

**Glanmore Bog SAC (site code 001879)**  
**Conservation objectives supporting document**  
**- blanket bogs and associated habitats**

**NPWS**

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## 1 Introduction

Achieving Favourable Conservation Status (FCS) is the overall objective to be reached for all Annex I habitat types and Annex II species of European Community interest listed in the EU Habitats Directive 92/43/EEC. It is defined in positive terms such that a habitat type or species must be prospering and have good prospects of continuing to do so.

Almost 19% of Ireland can be considered to support upland habitats (Perrin *et al.*, 2009). The importance of these areas for biodiversity conservation is unquestionable, with numerous upland habitat types listed under Annex I of the EU Habitats Directive and many rare and threatened bird and other animal species being associated with these habitats. This is reflected in the fact that over 40% of the total terrestrial area currently selected for designation as Special Areas of Conservation (SAC) in Ireland lies above 150m in altitude.

The Scoping Study and Pilot Survey of Upland Habitats (Perrin *et al.*, 2009) was commissioned by the National Parks and Wildlife Service (NPWS) with the primary remit of devising an appropriate strategy and methodologies for conducting a National Survey of Upland Habitats (NSUH). Four phases of the NSUH have since been completed between 2010 and 2014. The principle aims of the NSUH are to map all habitats within a site and to assess the conservation condition of the relevant Annex I habitats, listed in Table 1 below.

The conservation objectives attributes and targets, which are based on the monitoring criteria developed by the NSUH, have been applied to the blanket bog and associated Annex I habitats listed as Qualifying Interests for Glanmore Bog SAC (see Table 1 and Section 2).

The stream valley bog at Glanmore was surveyed by Mooney *et al.* (1991) as part of a wider blanket bog survey project across Ireland carried out by NPWS between 1987 and 1991 (see Conaghan, 2000). Grasslands were surveyed in 2008 as part of the Irish Semi-natural Grasslands Survey (ISGS) in the sub-site Glanmore (ISGS site code 402) in the SAC. The results of this survey are reported in O'Neill *et al.* (2013).

**Table 1:** Annex I habitats that occur in Irish uplands and which are primary focus habitats for the NSUH. Habitats in bold are those that are listed as Qualifying Interests for Glanmore Bog SAC.

Habitat code	Habitat name
<b>4010</b>	<b>Northern Atlantic wet heaths with <i>Erica tetralix</i></b>
4030	European dry heaths
4060	Alpine and Boreal heaths
<b>6230</b>	<b>Species-rich <i>Nardus</i> grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) *</b>
<b>7130</b>	<b>Blanket bogs (* if active bog)</b>
7140	Transition mires and quaking bogs
7150	Depressions on peat substrates of the Rhynchosporion
7230	Alkaline fens
8110	Siliceous scree of the montane to snow levels ( <i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladani</i> )
8120	Calcareous and calcshist scree of the montane to alpine levels ( <i>Thlaspietea rotundifolii</i> )
8210	Calcareous rocky slopes with chasmophytic vegetation
8220	Siliceous rocky slopes with chasmophytic vegetation

\* Denotes a priority habitat under the EU Habitats Directive

## **1.1 Glanmore Bog SAC**

Glanmore Bog SAC is 1,148ha in extent. The SAC encompasses the land immediately south of Ardgroom village in Co. Cork, it then runs in a south-easterly direction to include part of Skellig Hill, the Ownagappul River, Glenbeg Lough and valley, and the stream valley located between Eskatarriff Mountain (600m) and Knocknagree Mountain (586m). The majority of the SAC is within Co. Cork, with the south-eastern end extending into Co. Kerry (O.S. Discovery Series map 84). Geologically the SAC is mostly underlain by sandstone and siltstone.

## **1.2 Mapping methodology**

A detailed habitat mapping survey of Glanmore Bog SAC, utilising the methodology presented in Perrin *et al.* (2014), has not been conducted. Therefore, the data currently available are not sufficient to facilitate the production of an accurate habitat map for 4010 Wet heaths and 7130 Blanket bogs (\* if active bog) in Glanmore Bog SAC.

All current relevant datasets for Annex I habitats were summarised within the GIS files associated with NPWS (2013) and these were utilised to calculate an approximate area for 4010 Wet heaths and 7130 Blanket bogs (\* if active bog) in the SAC.

