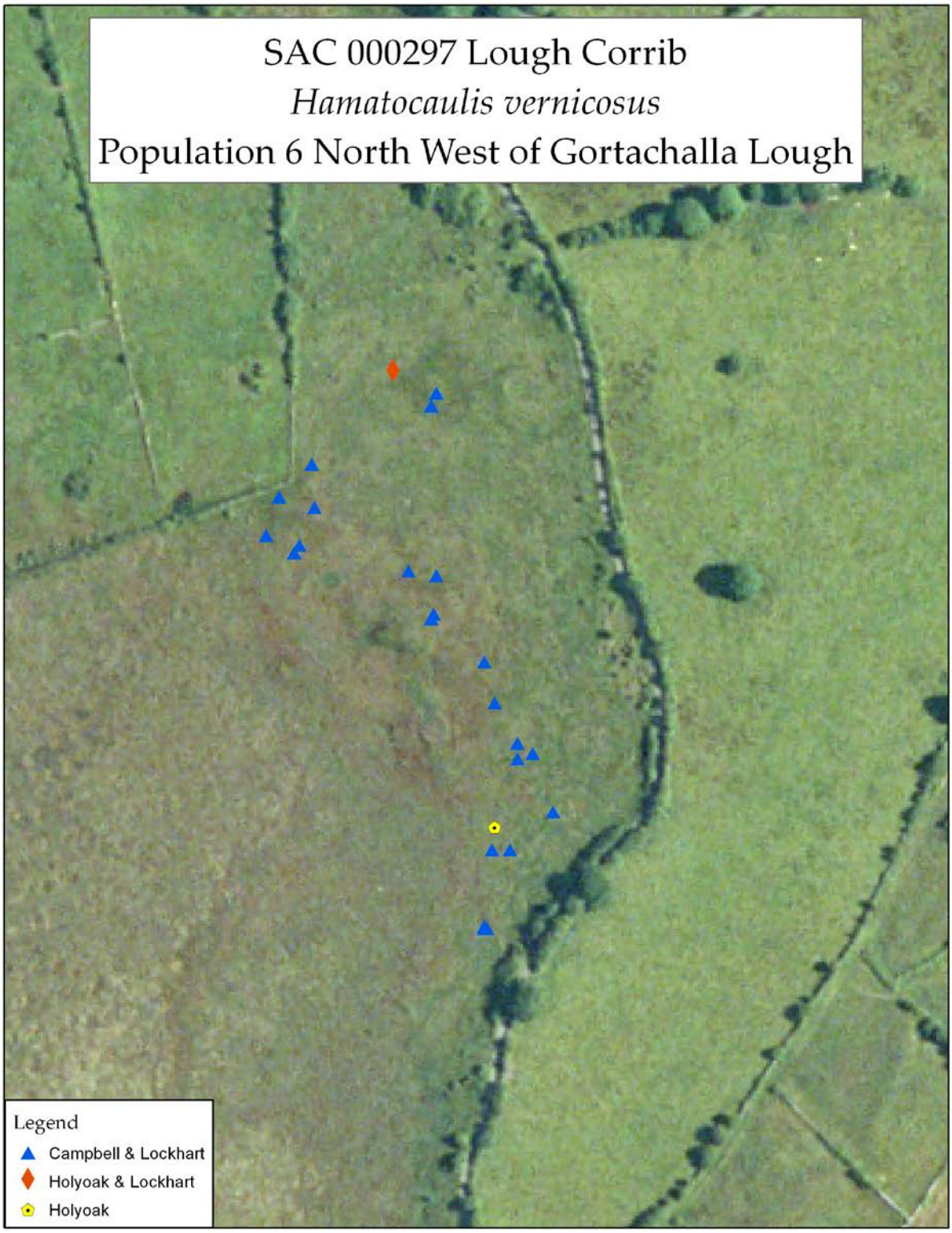
Conservation Objectives
***Hamatocaulis vernicosus* (Natura code: 1393)**

0 25 50 100 Metres

N

Map Version 1.0

Population 6: NW of Gortachalla Lough, Co. Galway (Lough Corrib SAC 000297)



Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 25th February 2013

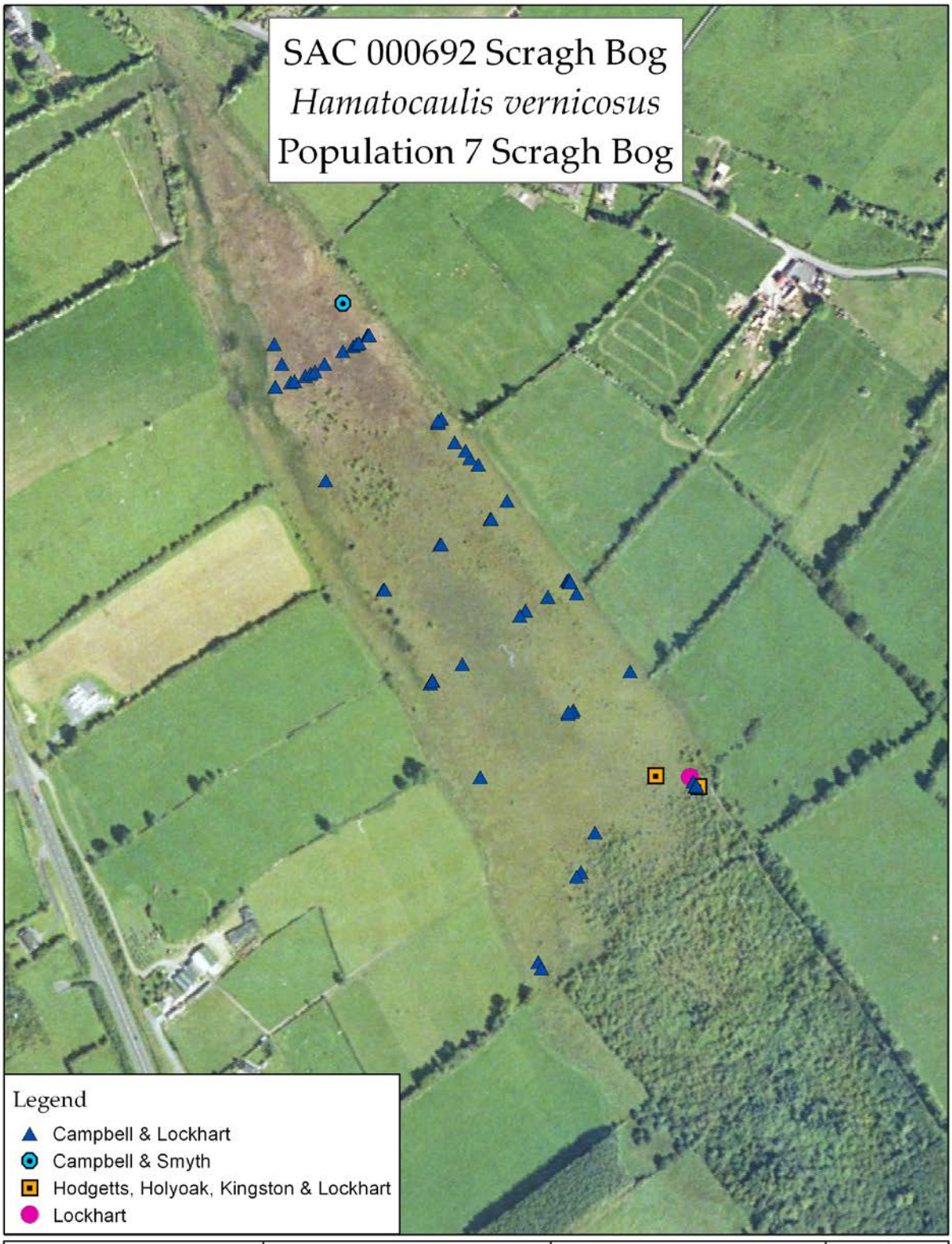
Conservation Objectives
***Hamatocaulis vernicosus* (Natura code: 1393)**

0 15 30 60 Metres

N

Map Version 1.0

Population 7: Scragh Bog, Co. Westmeath (Scragh Bog SAC 000692)



Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 26th February 2013

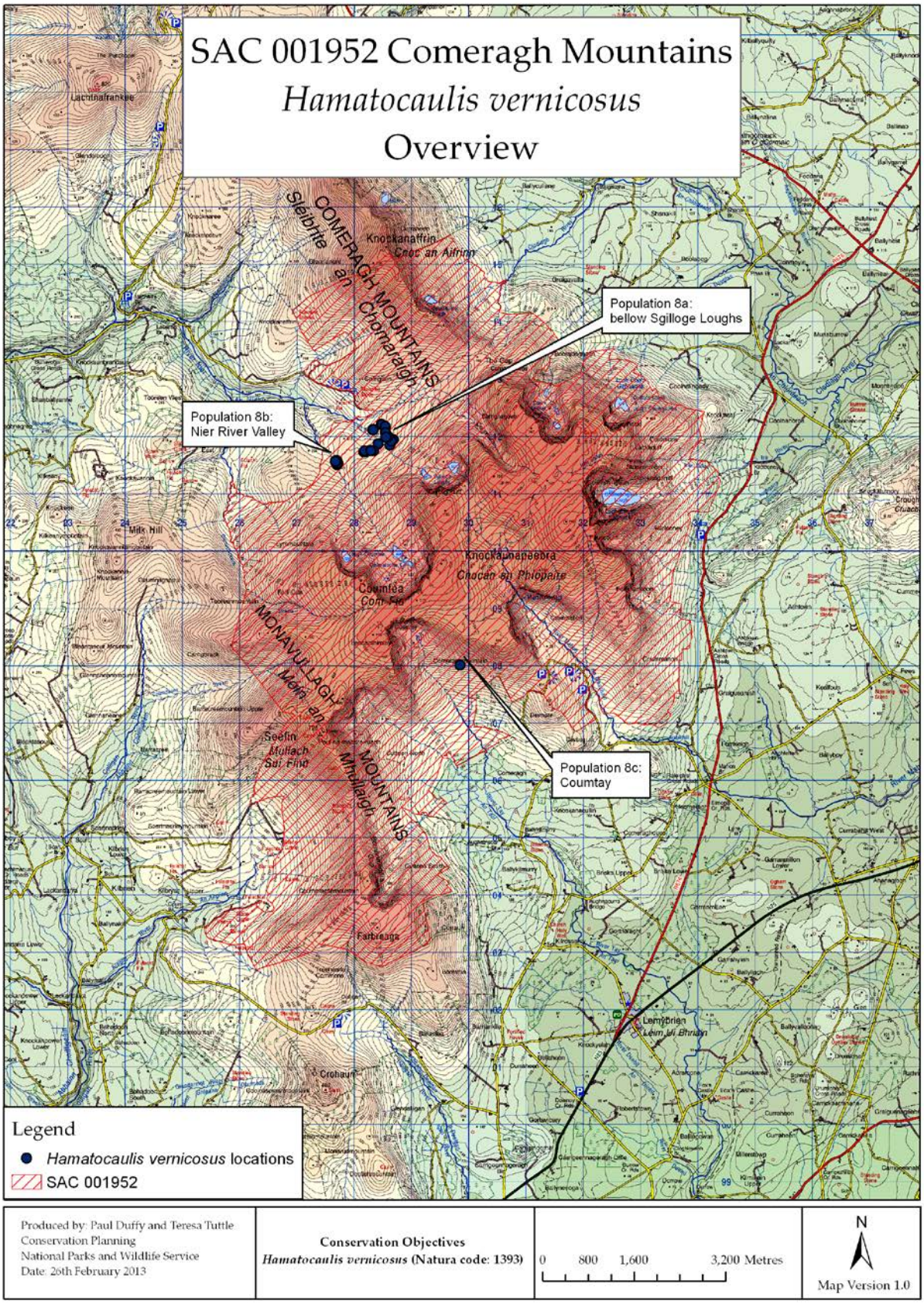
Conservation Objectives
***Hamatocaulis vernicosus* (Natura code: 1393)**