Data from the Irish Semi-natural Grasslands Survey (O'Neill *et al.*, 2013) were utilised to map the area of 6230 *Nardus* grasslands\* in the SAC.

## **1.3 Potential for habitat restoration**

Restoration management for 7130 Blanket bogs (\* if active bog) in this SAC is required, as the conservation objective for the habitat is to restore favourable conservation condition here. Areas that might be restored to active blanket bog could include inactive bog, bare eroding bog and recent cutover bog, and also areas of drained deep peat or older cutovers which currently support other types of vegetation such as heath. These latter areas may be classified as other Annex I habitats (e.g. 4010). Restoration of priority 7130 habitat may therefore result in loss in the area and distribution of other Annex I habitats that are Qualifying Interests. If such scenarios are identified by restoration management plans, the conservation objectives for these other Qualifying Interests should be adjusted accordingly.

## **2 Conservation objectives**

A site-specific conservation objective aims to define the favourable conservation condition of a habitat or species at site level. The maintenance of habitats and species within sites at favourable condition will contribute to the maintenance of favourable conservation status (FCS) of those habitats and species at a national level.

Conservation objectives are defined using attributes and targets that are based on parameters as set out in the Habitats Directive for defining favourable status, namely area, range, and structure and functions.

The *Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland* (Perrin *et al.*, 2014) have been used as a basis for setting most of the site-specific attributes and targets for uplands habitats. However, attributes and targets may change/become more refined as further information becomes available.

As no recent detailed survey has been undertaken to assess the area or the structure and functions of 4010 Wet heaths and 7130 Blanket bogs (\* if active bog) in Glanmore Bog SAC, the National Conservation Assessment (NCA) for these Annex I habitats (NPWS, 2013) was instead utilised to indicate condition of the habitats in the SAC. If area and structure and functions were both assessed as “Favourable”, the objective for that habitat is to maintain favourable conservation condition. If either parameter was assessed as “Unfavourable – Inadequate” or “Unfavourable – Bad”, the objective for that habitat is to restore favourable conservation condition. The NCA for 4010 Wet heaths was Unfavourable – Inadequate for area and Unfavourable – Bad for structure and functions. The NCA for 7130 Blanket bogs (\* if active bog) was Unfavourable – Bad for both area and structure and functions.

O’Neill *et al.* (2013) conducted conservation assessments of 6230 *Nardus* grasslands\* within Glanmore Bog SAC. This survey assessed area as Favourable and structure and functions as Unfavourable – Bad.

This document provides supporting information for the attributes of the conservation objectives for 4010 Wet heaths, 6230 *Nardus* grasslands\* and 7130 Blanket bogs (\* if active bog), given in the main conservation objectives document for Glanmore Bog SAC. The two documents should be read in conjunction with each other.

The conservation objective for each of the Annex I habitats dealt with in this supporting document are as follows:

- To restore the favourable conservation condition of Northern Atlantic wet heaths with *Erica tetralix* in Glanmore Bog SAC.
- To restore the favourable conservation condition of Species-rich *Nardus* grassland, on siliceous substrates in mountain areas (and sub-mountain areas, in Continental Europe)\* in Glanmore Bog SAC.
- To restore the favourable conservation condition of Blanket bogs (\* if active bog) in Glanmore Bog SAC.

### 3 Area

Habitat extent is a basic attribute to be assessed when determining the condition of a particular habitat. The target is for the habitat area to be stable or increasing. Approximate baseline figures are presented in Table 2 for 4010 Wet heaths, 6230 *Nardus* grasslands\* and 7130 Blanket bogs (\* if active bog) in Glanmore Bog SAC.

**Table 2:** Estimated extent of the blanket bog and associated Annex I habitats that are listed as Qualifying Interests for Glanmore Bog SAC. \*denotes priority habitat.

Annex I code	Habitat	Approximate area (ha)	% of SAC
4010	Wet heaths	341	30
6230	Species-rich <i>Nardus</i> grasslands*	6.5	1
7130	Blanket bogs (* if active bog)	308	27

As mentioned earlier, the area of habitat 7130 comprises active and inactive blanket bogs. The most frequent example of the latter encountered in the NSUH is described in Perrin *et al.* (2014) as a monospecific sward of common cottongrass (*Eriophorum angustifolium*) on eroded bog where a reasonable depth of peat remains. Note, however, that where examples of this community occur on re-deposited, eroded peat, these areas will not have the structural, hydrological or functional characteristics of naturally formed blanket bog.