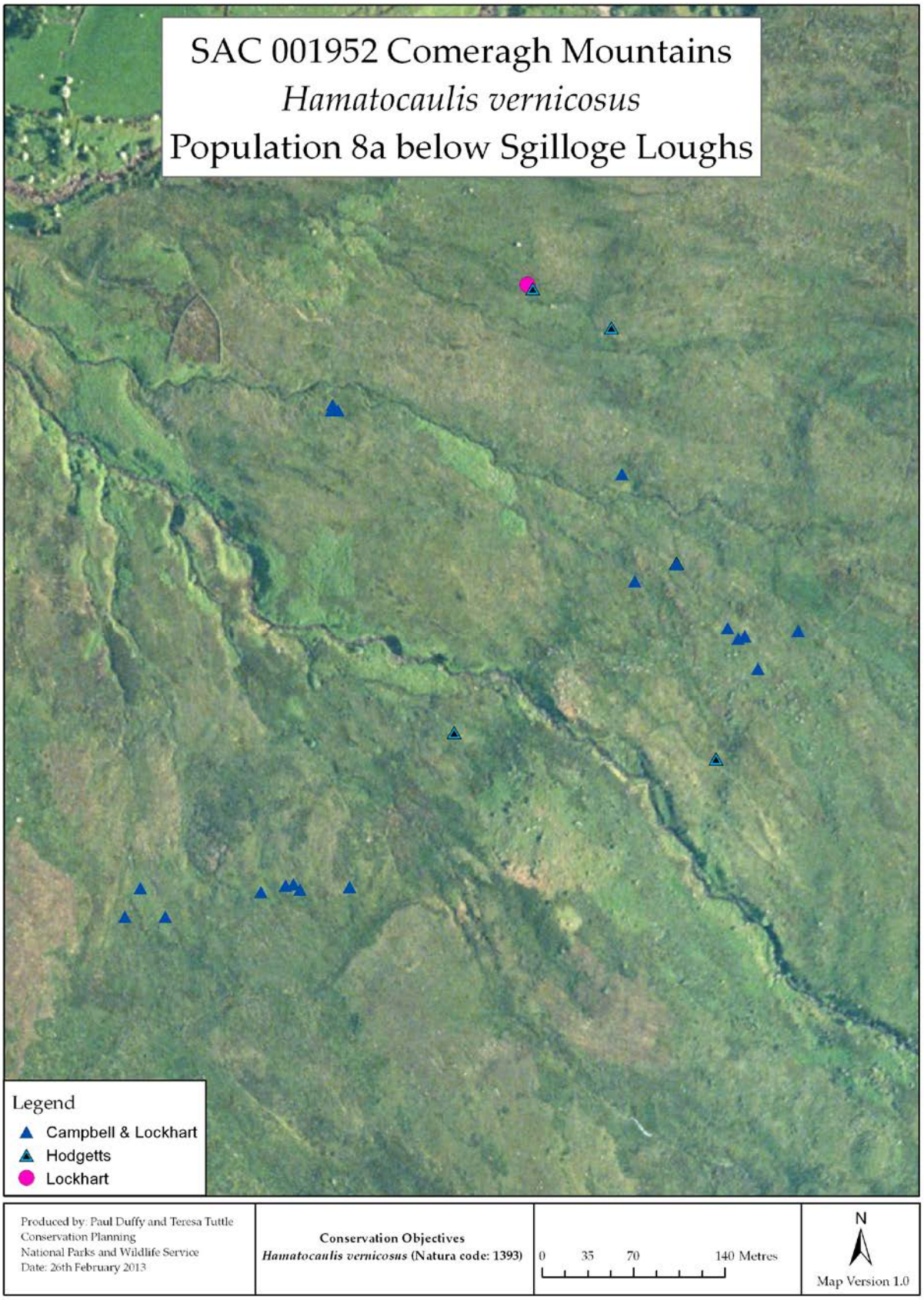
0 45 90 180 Metres

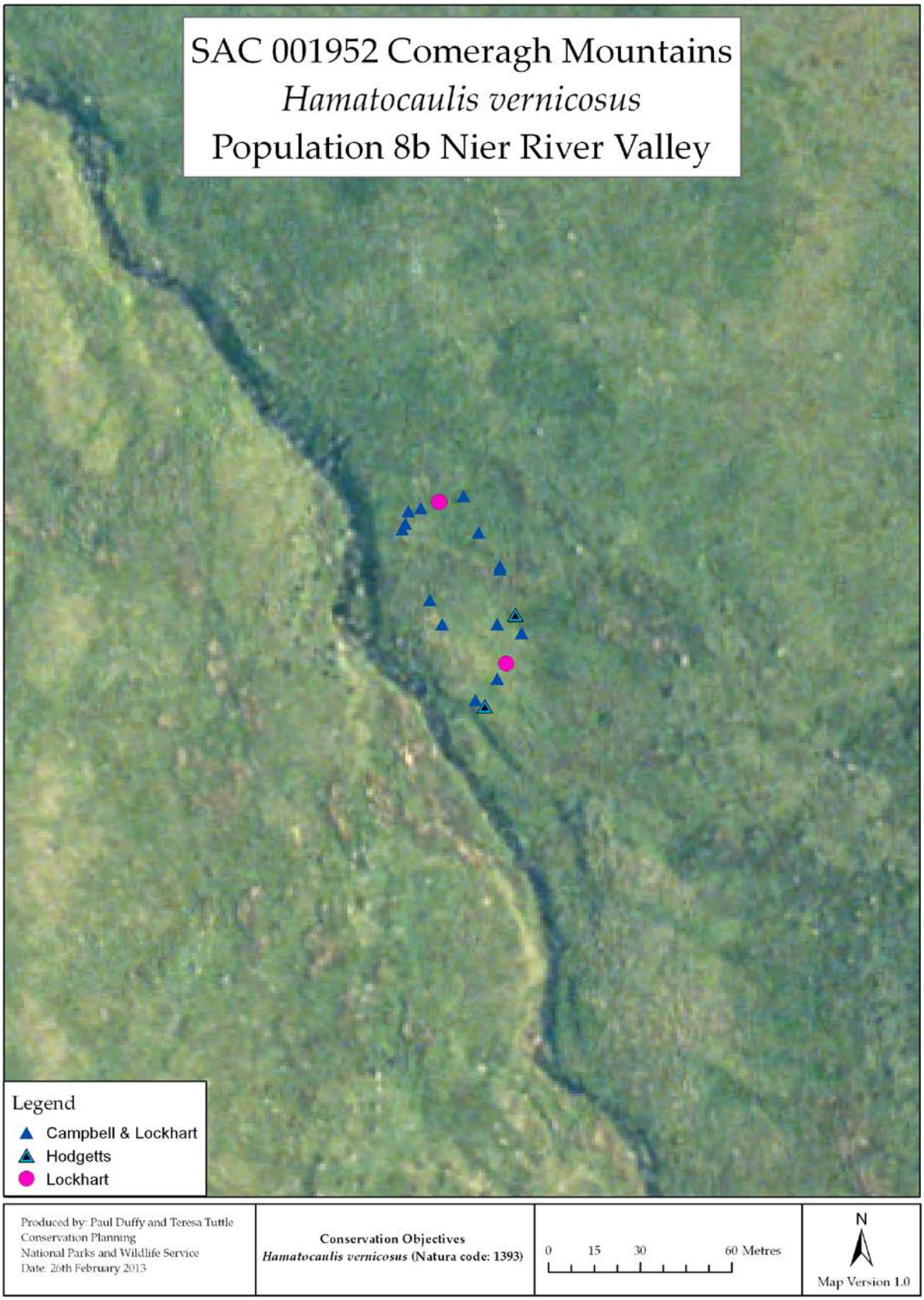
N

Map Version 1.0

Population 8a: Below Sgilloge Loughs, Population 8b, Nier River Valley & Population 8c: Coumtay, Co. Waterford (Comeragh Mountains SAC 001952)

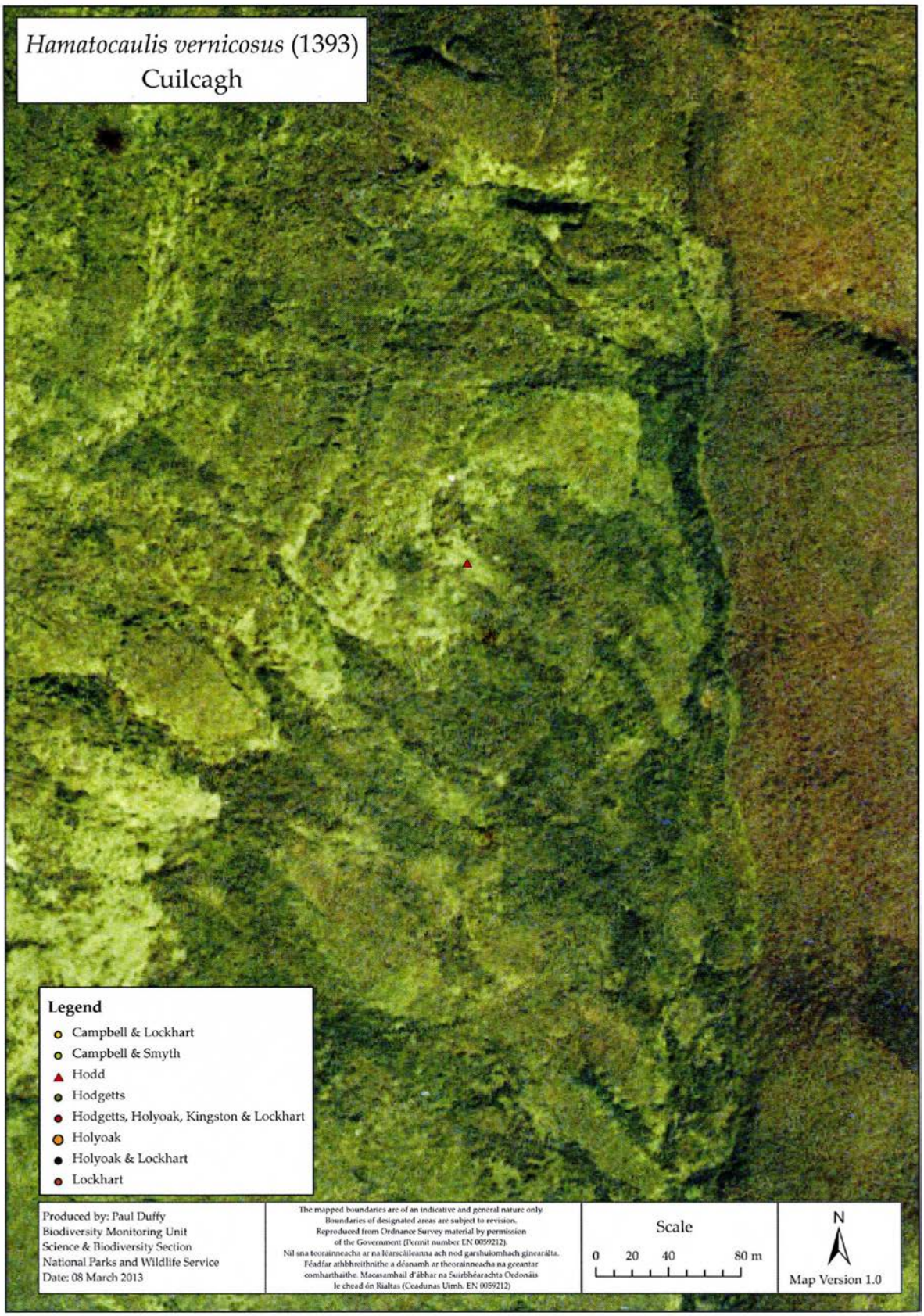



SAC 001952 Comeragh Mountains
Hamatocaulis vernicosus
Population 8a below Sgilloge Loughs
Legend
Campbell & Lockhart
Hodgetts
Lockhart
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 26th February 2013
Conservation Objectives
Hamatocaulis vernicosus (Natura code: 1393)
0
35
70
140 Metres
N
Map Version 1.0


SAC 001952 Comeragh Mountains
Hamatocaulis vernicosus
Population 8b Nier River Valley
Legend
Campbell & Lockhart
Hodgetts
Lockhart
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 26th February 2013
Conservation Objectives
Hamatocaulis vernicosus (Natura code: 1393)
0 15 30 60 Metres
N
Map Version 1.0


SAC 001952 Comeragh Mountains
Hamatocaulis vernicosus
Population 8c Coumtay
Legend
Hodgetts
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 26th February 2013
Conservation Objectives
Hamatocaulis vernicosus (Natura code: 1393)
0 15 30 60 Metres
N
Map Version 1.0

Population 9: Commas, Co. Cavan (Cuilcagh-Anierin Uplands SAC 000584)



Appendix II – Fine-scale monitoring recording sheets

Individual population fine-scale monitoring recording sheets have been compiled for the following populations:

1. Meentygrannagh, Co. Donegal – Upland population
2. Rathavisteen, Co. Mayo – Upland population
3. Largan More, Co. Mayo – Upland population
4. Uggool, Co. Mayo – Upland population
5. Owenbrin, Co. Mayo – Lowland population
6. NW of Gortachalla Lough, Co. Galway – Lowland population
7. Scragh Bog, Co. Westmeath – Lowland population

8a. Below Sgilloge Lough, Co. Waterford – Upland population
8b. Nier River Valley, Co. Waterford– Upland population
8c. Coumtay, Co. Waterford – Upland population

9. Commas, Co. Cavan – Upland population

Relevé card for *Hamatocaulis vernicosus* fine-scale monitoring

Population:	Meentygrannagh			**Surveyor:**			**Date:**		
County (vice):	Donegal (H35)			Aerial Photo ID:	O0302-D & O0324-B		**Area mapped** (✓)		
SAC:	Meentygrannagh Bog 000173			Discovery Map:	6				
Plot (2 x 2 m) Number	**1**			**2**			**3**	**4**	**5**
GPS co-ordinates									
Altitude (m.s.l.)									
Slope (degrees)									
Aspect									
Peat depth (cm)									
Surface water depth (cm) / Hand (✓)	**/**			**/**			**/**	**/**	**/**
Cover of *H. vernicosus* (to nearest 1%)									
No. of shoots in 10 x 10 cm area									
Mean vegetation height (cm)									
Max. vegetation height (cm)									
Tree cover (to nearest 5%)									
Shrub cover (to nearest 5%)									
Grass cover (to nearest 5%)									
Rush cover (to nearest 5%)									
Sedge cover (to nearest 5%)									
Forb cover (to nearest 5%)									
Fern/fern ally cover (“)									
Bryophyte cover (to nearest 5%)									
Lichen cover (to nearest 5%)									
Algae cover (to nearest 5%)									
Litter cover (to nearest 5%)									
Cover of bare ground (“)									
Cover of surface water (“)									
Cover of dung (to nearest 5%)									
Photo ID									
Surface water sample taken (✓)									
Shoots (>100) sample taken (✓)									

Species cover (to nearest 5%)	**1**	**2**	**3**	**4**	**5**	**Species cover (to nearest 5%)**	**1**	**2**	**3**	**4**	**5**
Agrostis stolonifera						*Lychnis flos-cuculi*					
Anagallis tenella						*Menyanthes trifoliata*					
Aneura pinguis						*Mnium undulatum*					
Anthoxanthum odoratum						*Molinia caerulea*					
Aulacomnium palustre						*Pedicularis palustris*					
Brachythecium rivulare						*Pellia endiviifolia*					
Brachythecium rutabulum						*Philonotis fontana*					
Bryum pseudotriquetrum						*Plantago lanceolata*					
Carex paniculata						*Plagiomnium undulatum*					
Calliergonella cuspidata						*Potentilla erecta*					
Campylium stellatum						*Potentilla palustris*					
Cardamine pratensis						*Potamogeton polygonifolius*					
Carex demissa						*Pseudoscleropodium purum*					
Carex echinata						*Ranunculus flammula*					
Carex lepidocarpa						*Rhytidiadelphus squarrosus*					
Carex limosa						*Riccardia multifida*					
Carex nigra						*Rumex acetosa*					
Carex panicea						*Sagina nodosa*					
Carex pulicaris						*Sphagnum contortum*					
Carex rostrata						*Sphagnum fallax*					
Cerastium fontanum						*Sphagnum inundatum*					
Cirsium palustre						*Sphagnum palustre*					
Cynosuros cristatus						*Sphagnum papillosum*					
Epilobium palustre						*Sphagnum squarrosum*					
Equisetum fluviatile						*Sphagnum subsecundum*					
Equisetum palustre						*Sphagnum subnitens*					
Festuca ovina						*Sphagnum teres*					
Fissidens adianthoides						*Straminergon stramineum*					
Galium palustre						*Triglochin palustris*					
Holcus lanatus						*Trifolium repens*					
Hylocomium splendens						*Utricularia intermedia*					
Juncus acutiflorus						*Veronica scutellata*					
Juncus bulbosus						*Viola palustris*					
Leontodon autumnalis						*Warnstorfia exannulata*					
Lophocolea bidentata											

Assessment of Meentygrannagh, Co. Donegal (Meentygrannagh Bog SAC 000173)

Population Assessment for Meentygrannagh:

Indicator	Method of assessment	Target	Result	Pass/Fail
Total area of extent of occupancy	Area of polygon around GPS points	≥ 2,500 m^2		
Percent cover (%)	Mean percentage cover within 3-5 plots	≥ 15%		
Density	Mean number of shoots in 10 x 10 cm area in 3-5 plots	≥ 80 shoots		