#### **4 Range**

Each habitat's range at site level, in the form of habitat distribution, has not been recorded in detail as no comprehensive mapping of the SAC has been recently undertaken. However, it is documented that 4010 Wet heaths occur throughout the SAC, typically forming a mosaic with dry heath, upland grassland, exposed rocks and blanket bog (Mooney *et al.*, 1991; NPWS internal files). 6230 *Nardus* grasslands\* occur on the western facing hillside below the Eskatarriff/Tooreennamna ridge (O'Neill *et al.*, 2013). 7130 Blanket bogs (\* if active bog) are present on the stream valley floor at Glanmore, on the ridge near Eskatarriff and at Bunskeellig (Mooney *et al.*, 1991; NPWS internal files). The target is that there should be no decline.

#### **5 Structure and functions**

Structure and functions relates to the physical components of a habitat ("structure") and the ecological processes that drive it ("functions"). For blanket bogs and associated habitats, these include a range of aspects such as soil chemistry, vegetation composition, hydrological regime, community diversity, habitat quality, species occurrence, indicators of local distinctiveness, disturbed ground, evidence of burning and negative species occurrence. These structure and functions are expanded on in the sections below.

At Glanmore Bog SAC, the structure and functions of 4010 Wet heaths and 7130 Blanket bogs (\* if active bog) have not been assessed in the field as there has been no recent detailed habitat survey.

The structure and functions of 6230 *Nardus* grasslands\* have been assessed as Unfavourable – Bad by the ISGS (O'Neill *et al.*, 2013). Reasons for failure included low species richness and insufficient forbs in the sward.

##### **5.1 Ecosystem function**

Ecosystem function is assessed primarily through consideration of soil nutrient levels. For 7130 Blanket bogs (\* if active bog), additional consideration is given to peat formation and hydrology.

###### **5.1.1 Ecosystem function: soil nutrients**

An attribute to assess soil nutrients is common to each of the habitats with a view to maintain the soil nutrient status within the natural range suited to the habitat. Relevant nutrients and natural ranges have yet to be defined. Nitrogen deposition and associated acidification are noted as being relevant to blanket bogs and all associated habitats in NPWS (2013). The target for each habitat is to maintain the soil nutrients status within the natural range.

### **5.1.2 Ecosystem function: peat formation**

Ecosystem function of 7130 Blanket bogs (\* if active bog) is further assessed through peat formation. Perrin *et al.* (2014) established an overriding assessment of blanket bog structure and functions based on the proportion of degraded bog within a site which includes eroding bog and cutover bog which would previously have been this Annex I habitat. If more than 1% of the combined area of active bog (Annex I habitat 7130\*), inactive bog (Annex I habitat 7130), eroded bog (habitat category PB5 – Fossitt, 2000) and recently cutover bog (habitat PB4 – Fossitt, 2000) is inactive, eroded or cutover then it should be assessed as Unfavourable – Inadequate, even if the results of the monitoring stops data are more positive. If more than 5% of the combined area is inactive, eroded or cutover it is assessed as Unfavourable – Bad.

The EU habitats interpretation manual (European Commission, 2013) defines active blanket bog as “still supporting a significant area of vegetation that is normally peat-forming”. For the purposes of defining favourable conservation condition of the Annex I habitat, the target is that at least 99% of the total Annex I blanket bog area is active bog.

### **5.1.3 Ecosystem function: hydrology**

Ecosystem function of 7130 Blanket bogs (\* if active bog) is further assessed through assessment of hydrology. Drains (cut for purposes of peat cutting, afforestation, etc.) and erosion gullies impact on the hydrology of blanket bog in the local vicinity. The target is for the natural hydrology to be unaffected by drains and erosion gullies. The process of restoring hydrological integrity may impact areas of heath habitats as discussed in Section 1.3.