Habitat for the Species Assessment for Meentygrannagh:

Indicator	Method of assessment	Target	Result	Pass/Fail
Hydrology	Hand should be pressed into vegetation	Water level should cover hand when pressed into the vegetation		
Tree cover	Estimation of tree cover to nearest 5% averaged over 3-5 plots	Mean percent tree cover should **not** exceed 15%		
Shrub cover	Estimation of shrub cover to nearest 5% averaged over 3-5 plots	Mean percent shrub cover should **not** exceed 20%		
Grass cover	Estimation of grass cover to nearest 5% averaged over 3-5 plots	Mean percent grass cover should **not** exceed 25%		
Bryophyte cover	Estimation of bryophyte cover to nearest 5% averaged over 3-5 plots	Mean percent bryophyte cover should exceed 50%		
Cover of *Calliergonella cuspidata*	Estimation of *C.cuspidata* cover to nearest 5% averaged over 3-5 plots	Mean percent cover of *C. cuspidata* should **not** exceed 15%		
Mean vegetation height	Mean height (cm) of 5 shoots per plot averaged over 3-5 plots	Mean vegetation height should **not** exceed 40 cm		

Future Prospects Assessment for Meentygrannagh:

Activity (EU code)	**Location (Inside/outside area of occupancy)**	**Influence (Positive/ Negative/ Neutral)**	**Intensity (High/ Medium/ Low)**	**Area affected (0-10m^2; 11-50m^2; 51-100m^2; >100m^2)**
Intensive grazing (A04.01)				
Excessive poaching (Trampling, overuse G05.01)				
Lack of grazing (A04.03)				
Fertilisation (A08)				
Diffuse pollution to surface waters due to agricultural and forestry activities (H01.05)				
Water abstractions from groundwater (J02.07)				
Hand cutting of peat (C01.03.01)				
Mechanical removal of peat (C01.03.02)				
Forest planting on open ground (B01)				
Motorised vehicle damage (G01.03)				
Dumping (Discharges E03)				
Biocenotic evolution, succession (incl. enlargement of scrub vegetation area) (K02)				
Species composition change (succession) (K02.01)				
Other:				

Overall Assessment for Meentygrannagh:

Attribute	Assessment
Population	
Habitat for the species	
Future Prospects	
Overall	

Results of determination of male and female shoots from Meentygrannagh

Site	Plot No.	Date	No. of male shoots	No. of female shoots	No. of indeterminate shoots	No. of infertile shoots	Total no. of shoots
Meentygrannagh	1						
	2						
	3						
	4						
	5						

Results of analysis of surface water samples from Meentygrannagh

Meentygrannagh Plot:	1	2	3	4	5
Surface water pH					
Surface water conductivity (µS/cm)					
Ammonium (NH_4) (mg/l)					
Nitrate (NO_3) (mg/l)					
Orthophosphate (O-P) (mg/l)					
Total phosphate (TP) (mg/l)					

Additional comments:

Relevé card for *Hamatocaulis vernicosus* fine-scale monitoring

Population:	Rathavisteen	**Surveyor:**		**Date:**	
County (vice):	Mayo (H27)	Aerial Photo ID:	O0939-D	**Area mapped** (✓)	
SAC:	Glenamoy Bog Complex 000500	Discovery Map:	23		

Plot (2 x 2 m) Number	**1**	**2**	**3**	**4**	**5**
GPS co-ordinates					
Altitude (m.s.l.)					
Slope (degrees)					
Aspect					
Peat depth (cm)					
Surface water depth (cm) / Hand (✓)	**/**	**/**	**/**	**/**	**/**
Cover of *H. vernicosus* (to nearest 1%)					
No. of shoots in 10 x 10 cm area					
Mean vegetation height (cm)					
Max. vegetation height (cm)					
Tree cover (to nearest 5%)					
Shrub cover (to nearest 5%)					
Grass cover (to nearest 5%)					
Rush cover (to nearest 5%)					
Sedge cover (to nearest 5%)					
Forb cover (to nearest 5%)					
Fern/fern ally cover (“)					
Bryophyte cover (to nearest 5%)					
Lichen cover (to nearest 5%)					
Algae cover (to nearest 5%)					
Litter cover (to nearest 5%)					
Cover of bare ground (“)					
Cover of surface water (“)					
Cover of dung (to nearest 5%)					
Photo ID					
Surface water sample taken (✓)					
Shoots (>100) sample taken (✓)					

Species cover (to nearest 5%)	**1**	**2**	**3**	**4**	**5**	**Species cover (to nearest 5%)**	**1**	**2**	**3**	**4**	**5**
Carex dioica											
Carex echinata											
Carex limosa											
Carex panicea											
Carex paniculata											
Eriophorum angustifolium											
Molinia caerulea											
Schoenus nigricans											
Sphagnum contortum											
Sphagnum squarrosum											
Other species:											

Assessment of Rathavisteen, Co. Mayo (Glenamoy Bog complex SAC 000500)

Population Assessment for Rathavisteen:

Indicator	Method of assessment	Target	Result	Pass/Fail
Total area of extent of occupancy	Area of polygon around GPS points	≥ 8 m^2		
Percent cover (%)	Mean percentage cover within 1-3 plots	-		-
Density	Mean number of shoots in 10 x 10 cm area in 1-3 plots	-		-

Habitat for the Species Assessment for Rathavisteen:

Indicator	Method of assessment	Target	Result	Pass/Fail
Hydrology	Hand should be pressed into vegetation	Water level should cover hand when pressed into the vegetation		
Tree cover	Estimation of tree cover to nearest 5% averaged over 1-3 plots	Mean percent tree cover should **not** exceed 15%		
Shrub cover	Estimation of shrub cover to nearest 5% averaged over 1-3 plots	Mean percent shrub cover should **not** exceed 20%		
Grass cover	Estimation of grass cover to nearest 5% averaged over 1-3 plots	Mean percent grass cover should **not** exceed 25%		
Bryophyte cover	Estimation of bryophyte cover to nearest 5% averaged over 1-3 plots	Mean percent bryophyte cover should exceed 50%		
Cover of *Calliergonella cuspidata*	Estimation of *C. cuspidata* cover to nearest 5% averaged over 1-3 plots	Mean percent cover of *C. cuspidata* should **not** exceed 15%		
Mean vegetation height	Mean height (cm) of 5 shoots per plot averaged over 1-3 plots	Mean vegetation height should **not** exceed 40 cm		

Future Prospects Assessment for Rathavisteen:

Activity (EU code)	Location (Inside/outside area of occupancy)	Influence (Positive/ Negative/ Neutral)	Intensity (High/ Medium/ Low)	Area affected (0-10m^2; 11-50m^2; 51-100m^2; >100m^2)
Intensive grazing (A04.01)				
Excessive poaching (Trampling, overuse G05.01)				
Lack of grazing (A04.03)				
Fertilisation (A08)				
Diffuse pollution to surface waters due to agricultural and forestry activities (H01.05)				
Water abstractions from groundwater (J02.07)				
Hand cutting of peat (C01.03.01)				
Mechanical removal of peat (C01.03.02)				
Forest planting on open ground (B01)				
Motorised vehicle damage (G01.03)				
Dumping (Discharges E03)				
Biocenotic evolution, succession (incl. enlargement of scrub vegetation area) (K02)				
Species composition change (succession) (K02.01)				
Other:				

Overall Assessment for Rathavisteen:

Attribute	Assessment
Population	
Habitat for the species	
Future Prospects	
Overall	

Results of determination of male and female shoots from Rathavisteen

Site	Plot No.	Date	No. of male shoots	No. of female shoots	No. of indeterminate shoots	No. of infertile shoots	Total no. of shoots
Rathavisteen	1						
	2						
	3						
	4						
	5						

Results of analysis of surface water samples from Rathavisteen

Rathavisteen Plot:	1	2	3	4	5
Surface water pH					
Surface water conductivity (µS/cm)					
Ammonium (NH_4) (mg/l)					
Nitrate (NO_3) (mg/l)					
Orthophosphate (O-P) (mg/l)					
Total phosphate (TP) (mg/l)					

Additional comments:

Relevé card for *Hamatocaulis vernicosus* fine-scale monitoring

Population:	Largan More	**Surveyor:**		**Date:**	
County (vice):	Mayo (H27)	Aerial Photo ID:	O1239-A & O1239-B	**Area mapped** (✓)	
SAC:	Carrowmore Lake Complex 000476	Discovery Map:	23		

Plot (2 x 2 m) Number	**1**	**2**	**3**	**4**	**5**
GPS co-ordinates					
Altitude (m.s.l.)					
Slope (degrees)					
Aspect					
Peat depth (cm)					
Surface water depth (cm) / Hand (✓)	/	/	/	/	/
Cover of *H. vernicosus* (to nearest 1%)					
No. of shoots in 10 x 10 cm area					
Mean vegetation height (cm)					
Max. vegetation height (cm)					
Tree cover (to nearest 5%)					
Shrub cover (to nearest 5%)					
Grass cover (to nearest 5%)					
Rush cover (to nearest 5%)					
Sedge cover (to nearest 5%)					
Forb cover (to nearest 5%)					
Fern/fern ally cover (“)					
Bryophyte cover (to nearest 5%)					
Lichen cover (to nearest 5%)					
Algae cover (to nearest 5%)					
Litter cover (to nearest 5%)					
Cover of bare ground (“)					
Cover of surface water (“)					
Cover of dung (to nearest 5%)					
Photo ID					
Surface water sample taken (✓)					
Shoots (>100) sample taken (✓)					

Species cover (to nearest 5%)	**1**	**2**	**3**	**4**	**5**	**Species cover (to nearest 5%)**	**1**	**2**	**3**	**4**	**5**
Agrostis stolonifera						*Potentilla erecta*					
Anagallis tenella						*Potentilla palustris*					
Aneura pinguis						*Potamogeton polygonifolius*					
Aulacomnium palustre						*Ranunculus flammula*					
Brachythecium rivulare						*Rhizomnium pseudopunctatum*					
Bryum pseudotriquetrum						*Riccardia multifida*					
Calliergonella cuspidata						*Sagina nodosa*					
Caltha palustris						*Saxifraga hirculus*					
Cardamine pratensis						*Scapania undulatum*					
Carex demissa						*Scorpidium cossonii*					
Carex diandra						*Scorpidium revolvens*					
Carex dioica						*Sphagnum denticulatum*					
Carex echinata						*Sphagnum inundatum*					
Carex lepidocarpa						*Sphagnum palustre*					
Carex limosa						*Sphagnum papillosum*					
Carex nigra						*Sphagnum recurvum* s.l.					
Carex panicea						*Sphagnum teres*					
Chiloscyphus polyanthos						*Straminergon stramineum*					
Cratoneuron filicinum						*Triglochin palustris*					
Dicranella palustris						*Utricularia intermedia*					
Drosera rotundifolia						*Viola palustris*					
Epilobium palustre						*Warnstorfia exannulata*					
Equisetum palustre											
Galium palustre						**Other species:**					
Galium saxatile											
Holcus lanatus											
Juncus acutiflorus											
Juncus bulbosus											
Juncus effusus											
Linum catharticum											
Menyanthes trifoliata											
Montia fontana											
Pellia endiviifolia											
Philonotis fontana											

Assessment of Largan More (Carrowmore Lake Complex 000476)

Population Assessment for Largan More:

Indicator	Method of assessment	Target	Result	Pass/Fail
Total area of extent of occupancy	Area of polygon around GPS points	≥ 1,270 m^2		
Percent cover (%)	Mean percentage cover within 3-5 plots	≥ 25%		
Density	Mean number of shoots in 10 x 10 cm area in 3-5 plots	≥ 67 shoots		

Habitat for the Species Assessment for Largan More:

Indicator	Method of assessment	Target	Result	Pass/Fail
Hydrology	Hand should be pressed into vegetation	Water level should cover hand when pressed into the vegetation		
Tree cover	Estimation of tree cover to nearest 5% averaged over 3-5 plots	Mean percent tree cover should **not** exceed 15%		
Shrub cover	Estimation of shrub cover to nearest 5% averaged over 3-5 plots	Mean percent shrub cover should **not** exceed 20%		
Grass cover	Estimation of grass cover to nearest 5% averaged over 3-5 plots	Mean percent grass cover should **not** exceed 25%		
Bryophyte cover	Estimation of bryophyte cover to nearest 5% averaged over 3-5 plots	Mean percent bryophyte cover should exceed 50%		
Cover of *Calliergonella cuspidata*	Estimation of *C. cuspidata* cover to nearest 5% averaged over 3-5 plots	Mean percent cover of *C. cuspidata* should **not** exceed 15%		
Mean vegetation height	Mean height (cm) of 5 shoots per plot averaged over 3-5 plots	Mean vegetation height should **not** exceed 40 cm		

Future Prospects Assessment for Largan More:

Activity (EU code)	Location (Inside/outside area of occupancy)	Influence (Positive/ Negative/ Neutral)	Intensity (High/ Medium/ Low)	Area affected (0-10m^2; 11-50m^2; 51-100m^2; >100m^2)
Intensive grazing (A04.01)				
Excessive poaching (Trampling, overuse G05.01)				
Lack of grazing (A04.03)				
Fertilisation (A08)				
Diffuse pollution to surface waters due to agricultural and forestry activities (H01.05)				
Water abstractions from groundwater (J02.07)				
Hand cutting of peat (C01.03.01)				
Mechanical removal of peat (C01.03.02)				
Forest planting on open ground (B01)				
Motorised vehicle damage (G01.03)				
Dumping (Discharges E03)				
Biocenotic evolution, succession (incl. enlargement of scrub vegetation area) (K02)				
Species composition change (succession) (K02.01)				
Other:				

Overall Assessment for Largan More:

Attribute	Assessment
Population	
Habitat for the species	
Future Prospects	
Overall	

Results of determination of male and female shoots from Largan More

Site	Plot No.	Date	No. of male shoots	No. of female shoots	No. of indeterminate shoots	No. of infertile shoots	Total no. of shoots
Largan More	1						
	2						
	3						
	4						
	5						

Results of analysis of surface water samples from Largan More

Largan More Plot:	1	2	3	4	5
Surface water pH					
Surface water conductivity (µS/cm)					
Ammonium (NH_4) (mg/l)					
Nitrate (NO_3) (mg/l)					
Orthophosphate (O-P) (mg/l)					
Total phosphate (TP) (mg/l)					

Additional comments:

Relevé card for *Hamatocaulis vernicosus* fine-scale monitoring

Population:	Uggool	**Surveyor:**		**Date:**	
County (vice):	Mayo (H27)	Aerial Photo ID:	O1378-A	**Area mapped** (✓)	
SAC:	Owenduff/Nephin Complex 000534	Discovery Map:	23		

Plot (2 x 2 m) Number	**1**	**2**	**3**	**4**	**5**
GPS co-ordinates					
Altitude (m.s.l.)					
Slope (degrees)					
Aspect					
Peat depth (cm)					
Surface water depth (cm) / Hand (✓)	/	/	/	/	/
Cover of *H. vernicosus* (to nearest 1%)					
No. of shoots in 10 x 10 cm area					
Mean vegetation height (cm)					
Max. vegetation height (cm)					
Tree cover (to nearest 5%)					
Shrub cover (to nearest 5%)					
Grass cover (to nearest 5%)					
Rush cover (to nearest 5%)					
Sedge cover (to nearest 5%)					
Forb cover (to nearest 5%)					
Fern/fern ally cover (“)					
Bryophyte cover (to nearest 5%)					
Lichen cover (to nearest 5%)					
Algae cover (to nearest 5%)					
Litter cover (to nearest 5%)					
Cover of bare ground (“)					
Cover of surface water (“)					
Cover of dung (to nearest 5%)					
Photo ID					
Surface water sample taken (✓)					
Shoots (>100) sample taken (✓)					

Species cover (to nearest 5%)	**1**	**2**	**3**	**4**	**5**	**Species cover (to nearest 5%)**	**1**	**2**	**3**	**4**	**5**
Aneura pinguis											
Carex limosa											
Cratoneuron filicinum											
Juncus bulbosus											
Montia fontana											
Palustriella commutata											
Philonotis fontana											
Saxifraga hirculus											
Scorpidium revolvens											
Warnstorfia exannulata											
Other species:											

Assessment of Uggool, Co. Mayo (Owenduff/Nephin Complex 000534)

Population Assessment for Uggool:

Indicator	Method of assessment	Target	Result	Pass/Fail
Total area of extent of occupancy	Area of polygon around GPS points	≥ 0.8 m^2		
Percent cover (%)	Mean percentage cover within 1-3 plots	-		-
Density	Mean number of shoots in 10 x 10 cm area in 1-3 plots	-		-

Habitat for the Species Assessment for Uggool:

Indicator	Method of assessment	Target	Result	Pass/Fail
Hydrology	Hand should be pressed into vegetation	Water level should cover hand when pressed into the vegetation		
Tree cover	Estimation of tree cover to nearest 5% averaged over 1-3 plots	Mean percent tree cover should **not** exceed 15%		
Shrub cover	Estimation of shrub cover to nearest 5% averaged over 1-3 plots	Mean percent shrub cover should **not** exceed 20%		
Grass cover	Estimation of grass cover to nearest 5% averaged over 1-3 plots	Mean percent grass cover should **not** exceed 25%		
Bryophyte cover	Estimation of bryophyte cover to nearest 5% averaged over 1-3 plots	Mean percent bryophyte cover should exceed 50%		
Cover of *Calliergonella cuspidata*	Estimation of *C. cuspidata* cover to nearest 5% averaged over 1-3 plots	Mean percent cover of *C. cuspidata* should **not** exceed 15%		
Mean vegetation height	Mean height (cm) of 5 shoots per plot averaged over 1-3 plots	Mean vegetation height should **not** exceed 40 cm		

Future Prospects Assessment for Uggool:

Activity (EU code)	**Location (Inside/outside area of occupancy)**	**Influence (Positive/ Negative/ Neutral)**	**Intensity (High/ Medium/ Low)**	**Area affected (0-10m^2; 11-50m^2; 51-100m^2; >100m^2)**
Intensive grazing (A04.01)				
Excessive poaching (Trampling, overuse G05.01)				
Lack of grazing (A04.03)				
Fertilisation (A08)				
Diffuse pollution to surface waters due to agricultural and forestry activities (H01.05)				
Water abstractions from groundwater (J02.07)				
Hand cutting of peat (C01.03.01)				
Mechanical removal of peat (C01.03.02)				
Forest planting on open ground (B01)				
Motorised vehicle damage (G01.03)				
Dumping (Discharges E03)				
Biocenotic evolution, succession (incl. enlargement of scrub vegetation area) (K02)				
Species composition change (succession) (K02.01)				
Other:				

Overall Assessment for Uggool:

Attribute	Assessment
Population	
Habitat for the species	
Future Prospects	
Overall	

Results of determination of male and female shoots from Uggool

Site	Plot No.	Date	No. of male shoots	No. of female shoots	No. of indeterminate shoots	No. of infertile shoots	Total no. of shoots
Uggool	1						
	2						
	3						
	4						
	5						

Results of analysis of surface water samples from Uggool

Uggool Plot:	1	2	3	4	5
Surface water pH					
Surface water conductivity (µS/cm)					
Ammonium (NH_4) (mg/l)					
Nitrate (NO_3) (mg/l)					
Orthophosphate (O-P) (mg/l)					
Total phosphate (TP) (mg/l)					

Additional comments:

Relevé card for *Hamatocaulis vernicosus* fine-scale monitoring

Population:	Owenbrin	**Surveyor:**		**Date:**	
County (vice):	Mayo (H16)	Aerial Photo ID:	O2530-D	**Area mapped** (✓)	
SAC:	Lough Carra/Mask Complex 001774	Discovery Map:	38		

Plot (2 x 2 m) Number	**1**	**2**	**3**	**4**	**5**
GPS co-ordinates					
Altitude (m.s.l.)					
Slope (degrees)					
Aspect					
Peat depth (cm)					
Surface water depth (cm) / Hand (✓)	/	/	/	/	/
Cover of *H. vernicosus* (to nearest 1%)					
No. of shoots in 10 x 10 cm area					
Mean vegetation height (cm)					
Max. vegetation height (cm)					
Tree cover (to nearest 5%)					
Shrub cover (to nearest 5%)					
Grass cover (to nearest 5%)					
Rush cover (to nearest 5%)					
Sedge cover (to nearest 5%)					
Forb cover (to nearest 5%)					
Fern/fern ally cover (“)					
Bryophyte cover (to nearest 5%)					
Lichen cover (to nearest 5%)					
Algae cover (to nearest 5%)					
Litter cover (to nearest 5%)					
Cover of bare ground (“)					
Cover of surface water (“)					
Cover of dung (to nearest 5%)					
Photo ID					
Surface water sample taken (✓)					
Shoots (>100) sample taken (✓)					

Species cover (to nearest 5%)	**1**	**2**	**3**	**4**	**5**	**Species cover (to nearest 5%)**	**1**	**2**	**3**	**4**	**5**
Achillea ptarmica											
Agrostis stolonifera											
Calliergonella cuspidata											
Calliergon giganteum											
Cardamine pratensis											
Carex echinata											
Carex nigra											
Carex panicea											
Climacium dendroides											
Epilobium palustre											
Festuca rubra											
Galium palustre											
Galium saxatile											
Hydrocotyle vulgaris											
Juncus acutiflorus											
Juncus bulbosus											
Juncus effusus											
Leontodon autumnalis											
Lotus uliginosum											
Mentha aquatica											
Nardus stricta											
Potentilla anserina											
Potentilla erecta											
Ranunculus flammula											
Ranunculus repens											
Sphagnum auriculatum											
Sphagnum fallax											
Sphagnum inundatum											
Sphagnum palustre											
Sphagnum squarrosum											
Veronica scutellata											
Warnstorfia exannulata											
Other species:											

Assessment of Owenbrin, Co. Mayo (Lough Carra/ Mask Complex SAC 001774)

Population Assessment for Owenbrin:

Indicator	Method of assessment	Target	Result	Pass/Fail
Total area of extent of occupancy	Area of polygon around GPS points	≥ 9,020 m^2		
Percent cover (%)	Mean percentage cover within 3-5 plots	≥ 45%		
Density	Mean number of shoots in 10 x 10 cm area in 3-5 plots	≥ 150 shoots		

Habitat for the Species Assessment for Owenbrin:

Indicator	Method of assessment	Target	Result	Pass/Fail
Hydrology	Hand should be pressed into vegetation	Water level should cover hand when pressed into the vegetation		
Tree cover	Estimation of tree cover to nearest 5% averaged over 3-5 plots	Mean percent tree cover should **not** exceed 15%		
Shrub cover	Estimation of shrub cover to nearest 5% averaged over 3-5 plots	Mean percent shrub cover should **not** exceed 20%		
Grass cover	Estimation of grass cover to nearest 5% averaged over 3-5 plots	Mean percent grass cover should **not** exceed 25%		
Bryophyte cover	Estimation of bryophyte cover to nearest 5% averaged over 3-5 plots	Mean percent bryophyte cover should exceed 50%		
Cover of *Calliergonella cuspidata*	Estimation of *C. cuspidata* cover to nearest 5% averaged over 3-5 plots	Mean percent cover of *C. cuspidata* should **not** exceed 15%		
Mean vegetation height	Mean height (cm) of 5 shoots per plot averaged over 3-5 plots	Mean vegetation height should **not** exceed 40 cm		

Future Prospects Assessment for Owenbrin:

Activity (EU code)	Location (Inside/outside area of occupancy)	Influence (Positive/ Negative/ Neutral)	Intensity (High/ Medium/ Low)	Area affected (0-10m^2; 11-50m^2; 51-100m^2; >100m^2)
Intensive grazing (A04.01)				
Excessive poaching (Trampling, overuse G05.01)				
Lack of grazing (A04.03)				
Fertilisation (A08)				
Diffuse pollution to surface waters due to agricultural and forestry activities (H01.05)				
Water abstractions from groundwater (J02.07)				
Hand cutting of peat (C01.03.01)				
Mechanical removal of peat (C01.03.02)				
Forest planting on open ground (B01)				
Motorised vehicle damage (G01.03)				
Dumping (Discharges E03)				
Biocenotic evolution, succession (incl. enlargement of scrub vegetation area) (K02)				
Species composition change (succession) (K02.01)				
Other:				

Overall Assessment for Owenbrin:

Attribute	Assessment
Population	
Habitat for the species	
Future Prospects	
Overall	

Results of determination of male and female shoots from Owenbrin

Site	Plot No.	Date	No. of male shoots	No. of female shoots	No. of indeterminate shoots	No. of infertile shoots	Total no. of shoots
Owenbrin	1						
	2						
	3						
	4						
	5						

Results of analysis of surface water samples from Owenbrin

Owenbrin Plot:	1	2	3	4	5
Surface water pH					
Surface water conductivity (µS/cm)					
Ammonium (NH_4) (mg/l)					
Nitrate (NO_3) (mg/l)					
Orthophosphate (O-P) (mg/l)					
Total phosphate (TP) (mg/l)					

Additional comments:

Relevé card for *Hamatocaulis vernicosus* fine-scale monitoring

Population:	NW of Gortachalla Lough	**Surveyor:**		**Date:**	
County (vice):	Galway (H16)	Aerial Photo ID:	O1349-B	**Area mapped** (✓)	
SAC:	Lough Corrib SAC 000297	Discovery Map:	45		

Plot (2 x 2 m) Number	**1**	**2**	**3**	**4**	**5**
GPS co-ordinates					
Altitude (m.s.l.)					
Slope (degrees)					
Aspect					
Peat depth (cm)					
Surface water depth (cm) / Hand (✓)	**/**	**/**	**/**	**/**	**/**
Cover of *H. vernicosus* (to nearest 1%)					
No. of shoots in 10 x 10 cm area					
Mean vegetation height (cm)					
Max. vegetation height (cm)					
Tree cover (to nearest 5%)					
Shrub cover (to nearest 5%)					
Grass cover (to nearest 5%)					
Rush cover (to nearest 5%)					
Sedge cover (to nearest 5%)					
Forb cover (to nearest 5%)					
Fern/fern ally cover (“)					
Bryophyte cover (to nearest 5%)					
Lichen cover (to nearest 5%)					
Algae cover (to nearest 5%)					
Litter cover (to nearest 5%)					
Cover of bare ground (“)					
Cover of surface water (“)					
Cover of dung (to nearest 5%)					
Photo ID					
Surface water sample taken (✓)					
Shoots (>100) sample taken (✓)					

Species cover (to nearest 5%)	**1**	**2**	**3**	**4**	**5**	**Species cover (to nearest 5%)**	**1**	**2**	**3**	**4**	**5**
Agrostis stolonifera						*Poa trivialis*					
Anagallis tenella						*Pedicularis palustris*					
Anthoxanthum odoratum						*Potamogeton polygonifolius*					
Briza media						*Ranunculus flammula*					
Bryum pseudotriquetrum						*Salix cinerea*					
Calliergon giganteum						*Schoenus nigricans*					
Calliergonella cuspidata						*Scorpidium revolvens*					
Campylium stellatum						*Scorpidium scorpioides*					
Cardamine pratensis						*Senecio aquaticus*					
Carex echinata						*Succisa pratensis*					
Carex hostiana						*Trifolium repens*					
Carex nigra						*Triglochin palustris*					
Carex panicea						*Utricularia vulgaris*					
Carex pulicaris						*Veronica scutellata*					
Cirsium palustre						*Warnstorfia exannulata*					
Cynosurus cristatus											
Eleocharis multicaulis						**Other species:**					
Eleocharis palustris											
Eleocharis quinqueflora											
Equisetum fluviatile											
Equisetum palustre											
Eriophorum angustifolium											
Galium palustre											
Hippuris vulgaris											
Holcus lanatus											
Hydrocotyle vulgaris											
Hylocomium splendens											
Juncus acutiflorus											
Juncus bulbosus											
Juncus conglomeratus											
Juncus effusus											
Lythrum salicaria											
Mentha aquatica											
Molinia caerulea											
Myosotis laxa											

Assessment of NW of Gortachalla Lough, Co. Galway (Lough Corrib SAC 000297)

Population Assessment for NW of Gortachalla Lough:

Indicator	Method of assessment	Target	Result	Pass/Fail
Total area of extent of occupancy	Area of polygon around GPS points	≥ 4,960 m^2		
Percent cover (%)	Mean percentage cover within 3-5 plots	≥ 55%		
Density	Mean number of shoots in 10 x 10 cm area in 3-5 plots	≥ 329 shoots		

Habitat for the Species Assessment for NW of Gortachalla Lough:

Indicator	Method of assessment	Target	Result	Pass/Fail
Hydrology	Hand should be pressed into vegetation	Water level should cover hand when pressed into the vegetation		
Tree cover	Estimation of tree cover to nearest 5% averaged over 3-5 plots	Mean percent tree cover should **not** exceed 15%		
Shrub cover	Estimation of shrub cover to nearest 5% averaged over 3-5 plots	Mean percent shrub cover should **not** exceed 20%		
Grass cover	Estimation of grass cover to nearest 5% averaged over 3-5 plots	Mean percent grass cover should **not** exceed 25%		
Bryophyte cover	Estimation of bryophyte cover to nearest 5% averaged over 3-5 plots	Mean percent bryophyte cover should exceed 50%		
Cover of *Calliergonella cuspidata*	Estimation of *C. cuspidata* cover to nearest 5% averaged over 3-5 plots	Mean percent cover of *C. cuspidata* should **not** exceed 15%		
Mean vegetation height	Mean height (cm) of 5 shoots per plot averaged over 3-5 plots	Mean vegetation height should **not** exceed 40 cm		

Future Prospects Assessment for NW of Gortachalla Lough:

Activity (EU code)	**Location (Inside/outside area of occupancy)**	**Influence (Positive/ Negative/ Neutral)**	**Intensity (High/ Medium/ Low)**	**Area affected (0-10m^2; 11-50m^2; 51-100m^2; >100m^2)**
Intensive grazing (A04.01)				
Excessive poaching (Trampling, overuse G05.01)				
Lack of grazing (A04.03)				
Fertilisation (A08)				
Diffuse pollution to surface waters due to agricultural and forestry activities (H01.05)				
Water abstractions from groundwater (J02.07)				
Hand cutting of peat (C01.03.01)				
Mechanical removal of peat (C01.03.02)				
Forest planting on open ground (B01)				
Motorised vehicle damage (G01.03)				
Dumping (Discharges E03)				
Biocenotic evolution, succession (incl. enlargement of scrub vegetation area) (K02)				
Species composition change (succession) (K02.01)				
Other:				

Overall Assessment for NW of Gortachalla Lough:

Attribute	Assessment
Population	
Habitat for the species	
Future Prospects	
Overall	

Results of determination of male and female shoots from NW of Gortachalla Lough

Site	Plot No.	Date	No. of male shoots	No. of female shoots	No. of indeterminate shoots	No. of infertile shoots	Total no. of shoots
NW of Gortachalla Lough	1						
	2						
	3						
	4						
	5						

Results of analysis of surface water samples from NW of Gortachalla Lough

NW of Gortachalla Lough Plot:	1	2	3	4	5
Surface water pH					
Surface water conductivity (µS/cm)					
Ammonium (NH_4) (mg/l)					
Nitrate (NO_3) (mg/l)					
Orthophosphate (O-P) (mg/l)					
Total phosphate (TP) (mg/l)					

Additional comments:

Relevé card for *Hamatocaulis vernicosus* fine-scale monitoring

Population:	Scragh Bog	**Surveyor:**		**Date:**	
County (vice):	Westmeath (H23)	Aerial Photo ID:	O2631-D & O2701-B	**Area mapped** (✓)	
SAC:	Scragh Bog 000692	Discovery Map:	41		

Plot (2 x 2 m) Number	**1**	**2**	**3**	**4**	**5**
GPS co-ordinates					
Altitude (m.s.l.)					
Slope (degrees)					
Aspect					
Peat depth (cm)					
Surface water depth (cm) / Hand (✓)	/	/	/	/	/
Cover of *H. vernicosus* (to nearest 1%)					
No. of shoots in 10 x 10 cm area					
Mean vegetation height (cm)					
Max. vegetation height (cm)					
Tree cover (to nearest 5%)					
Shrub cover (to nearest 5%)					
Grass cover (to nearest 5%)					
Rush cover (to nearest 5%)					
Sedge cover (to nearest 5%)					
Forb cover (to nearest 5%)					
Fern/fern ally cover (“)					
Bryophyte cover (to nearest 5%)					
Lichen cover (to nearest 5%)					
Algae cover (to nearest 5%)					
Litter cover (to nearest 5%)					
Cover of bare ground (“)					
Cover of surface water (“)					
Cover of dung (to nearest 5%)					
Photo ID					
Surface water sample taken (✓)					
Shoots (>100) sample taken (✓)					

Species cover (to nearest 5%)	**1**	**2**	**3**	**4**	**5**	**Species cover (to nearest 5%)**	**1**	**2**	**3**	**4**	**5**
Agrostis stolonifera						*Hylocomium splendens*					
Andromeda polifolia						*Juncus acutiflorus*					
Aneura pinguis						*Lemna minor*					
Angelica sylvestris						*Lemna trisulca*					
Apium nodiflorum						*Lychnis flos-cuculi*					
Aulacomnium palustre						*Mentha aquatica*					
Betula pubescens						*Menyanthes trifoliata*					
Bryum pseudotriquetrum						*Molinia caerulea*					
Calliergon giganteum						*Parnassia palustris*					
Calliergonella cuspidata						*Pedicularis palustris*					
Calypogeia muelleriana						*Plagiomnium elatum*					
Caltha palustris						*Poa trivialis*					
Calluna vulgaris						*Polytrichum strictum*					
Campylium stellatum						*Potentilla erecta*					
Cardamine pratensis						*Potentilla palustris*					
Carex appropinquata						*Salix cinerea* subsp. *oleifolia*					
Carex echinata						*Salix repens*					
Carex lasiocarpa						*Schoenus nigricans*					
Carex limosa						*Scorpidium cossonii*					
Carex nigra						*Scorpidium revolvens*					
Carex rostrata						*Scorpidium scorpioides*					
Climacium dendroides						*Sphagnum subnitens*					
Drosera rotundifolia						*Succisa pratensis*					
Epipactis palustris						*Trifolium repens*					
Epilobium palustre						*Vaccinium oxycoccus*					
Equisetum fluviatile						*Valeriana officinalis*					
Eriophorum angustifolium						*Veronica scutellata*					
Erica tetralix						*Viola palustris*					
Festuca rubra											
Filipendula ulmaria						**Other species:**					
Galium aparine											
Galium palustre											
Galium uliginosum											
Holcus lanatus											
Hydrocotyle vulgaris											

Assessment of Scragh Bog, Co. Westmeath (Scragh Bog SAC 000692)

Population Assessment for Scragh Bog:

Indicator	Method of assessment	Target	Result	Pass/Fail
Total area of extent of occupancy	Area of polygon around GPS points	≥ 47,550 m^2		
Percent cover (%)	Mean percentage cover within 3-5 plots	≥ 25%		
Density	Mean number of shoots in 10 x 10 cm area in 3-5 plots	≥ 145 shoots		

Habitat for the Species Assessment for Scragh Bog:

Indicator	Method of assessment	Target	Result	Pass/Fail
Hydrology	Hand should be pressed into vegetation	Water level should cover hand when pressed into the vegetation		
Tree cover	Estimation of tree cover to nearest 5% averaged over 3-5 plots	Mean percent tree cover should **not** exceed 15%		
Shrub cover	Estimation of shrub cover to nearest 5% averaged over 3-5 plots	Mean percent shrub cover should **not** exceed 20%		
Grass cover	Estimation of grass cover to nearest 5% averaged over 3-5 plots	Mean percent grass cover should **not** exceed 25%		
Bryophyte cover	Estimation of bryophyte cover to nearest 5% averaged over 3-5 plots	Mean percent bryophyte cover should exceed 50%		
Cover of *Calliergonella cuspidata*	Estimation of *C. cuspidata* cover to nearest 5% averaged over 3-5 plots	Mean percent cover of *C. cuspidata* should **not** exceed 60%		
Mean vegetation height	Mean height (cm) of 5 shoots per plot averaged over 3-5 plots	Mean vegetation height should **not** exceed 80 cm		

Future Prospects Assessment for Scragh Bog:

Activity (EU code)	Location (Inside/outside area of occupancy)	Influence (Positive/ Negative/ Neutral)	Intensity (High/ Medium/ Low)	Area affected (0-10m^2; 11-50m^2; 51-100m^2; >100m^2)
Intensive grazing (A04.01)				
Excessive poaching (Trampling, overuse G05.01)				
Lack of grazing (A04.03)				
Fertilisation (A08)				
Diffuse pollution to surface waters due to agricultural and forestry activities (H01.05)				
Water abstractions from groundwater (J02.07)				
Hand cutting of peat (C01.03.01)				
Mechanical removal of peat (C01.03.02)				
Forest planting on open ground (B01)				
Motorised vehicle damage (G01.03)				
Dumping (Discharges E03)				
Biocenotic evolution, succession (incl. enlargement of scrub vegetation area) (K02)				
Species composition change (succession) (K02.01)				
Other:				

Overall Assessment for Scragh Bog:

Attribute	Assessment
Population	
Habitat for the species	
Future Prospects	
Overall	

Results of determination of male and female shoots from Scragh Bog

Site	Plot No.	Date	No. of male shoots	No. of female shoots	No. of indeterminate shoots	No. of infertile shoots	Total no. of shoots
Scragh Bog	1						
	2						
	3						
	4						
	5						

Results of analysis of surface water samples from Scragh Bog

Scragh Bog Plot:	1	2	3	4	5
Surface water pH					
Surface water conductivity (µS/cm)					
Ammonium (NH_4) (mg/l)					
Nitrate (NO_3) (mg/l)					
Orthophosphate (O-P) (mg/l)					
Total phosphate (TP) (mg/l)					

Additional comments:

Relevé card for *Hamatocaulis vernicosus* fine-scale monitoring

Population:	Below Sgilloge Loughs	**Surveyor:**		**Date:**	
County (vice):	Waterford (H6)	Aerial Photo ID:	O5624-C & O5694-A	**Area mapped** (✓)	
SAC:	Comeragh Mountains 001952	Discovery Map:	73		

Plot (2 x 2 m) Number	**1**	**2**	**3**	**4**	**5**
GPS co-ordinates					
Altitude (m.s.l.)					
Slope (degrees)					
Aspect					
Peat depth (cm)					
Surface water depth (cm) / Hand (✓)	/	/	/	/	/
Cover of *H. vernicosus* (to nearest 1%)					
No. of shoots in 10 x 10 cm area					
Mean vegetation height (cm)					
Max. vegetation height (cm)					
Tree cover (to nearest 5%)					
Shrub cover (to nearest 5%)					
Grass cover (to nearest 5%)					
Rush cover (to nearest 5%)					
Sedge cover (to nearest 5%)					
Forb cover (to nearest 5%)					
Fern/fern ally cover (“)					
Bryophyte cover (to nearest 5%)					
Lichen cover (to nearest 5%)					
Algae cover (to nearest 5%)					
Litter cover (to nearest 5%)					
Cover of bare ground (“)					
Cover of surface water (“)					
Cover of dung (to nearest 5%)					
Photo ID					
Surface water sample taken (✓)					
Shoots (>100) sample taken (✓)					

Species cover (to nearest 5%)	**1**	**2**	**3**	**4**	**5**	**Species cover (to nearest 5%)**	**1**	**2**	**3**	**4**	**5**
Agrostis stolonifera						*Hydrocotyle vulgaris*					
Anagallis tenella						*Hylocomium splendens*					
Angelica sylvestris						*Isolepis setacea*					
Anthoxanthum odoratum						*Juncus acutiflorus*					
Brachythecium rivulare						*Juncus bulbosus*					
Bryum pseudotriquetrum						*Juncus effusus*					
Carex paniculata						*Leontodon autumnalis*					
Calliergonella cuspidata						*Lysimachia nemorum*					
Calliergon giganteum						*Marchantia polymorpha*					
Calypogeia muelleriana						*Mentha aquatica*					
Calluna vulgaris						*Montia fontana*					
Campylium stellatum						*Palustriella commutata*					
Cardamine pratensis						*Pedicularis palustris*					
Carex demissa						*Pellia endiviifolia*					
Carex dioica						*Philonotis fontana*					
Carex echinata						*Plantago lanceolata*					
Carex flacca						*Plagiomnium undulatum*					
Carex lepidocarpa						*Potentilla erecta*					
Carex nigra						*Potamogeton polygonifolius*					
Carex panicea						*Pseudoscleropodium purum*					
Carex paniculata						*Ranunculus ficaria*					
Carex pulicaris						*Ranunculus flammula*					
Carex rostrata						*Ranunculus repens*					
Cerastium fontanum						*Rhizomnium pseudopunctatum*					
Chrysosplenium oppositifolium						*Rhytidiadelphus squarrosus*					
Cirsium palustre						*Rumex acetosella*					
Cratoneuron filicinum						*Sagina nodosa*					
Cynosuros cristatus						*Scorpidium revolvens*					
Dactylorhiza maculata						*Sphagnum contortum*					
Dicranella palustris						*Sphagnum fallax*					
Epilobium palustre						*Succisa pratensis*					
Eriophorum angustifolium						*Thuidium tamariscinum*					
Festuca ovina						*Triglochin palustris*					
Festuca rubra						*Viola palustris*					
Galium palustre						*Warnstorfia exannulata*					

Assessment of Below Sgilloge Loughs, Co. Waterford (Comeragh Mountains SAC 001952)

Population Assessment for Below Sgilloge Loughs:

Indicator	Method of assessment	Target	Result	Pass/Fail
Total area of extent of occupancy	Area of polygon around GPS points	≥ 9,070 m^2		
Percent cover (%)	Mean percentage cover within 3-5 plots	≥ 25%		
Density	Mean number of shoots in 10 x 10cm area in 3-5 plots	≥ 128 shoots		

Habitat for the Species Assessment for Below Sgilloge Loughs:

Indicator	Method of assessment	Target	Result	Pass/Fail
Hydrology	Hand should be pressed into vegetation	Water level should cover hand when pressed into the vegetation		
Tree cover	Estimation of tree cover to nearest 5% averaged over 3-5 plots	Mean percent tree cover should **not** exceed 15%		
Shrub cover	Estimation of shrub cover to nearest 5% averaged over 3-5 plots	Mean percent shrub cover should **not** exceed 20%		
Grass cover	Estimation of grass cover to nearest 5% averaged over 3-5 plots	Mean percent grass cover should **not** exceed 25%		
Bryophyte cover	Estimation of bryophyte cover to nearest 5% averaged over 3-5 plots	Mean percent bryophyte cover should exceed 50%		
Cover of *Calliergonella cuspidata*	Estimation of *C. cuspidata* cover to nearest 5% averaged over 3-5 plots	Mean percent cover of *C. cuspidata* should **not** exceed 15%		
Mean vegetation height	Mean height (cm) of 5 shoots per plot averaged over 3-5 plots	Mean vegetation height should **not** exceed 40 cm		

Future Prospects Assessment for Below Sgilloge Loughs:

Activity (EU code)	**Location (Inside/outside area of occupancy)**	**Influence (Positive/ Negative/ Neutral)**	**Intensity (High/ Medium/ Low)**	**Area affected (0-10m^2; 11-50m^2; 51-100m^2; >100m^2)**
Intensive grazing (A04.01)				
Excessive poaching (Trampling, overuse G05.01)				
Lack of grazing (A04.03)				
Fertilisation (A08)				
Diffuse pollution to surface waters due to agricultural and forestry activities (H01.05)				
Water abstractions from groundwater (J02.07)				
Hand cutting of peat (C01.03.01)				
Mechanical removal of peat (C01.03.02)				
Forest planting on open ground (B01)				
Motorised vehicle damage (G01.03)				
Dumping (Discharges E03)				
Biocenotic evolution, succession (incl. enlargement of scrub vegetation area) (K02)				
Species composition change (succession) (K02.01)				
Other:				

Overall Assessment for Below Sgilloge Loughs:

Attribute	Assessment
Population	
Habitat for the species	
Future Prospects	
Overall	

Results of determination of male and female shoots from Below Sgilloge Loughs

Site	Plot No.	Date	No. of male shoots	No. of female shoots	No. of indeterminate shoots	No. of infertile shoots	Total no. of shoots
Below Sgilloge Loughs	1						
	2						
	3						
	4						
	5						

Results of analysis of surface water samples from Below Sgilloge Loughs

Below Sgilloge Loughs Plot:	1	2	3	4	5
Surface water pH					
Surface water conductivity (µS/cm)					
Ammonium (NH_4) (mg/l)					
Nitrate (NO_3) (mg/l)					
Orthophosphate (O-P) (mg/l)					
Total phosphate (TP) (mg/l)					

Additional comments:

Relevé card for *Hamatocaulis vernicosus* fine-scale monitoring

Population:	Nier River Valley	**Surveyor:**		**Date:**	
County (vice):	Waterford (H6)	Aerial Photo ID:	O5693-B	**Area mapped** (✓)	
SAC:	Comeragh Mountains 001952	Discovery Map:	73		

Plot (2 x 2 m) Number	**1**	**2**	**3**	**4**	**5**
GPS co-ordinates					
Altitude (m.s.l.)					
Slope (degrees)					
Aspect					
Peat depth (cm)					
Surface water depth (cm) / Hand (✓)	**/**	**/**	**/**	**/**	**/**
Cover of *H. vernicosus* (to nearest 1%)					
No. of shoots in 10 x 10 cm area					
Mean vegetation height (cm)					
Max. vegetation height (cm)					
Tree cover (to nearest 5%)					
Shrub cover (to nearest 5%)					
Grass cover (to nearest 5%)					
Rush cover (to nearest 5%)					
Sedge cover (to nearest 5%)					
Forb cover (to nearest 5%)					
Fern/fern ally cover (“)					
Bryophyte cover (to nearest 5%)					
Lichen cover (to nearest 5%)					
Algae cover (to nearest 5%)					
Litter cover (to nearest 5%)					
Cover of bare ground (“)					
Cover of surface water (“)					
Cover of dung (to nearest 5%)					
Photo ID					
Surface water sample taken (✓)					
Shoots (>100) sample taken (✓)					

Species cover (to nearest 5%)	**1**	**2**	**3**	**4**	**5**	**Species cover (to nearest 5%)**	**1**	**2**	**3**	**4**	**5**
Anagallis tenella						*Pedicularis palustris*					
Anthoxanthum odoratum						*Pellia endiviifolia*					
Aulacomnium palustre						*Pellia neesiana*					
Brachythecium rivulare						*Philonotis fontana*					
Bryum pseudotriquetrum						*Polytrichum strictum*					
Calliergonella cuspidata						*Potentilla erecta*					
Calypogeia muelleriana						*Ranunculus flammula*					
Cardamine pratensis						*Ranunculus repens*					
Carex echinata						*Rhizomnium pseudopunctatum*					
Carex nigra						*Rhytidiadelphus squarrosus*					
Carex panicea						*Rumex acetosa*					
Carex paniculata						*Scorpidium revolvens*					
Cephaloziella hampeana						*Sphagnum contortum*					
Chiloscyphus polyanthus						*Sphagnum fallax*					
Chrysosplenium oppositifolium						*Sphagnum palustre*					
Cynosuros cristatus						*Sphagnum papillosum*					
Dicranella palustris						*Sphagnum squarrosum*					
Drosera rotundifolia						*Sphagnum subnitens*					
Epilobium palustre						*Sphagnum teres*					
Eriophorum angustifolium						*Trifolium repens*					
Eurhynchium praelongum						*Veronica scutellata*					
Festuca ovina						*Viola palustris*					
Fissidens adianthoides						*Warnstorfia exannulata*					
Galium palustre											
Holcus lanatus						**Other species:**					
Hydrocotyle vulgaris											
Juncus acutiflorus											
Juncus bulbosus											
Juncus effusus											
Leontodon autumnalis											
Lophocolea bidentata											
Luzula multiflora											
Molinia caerulea											
Myosotis laxa											
Nardus stricta											

Assessment of Nier River Valley, Co. Waterford (Comeragh Mountains SAC 001952)

Population Assessment for Nier River Valley:

Indicator	Method of assessment	Target	Result	Pass/Fail
Total area of extent of occupancy	Area of polygon around GPS points	≥ 1,110 m^2		
Percent cover (%)	Mean percentage cover within 3-5 plots	≥ 50%		
Density	Mean number of shoots in 10 x 10 cm area in 3-5 plots	≥ 295 shoots		

Habitat for the Species Assessment for Nier River Valley:

Indicator	Method of assessment	Target	Result	Pass/Fail
Hydrology	Hand should be pressed into vegetation	Water level should cover hand when pressed into the vegetation		
Tree cover	Estimation of tree cover to nearest 5% averaged over 3-5 plots	Mean percent tree cover should **not** exceed 15%		
Shrub cover	Estimation of shrub cover to nearest 5% averaged over 3-5 plots	Mean percent shrub cover should **not** exceed 20%		
Grass cover	Estimation of grass cover to nearest 5% averaged over 3-5 plots	Mean percent grass cover should **not** exceed 25%		
Bryophyte cover	Estimation of bryophyte cover to nearest 5% averaged over 3-5 plots	Mean percent bryophyte cover should exceed 50%		
Cover of *Calliergonella cuspidata*	Estimation of *C. cuspidata* cover to nearest 5% averaged over 3-5 plots	Mean percent cover of *C. cuspidata* should **not** exceed 15%		
Mean vegetation height	Mean height (cm) of 5 shoots per plot averaged over 3-5 plots	Mean vegetation height should **not** exceed 40 cm		

Future Prospects Assessment for Nier River Valley:

Activity (EU code)	Location (Inside/outside area of occupancy)	Influence (Positive/ Negative/ Neutral)	Intensity (High/ Medium/ Low)	Area affected (0-10m^2; 11-50m^2; 51-100m^2; >100m^2)
Intensive grazing (A04.01)				
Excessive poaching (Trampling, overuse G05.01)				
Lack of grazing (A04.03)				
Fertilisation (A08)				
Diffuse pollution to surface waters due to agricultural and forestry activities (H01.05)				
Water abstractions from groundwater (J02.07)				
Hand cutting of peat (C01.03.01)				
Mechanical removal of peat (C01.03.02)				
Forest planting on open ground (B01)				
Motorised vehicle damage (G01.03)				
Dumping (Discharges E03)				
Biocenotic evolution, succession (incl. enlargement of scrub vegetation area) (K02)				
Species composition change (succession) (K02.01)				
Other:				

Overall Assessment for Nier River Valley:

Attribute	Assessment
Population	
Habitat for the species	
Future Prospects	
Overall	

Results of determination of male and female shoots from Nier River Valley

Site	Plot No.	Date	No. of male shoots	No. of female shoots	No. of indeterminate shoots	No. of infertile shoots	Total no. of shoots
Nier River Valley	1						
	2						
	3						
	4						
	5						

Results of analysis of surface water samples from Nier River Valley

Nier River Valley Plot:	1	2	3	4	5
Surface water pH					
Surface water conductivity (µS/cm)					
Ammonium (NH_4) (mg/l)					
Nitrate (NO_3) (mg/l)					
Orthophosphate (O-P) (mg/l)					
Total phosphate (TP) (mg/l)					

Additional comments:

Relevé card for *Hamatocaulis vernicosus* fine-scale monitoring

Population:	Coumtay	**Surveyor:**		**Date:**	
County (vice):	Waterford (H6)	Aerial Photo ID:	O5765-A	**Area mapped** (✓)	
SAC:	Comeragh Mountains 001952	Discovery Map:	73		

Plot (2 x 2 m) Number	**1**	**2**	**3**	**4**	**5**
GPS co-ordinates					
Altitude (m.s.l.)					
Slope (degrees)					
Aspect					
Peat depth (cm)					
Surface water depth (cm) / Hand (✓)	**/**	**/**	**/**	**/**	**/**
Cover of *H. vernicosus* (to nearest 1%)					
No. of shoots in 10 x 10 cm area					
Mean vegetation height (cm)					
Max. vegetation height (cm)					
Tree cover (to nearest 5%)					
Shrub cover (to nearest 5%)					
Grass cover (to nearest 5%)					
Rush cover (to nearest 5%)					
Sedge cover (to nearest 5%)					
Forb cover (to nearest 5%)					
Fern/fern ally cover (“)					
Bryophyte cover (to nearest 5%)					
Lichen cover (to nearest 5%)					
Algae cover (to nearest 5%)					
Litter cover (to nearest 5%)					
Cover of bare ground (“)					
Cover of surface water (“)					
Cover of dung (to nearest 5%)					
Photo ID					
Surface water sample taken (✓)					
Shoots (>100) sample taken (✓)					

Species cover (to nearest 5%)	**1**	**2**	**3**	**4**	**5**	**Species cover (to nearest 5%)**	**1**	**2**	**3**	**4**	**5**
Anagallis tenella											
Bryum pseudotriquetrum											
Campylium stellatum											
Carex echinata											
Juncus articulatus											
Philonotis fontana											
Ranunculus flammula											
Sphagnum contortum											
Warnstorfia exannulata											
Other species:											

Assessment of Coumtay, Co. Waterford (Comeragh Mountains SAC 001952)

Population Assessment for Coumtay:

Indicator	Method of assessment	Target	Result	Pass/Fail
Total area of occupancy	Area of polygon around GPS points	≥ 0.8 m^2		
Percent cover (%)	Mean percentage cover within 1-3 plots	-		-
Density	Mean number of shoots in 10 x 10 cm area in 1-3 plots	-		-

Habitat for the Species Assessment for Coumtay:

Indicator	Method of assessment	Target	Result	Pass/Fail
Hydrology	Hand should be pressed into vegetation	Water level should cover hand when pressed into the vegetation		
Tree cover	Estimation of tree cover to nearest 5% averaged over 1-3 plots	Mean percent tree cover should **not** exceed 15%		
Shrub cover	Estimation of shrub cover to nearest 5% averaged over 1-3 plots	Mean percent shrub cover should **not** exceed 20%		
Grass cover	Estimation of grass cover to nearest 5% averaged over 1-3 plots	Mean percent grass cover should **not** exceed 25%		
Bryophyte cover	Estimation of bryophyte cover to nearest 5% averaged over 1-3 plots	Mean percent bryophyte cover should exceed 50%		
Cover of *Calliergonella cuspidata*	Estimation of *C. cuspidata* cover to nearest 5% averaged over 1-3 plots	Mean percent cover of *C. cuspidata* should **not** exceed 15%		
Mean vegetation height	Mean height (cm) of 5 shoots per plot averaged over 1-3 plots	Mean vegetation height should **not** exceed 40 cm		

Future Prospects Assessment for Coumtay:

Activity (EU code)	Location (Inside/outside area of occupancy)	Influence (Positive/ Negative/ Neutral)	Intensity (High/ Medium/ Low)	Area affected (0-10m^2; 11-50m^2; 51-100m^2; >100m^2)
Intensive grazing (A04.01)				
Excessive poaching (Trampling, overuse G05.01)				
Lack of grazing (A04.03)				
Fertilisation (A08)				
Diffuse pollution to surface waters due to agricultural and forestry activities (H01.05)				
Water abstractions from groundwater (J02.07)				
Hand cutting of peat (C01.03.01)				
Mechanical removal of peat (C01.03.02)				
Forest planting on open ground (B01)				
Motorised vehicle damage (G01.03)				
Dumping (Discharges E03)				
Biocenotic evolution, succession (incl. enlargement of scrub vegetation area) (K02)				
Species composition change (succession) (K02.01)				
Other:				

Overall Assessment for Coumtay:

Attribute	Assessment
Population	
Habitat for the species	
Future Prospects	
Overall	

Results of determination of male and female shoots from Coumtay

Site	Plot No.	Date	No. of male shoots	No. of female shoots	No. of indeterminate shoots	No. of infertile shoots	Total no. of shoots
Coumtay	1						
	2						
	3						
	4						
	5						

Results of analysis of surface water samples from Coumtay

Coumtay Plot:	1	2	3	4	5
Surface water pH					
Surface water conductivity (µS/cm)					
Ammonium (NH_4) (mg/l)					
Nitrate (NO_3) (mg/l)					
Orthophosphate (O-P) (mg/l)					
Total phosphate (TP) (mg/l)					

Additional comments:

Relevé card for *Hamatocaulis vernicosus* fine-scale monitoring

Population:	Commas	**Surveyor:**		**Date:**	
County (vice):	Cavan (H30)	Aerial Photo ID:	O1204-A	**Area mapped** (✓)	
SAC:	Culicagh-Anierin Uplands 000584	Discovery Map:	26		

Plot (2 x 2 m) Number	**1**	**2**	**3**	**4**	**5**
GPS co-ordinates					
Altitude (m.s.l.)					
Slope (degrees)					
Aspect					
Peat depth (cm)					
Surface water depth (cm) / Hand (✓)	/	/	/	/	/
Cover of *H. vernicosus* (to nearest 1%)					
No. of shoots in 10 x 10 cm area					
Mean vegetation height (cm)					
Max. vegetation height (cm)					
Tree cover (to nearest 5%)					
Shrub cover (to nearest 5%)					
Grass cover (to nearest 5%)					
Rush cover (to nearest 5%)					
Sedge cover (to nearest 5%)					
Forb cover (to nearest 5%)					
Fern/fern ally cover (")					
Bryophyte cover (to nearest 5%)					
Lichen cover (to nearest 5%)					
Algae cover (to nearest 5%)					
Litter cover (to nearest 5%)					
Cover of bare ground (")					
Cover of surface water (")					
Cover of dung (to nearest 5%)					
Photo ID					
Surface water sample taken (✓)					
Shoots (>100) sample taken (✓)					

Species cover (to nearest 5%)	**1**	**2**	**3**	**4**	**5**	**Species cover (to nearest 5%)**	**1**	**2**	**3**	**4**	**5**
Calliergonella cuspidata											