## **5.2 Community diversity**

Wet heath vegetation communities have been recorded in Glanmore Bog SAC (Mooney *et al.*, 1991; NPWS internal files), two of which correspond to the NSUH provisional communities WH3 *Calluna vulgaris* – *Molinia caerulea* – *Sphagnum capillifolium* wet/damp heath and WH7 *Molinia caerulea* – *Ulex gallii* wet heath, as described in the NSUH manual (Perrin *et al.*, 2014). O’Neill *et al.* (2013) recorded species-rich *Nardus* grassland\* vegetation communities in the SAC, one of which corresponds to the NSUH provisional community UG1e *Agrostis capillaris* – *Festuca ovina* species-rich non-calcareous sub-community. A variety of blanket bog vegetation communities have also been recorded in the SAC (Mooney *et al.*, 1991; NPWS internal files), two of which correspond to the NSUH provisional communities BB1 *Schoenus nigricans* – *Eriophorum angustifolium* bog and BB5 *Calluna vulgaris* – *Eriophorum* spp. bog.

The target for the SAC is to maintain the variety of vegetation communities within 4010 Wet heaths, 6230 *Nardus* grasslands\* and 7130 Blanket bogs (\* if active bog), subject to natural processes.

## **5.3 Vegetation composition**

Vegetation composition is assessed through a range of attributes tailored to each of the habitats. In general terms, they establish minimum thresholds for the occurrence or cover of desirable species and maximum thresholds for undesirable species.

### **5.3.1 Vegetation composition: positive indicator species**

The attribute for positive indicator species is common to each of the blanket bogs and associated Annex I habitats, and habitat-specific lists of the positive indicator species are presented in the NSUH manual (Perrin *et al.*, 2014). A positive species criterion is set to ensure that vegetation remains representative of the habitat and is not degrading or succeeding to a different habitat. The target by which this attribute is measured varies between habitats. Descriptions of these habitats can be found in the NSUH manual (Perrin *et al.*, 2014).

For some habitats, a certain number of positive indicator species is required. At least seven positive indicator species are required at each monitoring stop for 7130 Blanket bogs (\* if active bog).

6230 *Nardus* grasslands\* require at least seven positive indicator species present at each monitoring stop and at least two high quality indicator species for base-rich examples of the habitat and at least one for base-poor examples of the habitat.

For some other habitats, a percentage threshold is set. At least 50% cover of positive indicators is required for 4010 Wet heaths.

### **5.3.2 Vegetation composition: other desirable species**

Other elements of vegetation composition which can collectively be regarded as being desirable are also established with a range of habitat-specific targets set.

#### **Lichens and bryophytes**

Minimum thresholds for cover of lichens and bryophytes are set for habitats where a plentiful lichen/moss layer is characteristic, such as 4010 Wet heaths and 7130 Blanket bogs (\* if active bog). Within the habitat-specific targets for these attributes, the specific species, or groups of species which are required, are listed together with any exclusions (e.g. *Sphagnum fallax* can be indicative of degraded bog so is excluded from the 7130 Blanket bogs (\* if active bog) assessment).

#### **Cross-leaved heath**

Cross-leaved heath (*Erica tetralix*) is specifically mentioned in the formal title of habitat 4010 Wet heaths and is the only characteristic species listed in European Commission (2013). Whilst it is seldom abundant in wet heaths, its presence at high frequencies is considered one of the few characteristics common between the varied communities of this habitat (JNCC, 2009). The target is for the presence of cross-leaved heath within a 20m radius of each monitoring stop.

#### **Ericoid species and crowberry**

A dwarf shrub layer with ericoid species is characteristic of 4010 Wet heaths (crowberry (*Empetrum nigrum*) is only rarely present). Low cover of these species would be indicative of chronic overgrazing, burning, etc. The target is for at least 15% cover of these species at each monitoring stop.

## **Species richness**

Species richness is a key characteristic of 6230 *Nardus* grasslands\* which distinguishes it from species-poor *Nardus* swards that are very common in the uplands of Ireland and the UK. A minimum species richness threshold of 25 has been set. Vascular plant, bryophyte and lichen species are counted.

### **5.3.3 Vegetation composition: negative indicator species**

A percentage cover threshold for negative indicator species has been established for blanket bog and associated habitats, including those listed as Qualifying Interests for Glanmore Bog SAC. Habitat-specific negative indicator species lists have been established for each of the habitats and are presented in Perrin *et al.* (2014). Presence of these species would likely indicate undesirable impacts of management such as overgrazing, undergrazing, nutrient enrichment, agricultural improvement or impacts on hydrology. The percentage threshold is generally set quite low such that impacts can be reversed before they become more severe.