Assessment of Commas, Co. Cavan (Cuilcagh-Anierin Uplands SAC 000584)

Population Assessment for Commas:

Indicator	Method of assessment	Target	Result	Pass/Fail
Total area of extent of occupancy	Area of polygon around GPS points	≥ 1.6m^2		
Percent cover (%)	Mean percentage cover within 1-3 plots	-		-
Density	Mean number of shoots in 10 x 10 cm area in 1-3 plots	-		-

Habitat for the Species Assessment for Commas:

Indicator	Method of assessment	Target	Result	Pass/Fail
Hydrology	Hand should be pressed into vegetation	Water level should cover hand when pressed into the vegetation		
Tree cover	Estimation of tree cover to nearest 5% averaged over 1-3 plots	Mean percent tree cover should **not** exceed 15%		
Shrub cover	Estimation of shrub cover to nearest 5% averaged over 1-3 plots	Mean percent shrub cover should **not** exceed 20%		
Grass cover	Estimation of grass cover to nearest 5% averaged over 1-3 plots	Mean percent grass cover should **not** exceed 25%		
Bryophyte cover	Estimation of bryophyte cover to nearest 5% averaged over 1-3 plots	Mean percent bryophyte cover should exceed 50%		
Cover of *Calliergonella cuspidata*	Estimation of *C. cuspidata* cover to nearest 5% averaged over 1-3 plots	Mean percent cover of *C. cuspidata* should **not** exceed 15%		
Mean vegetation height	Mean height (cm) of 5 shoots per plot averaged over 1-3 plots	Mean vegetation height should **not** exceed 40 cm		

Future Prospects Assessment for Commas:

Activity (EU code)	Location (Inside/outside area of occupancy)	Influence (Positive/ Negative/ Neutral)	Intensity (High/ Medium/ Low)	Area affected (0-10m^2; 11-50m^2; 51-100m^2; >100m^2)
Intensive grazing (A04.01)				
Excessive poaching (Trampling, overuse G05.01)				
Lack of grazing (A04.03)				
Fertilisation (A08)				
Diffuse pollution to surface waters due to agricultural and forestry activities (H01.05)				
Water abstractions from groundwater (J02.07)				
Hand cutting of peat (C01.03.01)				
Mechanical removal of peat (C01.03.02)				
Forest planting on open ground (B01)				
Motorised vehicle damage (G01.03)				
Dumping (Discharges E03)				
Biocenotic evolution, succession (incl. enlargement of scrub vegetation area) (K02)				
Species composition change (succession) (K02.01)				
Other:				

Overall Assessment for Commas:

Attribute	Assessment
Population	
Habitat for the species	
Future Prospects	
Overall	

Results of determination of male and female shoots from Commas

Site	Plot No.	Date	No. of male shoots	No. of female shoots	No. of indeterminate shoots	No. of infertile shoots	Total no. of shoots
Commas	1						
	2						
	3						
	4						
	5						

Results of analysis of surface water samples from Commas

Commas Plot:	1	2	3	4	5
Surface water pH					
Surface water conductivity (µS/cm)					
Ammonium (NH_4) (mg/l)					
Nitrate (NO_3) (mg/l)					
Orthophosphate (O-P) (mg/l)					
Total phosphate (TP) (mg/l)					

Additional comments:

Overall Conservation Assessment of each *Hamatocaulis vernicosus* population

Population	Population Assessment	Habitat for the Species Assessment	Future Prospects Assessment	Overall Assessment	Comments
Meentygrannagh					
Rathavisteen					
Largan More					
Uggool					
Owenbrin					
Gortachalla					
Scragh Bog					
Below Sgilloge Loughs					
River Nier					
Coumtay					
Commas					

Appendix III – GPS points and associated data for maps

Pop. No.	Population (SAC)	X	Y	10km_ Grid_Sq	1km_ Grid_Sq	Date	Year	Source	Accuracy	Notes
1	Meentygrannagh (Meentygrannagh Bog)	202587	405889	C00	C0205	26/01/1999	1999	Lockhart	From Map / Ortho	Derived from Ortho in accompanying file; Site 1 from notes
1	Meentygrannagh (Meentygrannagh Bog)	202668	406216	C00	C0206	22/06/2004	2004	Lockhart	From Map	Derived from 1:50,000 Map; Site 2 from notes
1	Meentygrannagh (Meentygrannagh Bog)	202920	406246	C00	C0206	22/06/2004	2004	Lockhart	From Map	Derived from 1:50,000 Map; Site 3 from Notes - Later moved from original location (202967, 406338) following expert opinion
1	Meentygrannagh (Meentygrannagh Bog)	202779	406146	C00	C0206	04/08/2009	2009	Campbell & Lockhart	GPS	Extent of cover
1	Meentygrannagh (Meentygrannagh Bog)	202701	406206	C00	C0206	04/08/2009	2009	Campbell & Lockhart	GPS	Extent of cover
1	Meentygrannagh (Meentygrannagh Bog)	202713	406175	C00	C0206	04/08/2009	2009	Campbell & Lockhart	GPS	Extent of cover
1	Meentygrannagh (Meentygrannagh Bog)	202707	406194	C00	C0206	04/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*; Plot 1 (M1)
1	Meentygrannagh (Meentygrannagh Bog)	202664	405949	C00	C0205	04/08/2009	2009	Campbell & Lockhart	GPS	*H .vernicosus*; Plot 2 (M2)
1	Meentygrannagh (Meentygrannagh Bog)	202820	406204	C00	C0206	04/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*; Plot 3 (M3)
1	Meentygrannagh (Meentygrannagh Bog)	202736	406184	C00	C0206	04/08/2009	2009	Campbell & Lockhart	GPS	*H vernicosus*; Plot 4 (M4)
1	Meentygrannagh (Meentygrannagh Bog)	202556	406008	C00	C0206	24/08/2010	2010	Campbell & Lockhart	GPS	*H. vernicosus*; Plot 5 (M5)
1	Meentygrannagh (Meentygrannagh Bog)	202578	405887	C00	C0205	24/08/2010	2010	Campbell & Lockhart	GPS	*H .vernicosus*; Plot 6 (M6)
1	Meentygrannagh (Meentygrannagh Bog)	202823	406207	C00	C0206	04/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
1	Meentygrannagh (Meentygrannagh Bog)	202767	406137	C00	C0206	15/02/2010	2010	Campbell & Lockhart	GPS	*H. vernicosus*
1	Meentygrannagh (Meentygrannagh Bog)	202533	406006	C00	C0206	24/08/2010	2010	Campbell & Lockhart	GPS	*H. vernicosus*
1	Meentygrannagh (Meentygrannagh Bog)	202684	405992	C00	C0205	15/02/2011	2011	Campbell & Lockhart	GPS	*H. vernicosus*
1	Meentygrannagh (Meentygrannagh Bog)	202607	405912	C00	C0205	15/02/2011	2011	Campbell & Lockhart	GPS	*H. vernicosus*
2	Rathavisteen (Glenamoy Bog Complex)	98138	337147	F93	F9837	10/06/1999	1999	Lockhart	From Map / Ortho	Derived from Notes & Ortho - Includes Relevé data
3	Largan More (Carrowmore Lake Complex)	90140	324077	F92	F9024	21/07/1999	1999	Lockhart	From Map / ortho	Derived from 1995 Ortho - Includes Relevé data
3	Largan More (Carrowmore Lake Complex)	90169	323994	F92	F9023	25/08/2010	2010	Campbell & Lockhart	GPS	Extent of cover
3	Largan More (Carrowmore Lake Complex)	90158	324017	F92	F9024	05/08/2009	2009	Campbell & Lockhart	GPS	*H .vernicosus*; Plot 1 (LM1)
3	Largan More (Carrowmore Lake Complex)	90435	323982	F92	F9023	05/08/2009	2009	Campbell & Lockhart	GPS	*H .vernicosus*; Plot 2 (LM2)
3	Largan More (Carrowmore Lake Complex)	90207	324079	F92	F9024	05/08/2009	2009	Campbell & Lockhart	GPS	*H .vernicosus*; Plot 3 (LM3)
3	Largan More (Carrowmore Lake Complex)	90190	324014	F92	F9024	25/08/2010	2010	Campbell & Lockhart	GPS	*H. vernicosus*; Plot 4 (LM4)
3	Largan More (Carrowmore Lake Complex)	90191	324023	F92	F9024	05/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
3	Largan More (Carrowmore Lake Complex)	90188	324014	F92	F9024	15/02/2010	2010	Campbell & Lockhart	GPS	*H. vernicosus*
3	Largan More (Carrowmore Lake Complex)	89932	323768	F82	F8923	15/02/2010	2010	Campbell & Lockhart	GPS	*H. vernicosus*
3	Largan More (Carrowmore Lake Complex)	90387	323980	F92	F9023	16/02/2011	2011	Campbell & Lockhart	GPS	*H. vernicosus*
3	Largan More (Carrowmore Lake Complex)	90387	323979	F92	F9023	16/02/2011	2011	Campbell & Lockhart	GPS	*H. vernicosus*
4	Uggool (Owenduff/Nephin Complex)	92513	318750	F91	F9218	28/05/1999	1999	Lockhart	From Ortho	Derived from Notes & Ortho - Includes Relevé data
5	Owenbrin (Lough Carra / Mask Complex)	106189	262854	M06	M0662	28/03/2000	2000	Lockhart	From Ortho	Derived from Notes & Ortho - Includes Relevé data
5	Owenbrin (Lough Carra / Mask Complex)	106209	262853	M06	M0662	06/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
5	Owenbrin (Lough Carra / Mask Complex)	106166	262855	M06	M0662	06/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
5	Owenbrin (Lough Carra / Mask Complex)	106352	262938	M06	M0662	06/08/2009	2009	Campbell & Lockhart	GPS	*H .vernicosus*; Plot 1 (O1)
5	Owenbrin (Lough Carra / Mask Complex)	106171	262899	M06	M0662	06/08/2009	2009	Campbell & Lockhart	GPS	*H .vernicosus*; Plot 2 (O2)
5	Owenbrin (Lough Carra / Mask Complex)	106222	262910	M06	M0662	26/08/2010	2010	Campbell & Lockhart	GPS	*H .vernicosus*; Plot 3 (O3)
5	Owenbrin (Lough Carra / Mask Complex)	106207	262853	M06	M0662	06/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*; Plot 4 (O4)
5	Owenbrin (Lough Carra / Mask Complex)	106149	262924	M06	M0662	06/08/2009	2009	Campbell & Lockhart	GPS	Extent of cover
5	Owenbrin (Lough Carra / Mask Complex)	106278	263041	M06	M0663	06/08/2009	2009	Campbell & Lockhart	GPS	Extent of cover
5	Owenbrin (Lough Carra / Mask Complex)	106185	262914	M06	M0662	17/02/2010	2010	Campbell & Lockhart	GPS	*H. vernicosus*
5	Owenbrin (Lough Carra / Mask Complex)	106255	262920	M06	M0662	17/02/2010	2010	Campbell & Lockhart	GPS	*H. vernicosus*
5	Owenbrin (Lough Carra / Mask Complex)	106258	262920	M06	M0662	17/02/2010	2010	Campbell & Lockhart	GPS	*H. vernicosus*
5	Owenbrin (Lough Carra / Mask Complex)	106245	262967	M06	M0662	17/02/2010	2010	Campbell & Lockhart	GPS	Extent of cover
5	Owenbrin (Lough Carra / Mask Complex)	106257	262919	M06	M0662	17/02/2010	2010	Campbell & Lockhart	GPS	Extent of cover
5	Owenbrin (Lough Carra / Mask Complex)	106245	262946	M06	M0662	17/02/2011	2011	Campbell & Lockhart	GPS	*H. vernicosus*
6	NW of Gortachalla Lough (Lough Corrib)	122520	237530	M23	M2237	25/06/2004	2004	Holyoak	GPS	Corresponds to Recorder location for the species
6	NW of Gortachalla Lough (Lough Corrib)	122480	237710	M23	M2237	05/07/2004	2004	Holyoak & Lockhart	GPS	Includes Relevé data