### **5.3.4 Vegetation composition: non-native species**

An attribute for non-native species is common 4010 Wet heaths, 6230 *Nardus* grasslands\* and 7130 Blanket bogs (\* if active bog). Non-native species can be invasive and have deleterious effects on native vegetation. The target for both habitats is for the total cover of non-native species to be less than 1%. A low target is set as non-native species can spread rapidly and are most easily dealt with when still at lower abundances.

### **5.3.5 Vegetation composition: undesirable native species**

For 4010 Wet heaths, 6230 *Nardus* grasslands\* and 7130 Blanket bogs (\* if active bog), maximum percentage cover thresholds for undesirable native species are also set. These are detailed below.

#### **Bracken, native trees and shrubs**

The cover of bracken (*Pteridium aquilinum*) and native trees and shrubs is assessed for 4010 Wet heaths. Tree and shrub cover is assessed for 7130 Blanket bogs (\* if active bog). For 6230 *Nardus* grasslands\*, cover of shrubs, bracken and heath is considered within this criterion. High cover of bracken would indicate that the habitat may be succeeding towards a dense bracken community, and high cover of native trees and shrubs would indicate that the habitat may be succeeding towards scrub or woodland due to lack of grazing or, for bog habitats, due to the habitat drying out.

#### **Soft rush**

High cover of soft rush (*Juncus effusus*) in 4010 Wet heaths would suggest undesirable hydrological conditions. Note, however, that poor flushes dominated by soft rush often naturally occur in mosaic with these habitats. Discrete areas of this separate habitat should not be considered here. The target is for the cover of soft rush to be less than 10%.

### **Potential dominant species**

For 7130 Blanket bogs (\* if active bog), a maximum threshold is given for bog species which could potentially dominate the habitat, reflecting a reduction in diversity. The selected species are ling (*Calluna vulgaris*), many-stalked spike-rush (*Eleocharis multicaulis*), hare's-tail cottongrass (*Eriophorum vaginatum*), purple moor-grass (*Molinia caerulea*), black bog-rush (*Schoenus nigricans*) and deergrass (*Trichophorum germanicum*). The target is for cover of each of the potential dominant species to be less than 75%.

### **Dwarf shrub cover**

A dwarf shrub layer is characteristic of 4010 Wet heaths, but the vegetation should be a mixture of dwarf shrub and graminoid species with higher cover of dwarf shrubs being potentially indicative of drainage. A maximum target of 75% is therefore set.

### **Moss cover**

High cover of *Sphagnum* or *Polytrichum* mosses would not be characteristic of 6230 *Nardus* grasslands\*. Such levels may indicate changes in hydrology or soil nutrients within the habitat, but are more likely to indicate that the community is inherently a marginal example of Annex I habitat 6230\*. Maximum cover thresholds are set for *Sphagnum* cover to be less than or equal to 10% and for *Polytrichum* cover to be less than or equal to 25%.

## **5.4 Vegetation structure**

Vegetation structure is assessed through a number of attributes tailored to each of the habitats. These measures assess levels of grazing and browsing, burning and *Sphagnum* condition.

### **5.4.1 Browsing and grazing**

Browsing is generally measured through viewing the last complete season's shoots of particular species and assessing the proportion which shows signs of having been browsed. The species which are assessed for browsing are generally the dwarf shrub species: ericoids, crowberry (*Empetrum nigrum*) and bog-myrtle (*Myrica gale*). The target for 4010 Wet heaths and 7130 Blanket bogs (\* if active bog) is for less than 33% of shoots to show signs of browsing. Grazing levels for 6230 *Nardus* grasslands\* are assessed through vegetation height (see Section 5.4.4).

### **5.4.2 Burning**

Fires can be part of the natural cycle of heaths and may, under carefully controlled circumstances, be used as an occasional management tool to promote regeneration of, or diversity of growth phases, in ling (*Calluna vulgaris*). However, currently most hill fires in Ireland are intentionally started to encourage grass growth for livestock. Fires that are too intense, too frequent, too extensive or which occur in sensitive areas are damaging to habitats. An assessment of burning is made for 4010 Wet heaths and 7130 Blanket bogs (\* if active bog). Habitat-specific lists of sensitive areas where burning should not occur are presented in Perrin *et al.* (2014).