Pop. No.	Population (SAC)	X	Y	10km_ Grid_Sq	1km_ Grid_Sq	Date	Year	Source	Accuracy	Notes
6	NW of Gortachalla Lough (Lough Corrib)	122526	237521	M23	M2237	07/08/2009	2009	Campbell & Lockhart	GPS	Extent of cover
6	NW of Gortachalla Lough (Lough Corrib)	122543	237536	M23	M2237	07/08/2009	2009	Campbell & Lockhart	GPS	Extent of cover
6	NW of Gortachalla Lough (Lough Corrib)	122529	237563	M23	M2237	07/08/2009	2009	Campbell & Lockhart	GPS	Extent of cover
6	NW of Gortachalla Lough (Lough Corrib)	122535	237559	M23	M2237	07/08/2009	2009	Campbell & Lockhart	GPS	Extent of cover
6	NW of Gortachalla Lough (Lough Corrib)	122520	237579	M23	M2237	07/08/2009	2009	Campbell & Lockhart	GPS	Extent of cover
6	NW of Gortachalla Lough (Lough Corrib)	122430	237645	M23	M2237	07/08/2009	2009	Campbell & Lockhart	GPS	Extent of cover
6	NW of Gortachalla Lough (Lough Corrib)	122435	237660	M23	M2237	07/08/2009	2009	Campbell & Lockhart	GPS	Extent of cover; Moved from original location (122434, 237666) on foot of expert opinion PD 19/02/13
6	NW of Gortachalla Lough (Lough Corrib)	122517	237490	M23	M2237	17/02/2010	2010	Campbell & Lockhart	GPS	Extent of cover
6	NW of Gortachalla Lough (Lough Corrib)	122529	237557	M23	M2237	07/08/2009	2009	Campbell & Lockhart	GPS	*H. vericosus*; Plot 1 (G1)
6	NW of Gortachalla Lough (Lough Corrib)	122497	237701	M23	M2237	07/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*: Plot 2 (G2)
6	NW of Gortachalla Lough (Lough Corrib)	122496	237614	M23	M2237	27/08/2010	2010	Campbell & Lockhart	GPS	*H. vernicosus*: Plot 3 (G3)
6	NW of Gortachalla Lough (Lough Corrib)	122441	237638	M23	M2237	07/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*: Plot 4 (G4)
6	NW of Gortachalla Lough (Lough Corrib)	122519	237521	M23	M2237	07/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
6	NW of Gortachalla Lough (Lough Corrib)	122516	237595	M23	M2237	07/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
6	NW of Gortachalla Lough (Lough Corrib)	122495	237612	M23	M2237	07/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
6	NW of Gortachalla Lough (Lough Corrib)	122486	237631	M23	M2237	07/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
6	NW of Gortachalla Lough (Lough Corrib)	122495	237696	M23	M2237	07/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
6	NW of Gortachalla Lough (Lough Corrib)	122448	237673	M23	M2237	07/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
6	NW of Gortachalla Lough (Lough Corrib)	122449	237656	M23	M2237	07/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
6	NW of Gortachalla Lough (Lough Corrib)	122443	237641	M23	M2237	07/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
6	NW of Gortachalla Lough (Lough Corrib)	122517	237490	M23	M2237	17/02/2010	2010	Campbell & Lockhart	GPS	*H. vernicosus*
6	NW of Gortachalla Lough (Lough Corrib)	122516	237490	M23	M2237	17/02/2010	2010	Campbell & Lockhart	GPS	*H. vernicosus*
6	NW of Gortachalla Lough (Lough Corrib)	122497	237629	M23	M2237	17/02/2010	2010	Campbell & Lockhart	GPS	*H. vernicosus*
6	NW of Gortachalla Lough (Lough Corrib)	122516	237491	M23	M2237	17/02/2011	2011	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242552	258959	N45	N4259	13/07/2004	2004	Lockhart	From Ortho	Includes Relevé data
7	Scragh Bog (Scragh Bog)	242560	258950	N45	N4258	10/09/2007	2007	Hodgetts, Holyoak, Kingston & Lockhart	GPS	Corresponds to one of the Recorder locations for the site - DSS0052000000AEC - also contains limited associated species list; Record A from Site Card
7	Scragh Bog (Scragh Bog)	242520	258960	N45	N4258	10/09/2007	2007	Hodgetts, Holyoak, Kingston & Lockhart	GPS	Corresponds to one of the Recorder locations for the site - DSS0052000000AEJ - also contains associated species list; Record B from Site Card
7	Scragh Bog (Scragh Bog)	242463	258907	N45	N4258	31/07/2009	2009	Campbell & Lockhart	GPS	Extent of cover
7	Scragh Bog (Scragh Bog)	242450	258870	N45	N4258	31/07/2009	2009	Campbell & Lockhart	GPS	Extent of cover
7	Scragh Bog (Scragh Bog)	242446	258866	N45	N4258	31/07/2009	2009	Campbell & Lockhart	GPS	Extent of cover
7	Scragh Bog (Scragh Bog)	242356	258959	N45	N4258	31/07/2009	2009	Campbell & Lockhart	GPS	Extent of cover
7	Scragh Bog (Scragh Bog)	242443	259022	N45	N4259	31/07/2009	2009	Campbell & Lockhart	GPS	Extent of cover
7	Scragh Bog (Scragh Bog)	242496	259058	N45	N4259	31/07/2009	2009	Campbell & Lockhart	GPS	Extent of cover
7	Scragh Bog (Scragh Bog)	242437	259143	N45	N4259	31/07/2009	2009	Campbell & Lockhart	GPS	Extent of cover
7	Scragh Bog (Scragh Bog)	242309	259047	N45	N4259	31/07/2009	2009	Campbell & Lockhart	GPS	Extent of cover
7	Scragh Bog (Scragh Bog)	242265	259135	N45	N4259	31/07/2009	2009	Campbell & Lockhart	GPS	Extent of cover
7	Scragh Bog (Scragh Bog)	242365	259201	N45	N4259	31/07/2009	2009	Campbell & Lockhart	GPS	Extent of cover
7	Scragh Bog (Scragh Bog)	242381	259218	N45	N4259	31/07/2009	2009	Campbell & Lockhart	GPS	Extent of cover
7	Scragh Bog (Scragh Bog)	242354	259252	N45	N4259	31/07/2009	2009	Campbell & Lockhart	GPS	Extent of cover
7	Scragh Bog (Scragh Bog)	242319	259295	N45	N4259	31/07/2009	2009	Campbell & Lockhart	GPS	Extent of cover
7	Scragh Bog (Scragh Bog)	242163	259365	N45	N4259	13/08/2009	2009	Campbell & Lockhart	GPS	Extent of cover
7	Scragh Bog (Scragh Bog)	242164	259325	N45	N4259	13/08/2009	2009	Campbell & Lockhart	GPS	Extent of cover
7	Scragh Bog (Scragh Bog)	242250	259373	N45	N4259	13/08/2009	2009	Campbell & Lockhart	GPS	Extent of cover
7	Scragh Bog (Scragh Bog)	242555	258955	N45	N4258	31/07/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242557	258950	N45	N4258	31/07/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242410	258786	N45	N4258	31/07/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242439	259144	N45	N4259	26/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*; Plot 1 (SB1)

Pop. No.	Population (SAC)	X	Y	10km_ Grid_Sq	1km_ Grid_Sq	Date	Year	Source	Accuracy	Notes
7	Scragh Bog (Scragh Bog)	242318	259177	N45	N4259	26/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*; Plot 2 (SB2)
7	Scragh Bog (Scragh Bog)	242558	258951	N45	N4258	26/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*; Plot 3 (SB3)
7	Scragh Bog (Scragh Bog)	242251	259373	N45	N4259	13/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*; Plot 4 (SB3)
7	Scragh Bog (Scragh Bog)	242319	259295	N45	N4259	31/07/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*; Plot 5 (SB5)
7	Scragh Bog (Scragh Bog)	242311	259050	N45	N4259	08/09/2010	2010	Campbell & Lockhart	GPS	*H. vernicosus*; Plot 6 (SB6)
7	Scragh Bog (Scragh Bog)	242438	259018	N45	N4259	13/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*; Plot 7 (SB7)
7	Scragh Bog (Scragh Bog)	242413	258780	N45	N4258	31/07/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242442	259020	N45	N4259	31/07/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242446	259131	N45	N4259	31/07/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242439	259142	N45	N4259	31/07/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242440	259142	N45	N4259	31/07/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242419	259128	N45	N4259	31/07/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242398	259115	N45	N4259	31/07/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242398	259115	N45	N4259	31/07/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242393	259110	N45	N4259	31/07/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242339	259065	N45	N4259	31/07/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242266	259135	N45	N4259	31/07/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242319	259177	N45	N4259	31/07/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242366	259201	N45	N4259	31/07/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242346	259258	N45	N4259	31/07/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242342	259265	N45	N4259	31/07/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242332	259273	N45	N4259	31/07/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242316	259291	N45	N4259	31/07/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242211	259237	N45	N4259	31/07/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242170	259346	N45	N4259	13/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242164	259325	N45	N4259	13/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242178	259329	N45	N4259	13/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242182	259330	N45	N4259	13/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242192	259335	N45	N4259	13/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242197	259337	N45	N4259	13/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242201	259339	N45	N4259	13/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242210	259346	N45	N4259	13/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242227	259358	N45	N4259	13/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242237	259363	N45	N4259	13/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242240	259365	N45	N4259	13/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242242	259366	N45	N4259	13/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242558	258951	N45	N4258	26/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242316	259293	N45	N4259	26/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242252	259373	N45	N4259	26/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242311	259049	N45	N4259	26/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242438	259020	N45	N4259	26/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
7	Scragh Bog (Scragh Bog)	242227	259403	N45	N4259	07/03/2011	2011	Campbell & Smyth	GPS	*H. vernicosus*
8a	below Sgilloge Loughs (Comeragh Mountains)	228476	112213	S21	S2812	16/09/1998	1998	Lockhart	From Ortho	Derived from Ortho - Includes Relevé data
8a	below Sgilloge Loughs (Comeragh Mountains)	228480	112210	S21	S2812	12/09/2007	2007	Hodgetts	GPS	Corresponds to one of the Recorder Locations for the site - DSS0052000000B3Z - Includes Relevé data
8a	below Sgilloge Loughs (Comeragh Mountains)	228590	112000	S21	S2812	12/09/2007	2007	Hodgetts	GPS	
8a	below Sgilloge Loughs (Comeragh Mountains)	228540	112180	S21	S2812	12/09/2007	2007	Hodgetts	GPS	

Pop. No.	Population (SAC)	X	Y	10km_ Grid_Sq	1km_ Grid_Sq	Date	Year	Source	Accuracy	Notes
8a	below Sgilloge Loughs (Comeragh Mountains)	228620	111850	S21	S2811	12/09/2007	2007	Hodgetts	GPS	
8a	below Sgilloge Loughs (Comeragh Mountains)	228420	111870	S21	S2811	12/09/2007	2007	Hodgetts	GPS	
8a	below Sgilloge Loughs (Comeragh Mountains)	228326	112117	S21	S2812	11/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
8a	below Sgilloge Loughs (Comeragh Mountains)	228327	112121	S21	S2812	11/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
8a	below Sgilloge Loughs (Comeragh Mountains)	228629	111950	S21	S2811	11/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
8a	below Sgilloge Loughs (Comeragh Mountains)	228683	111948	S21	S2811	11/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
8a	below Sgilloge Loughs (Comeragh Mountains)	228302	111750	S21	S2811	11/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
8a	below Sgilloge Loughs (Comeragh Mountains)	228297	111754	S21	S2811	11/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
8a	below Sgilloge Loughs (Comeragh Mountains)	228272	111748	S21	S2811	11/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
8a	below Sgilloge Loughs (Comeragh Mountains)	228199	111729	S21	S2811	11/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
8a	below Sgilloge Loughs (Comeragh Mountains)	228642	111944	S21	S2811	11/08/2009	2009	Campbell & Lockhart	GPS	Extent of cover
8a	below Sgilloge Loughs (Comeragh Mountains)	228637	111942	S21	S2811	11/08/2009	2009	Campbell & Lockhart	GPS	Extent of cover
8a	below Sgilloge Loughs (Comeragh Mountains)	228652	111919	S21	S2811	11/08/2009	2009	Campbell & Lockhart	GPS	Extent of cover
8a	below Sgilloge Loughs (Comeragh Mountains)	228340	111752	S21	S2811	11/08/2009	2009	Campbell & Lockhart	GPS	Extent of cover
8a	below Sgilloge Loughs (Comeragh Mountains)	228168	111729	S21	S2811	11/08/2009	2009	Campbell & Lockhart	GPS	Extent of cover
8a	below Sgilloge Loughs (Comeragh Mountains)	228180	111751	S21	S2811	11/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*; Plot 1 (BSL1)
8a	below Sgilloge Loughs (Comeragh Mountains)	228291	111753	S21	S2811	11/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*; Plot 2 (BSL 2)
8a	below Sgilloge Loughs (Comeragh Mountains)	228590	111999	S21	S2811	11/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*; Plot 3 (BSL 3)
8a	below Sgilloge Loughs (Comeragh Mountains)	228331	112117	S21	S2812	11/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*; Plot 4 (BSL 4)
8a	below Sgilloge Loughs (Comeragh Mountains)	228548	112068	S21	S2812	30/08/2010	2010	Campbell & Lockhart	GPS	*H. vernicosus*
8a	below Sgilloge Loughs (Comeragh Mountains)	228558	111986	S21	S2811	21/02/2011	2011	Campbell & Lockhart	GPS	*H. vernicosus*
8b	Nier River Valley (Comeragh Mountains)	227685	111577	S21	S2711	16/09/1998	1998	Lockhart	From Ortho	Derived from Notes & Ortho - Corresponds to Relevé 2
8b	Nier River Valley (Comeragh Mountains)	227707	111524	S21	S2711	16/09/1998	1998	Lockhart	From Ortho	Derived from Notes & Ortho - Corresponds to Relevé 1
8b	Nier River Valley (Comeragh Mountains)	227710	111540	S21	S2711	14/09/2007	2007	Hodgetts	GPS	Corresponds to one of the two Recorder Locations for the site - DSS0052000000B3C - Includes associated species list
8b	Nier River Valley (Comeragh Mountains)	227700	111510	S21	S2711	14/09/2007	2007	Hodgetts	GPS	Corresponds to one of the two Recorder Locations for the site - DSS0052000000B9D - Includes associated species list
8b	Nier River Valley (Comeragh Mountains)	227705	111556	S21	S2711	11/08/2009	2009	Campbell & Lockhart	GPS	Extent of cover

Pop. No.	Population (SAC)	X	Y	10km_ Grid_Sq	1km_ Grid_Sq	Date	Year	Source	Accuracy	Notes
8b	Nier River Valley (Comeragh Mountains)	227698	111567	S21	S2711	11/08/2009	2009	Campbell & Lockhart	GPS	Extent of cover
8b	Nier River Valley (Comeragh Mountains)	227679	111575	S21	S2711	11/08/2009	2009	Campbell & Lockhart	GPS	Extent of cover
8b	Nier River Valley (Comeragh Mountains)	227675	111574	S21	S2711	11/08/2009	2009	Campbell & Lockhart	GPS	Extent of cover
8b	Nier River Valley (Comeragh Mountains)	227673	111568	S21	S2711	11/08/2009	2009	Campbell & Lockhart	GPS	Extent of cover
8b	Nier River Valley (Comeragh Mountains)	227682	111545	S21	S2711	11/08/2009	2009	Campbell & Lockhart	GPS	Extent of cover
8b	Nier River Valley (Comeragh Mountains)	227686	111537	S21	S2711	11/08/2009	2009	Campbell & Lockhart	GPS	Extent of cover
8b	Nier River Valley (Comeragh Mountains)	227693	111579	S21	S2711	11/08/2009	2009	Campbell & Lockhart	GPS	Extent of cover
8b	Nier River Valley (Comeragh Mountains)	227697	111512	S21	S2711	11/08/2009	2009	Campbell & Lockhart	GPS	Extent of cover
8b	Nier River Valley (Comeragh Mountains)	227704	111519	S21	S2711	11/08/2009	2009	Campbell & Lockhart	GPS	Extent of cover
8b	Nier River Valley (Comeragh Mountains)	227712	111534	S21	S2711	11/08/2009	2009	Campbell & Lockhart	GPS	Extent of cover
8b	Nier River Valley (Comeragh Mountains)	227705	111555	S21	S2711	11/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*
8b	Nier River Valley (Comeragh Mountains)	227704	111537	S21	S2711	11/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*; Plot 1 (NV1)
8b	Nier River Valley (Comeragh Mountains)	227674	111570	S21	S2711	11/08/2009	2009	Campbell & Lockhart	GPS	*H. vernicosus*; Plot 2 (NV2)
8c	Coumtay (Comeragh Mountains)	229850	108010	S20	S2908	18/09/2007	2007	Hodgetts	GPS	Corresponds to Recorder Location for the site - DSS0052000000B2W - Includes associated species list
9	Commas (Cuilcagh-Anierin Uplands)	212985	327848	H12	H1227	20/08/2012	2012	Hodd	GPS	National Survey of Uplands Habitats (Phase 3, 2012-2013) BEC