4010 Wet heaths and 7130 Blanket bogs (\* if active bog) have the same targets relating to there being no signs of burning into the moss, liverwort or lichen layer or exposure of peat surface due to burning and no signs of burning in sensitive areas.

### **5.4.3 Sphagnum condition**

Disturbance to *Sphagnum* is assessed for habitats 4010 Wet heaths and 7130 Blanket bogs (\* if active bog). High levels of disturbed *Sphagnum* would indicate undesirable levels of grazers. For both habitats, the target is for less than 10% of the *Sphagnum* cover to be crushed, broken and/or pulled up.

### **5.4.4 Vegetation height**

Vegetation height is used as an indication of grazing intensity for 6230 *Nardus* grasslands\*. At least 25% of the sward should be between 5cm and 50cm tall. These lower and upper height limits are set to record overgrazing and undergrazing respectively.

### **5.4.5 Forb to graminoid ratio and litter cover**

Two attributes unique to 6230 *Nardus* grasslands\* are forb to graminoid (grass/sedge/rush) ratio and litter cover. Forb richness is characteristic of conservation value swards. The target is for the forb component of the forb:graminoid ratio to be 20-90%.

High levels of leaf litter can be indicative of undergrazing and rank swards, with a resulting impact on species richness. The target is for a cover of litter less than or equal to 20%.

## **5.5 Physical structure**

The physical structure of the habitats can be damaged by drainage, walking trails, unsuitable levels of grazing and erosion. Physical structure is assessed through a number of attributes tailored to each of the habitats. Elements which are assessed for the habitats comprise disturbed bare ground, drainage and erosion; these are detailed below.

### **5.5.1 Disturbed bare ground**

This attribute is common to 4010 Wet heaths, 6230 *Nardus* grasslands\* and 7130 Blanket bogs (\* if active bog). Disturbance can include hoof marks, wallows, human foot prints, vehicle and machinery tracks. Excessive disturbance can result in loss of characteristic species and presage erosion for heaths and peatlands. The target for both habitats is set at there being less than 10% disturbed ground.

### **5.5.2 Drainage**

Drainage can result in loss of characteristic species and transition to drier habitats. This attribute is applied to 4010 Wet heaths and 7130 Blanket bogs (\* if active bog). For both habitats, the target is the area showing signs of drainage from heavy trampling, tracking or ditches to be less than 10%.

### **5.5.3 Erosion**

Erosion is assessed for 7130 Blanket bogs (\* if active bog) as it leads to loss of peat from the blanket bog system, increases in peat sediment in nearby water courses, loss of blanket bog habitat and drainage. The target for the habitat is less than 5% of the greater bog mosaic comprises erosion gullies and eroded areas. The greater bog mosaic incorporates the blanket bog itself and associated vegetation types and non-vegetation cover types that appear to have been derived from former blanket bog, including, but not limited to, bare peat, loose rock, gravel and running water.

### **5.5.4 Grazing or disturbance**

An additional assessment of grazing or disturbance is made for 6230 *Nardus* grasslands\* in the local vicinity of the monitoring stops. Serious grazing and disturbance can impact on species richness, nutrient status and soil stability. The target is for the area of habitat showing signs of serious grazing or disturbance to be less than 20m<sup>2</sup>.

## **5.6 Indicators of local distinctiveness**

Rare species (those considered at least *Near Threatened* on the appropriate Red Data List) which can be assigned to a particular habitat should be considered indicators of local distinctiveness for the habitat. The target is for no decline in distribution or population sizes of rare, threatened or scarce species associated with the particular habitat.

The *Near Threatened* moss *Campylopus shawii* (Lockhart *et al.*, 2012) occurs within flushed areas of the 7130 Blanket bog (\*if active bog) habitat in Glanmore Bog SAC (NPWS internal files).

Where hepatic mats of the *Calluna vulgaris-Herbertus aduncus* community have been recorded within a particular habitat, these should also be listed as indicators of local distinctiveness. No assessment of the conservation status of this community has been conducted but proposals for such an assessment are presented in Barron & Perrin (2014). The target for these hepatic mats is for no decline in status of hepatic mats associated with the habitat in question.

## 6 References

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