

INTERTIDAL HONEYCOMB WORM REEF

Sabellaria alveolata

Condition Monitoring results 2023

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agus Gnóthaí Tuaithe**

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Summary

This report provides a status update on the extent and condition of intertidal honeycomb worm (*Sabellaria alveolata*) reef in Northern Ireland based on surveys undertaken in 2022-2023. Introductory information is provided on *Sabellaria* spp. reef habitats, their conservation importance and key pressures, along with results from targeted intertidal monitoring.

While two *Sabellaria* species occur in Northern Irish waters (*S. alveolata* and *S. spinulosa*), the survey results presented in this report relate exclusively to intertidal *S. alveolata*. *S. spinulosa* is predominantly subtidal in Northern Ireland; although reef-forming aggregations have been recorded by DAERA and AFBI in offshore and subtidal locations, these habitats are outside the scope of the present study.

The report concludes that intertidal *S. alveolata* reef is currently confirmed at a single site; Glasdrumman Co. Down. Colonies recorded elsewhere do not meet the minimum threshold criteria to qualify as reef habitat. At Glasdrumman, *S. alveolata* forms extensive sheet reef with clumps covering large areas of the rocky substrate. Continued monitoring is recommended to ensure conservation objectives for this designated feature of the Mourne Coast ASSI continue to be met.



Figure 256 – Intertidal *Sabellaria alveolata* reef

Introduction

What are *Sabellaria* reefs and where are they found?

Sabellaria reefs are biogenic habitat formed by dense aggregations of tube-building polychaete worms of the family *Sabelliidae*. Two reef-forming species occur in the North East Atlantic: the typically intertidal *Sabellaria alveolata*, commonly known as honeycomb worm, and the predominantly subtidal *Sabellaria spinulosa*. Reefs are constructed from coarse sand particles and typically occur in areas where hydrodynamic conditions provide a continuous supply of suspended sediment (Benson, et al., 2013).

Historically intertidal *S. alveolata* reefs have not been extensively surveyed around the island of Ireland (Firth, et al., 2021). They are restricted in distribution and have been recorded at only a small number of locations along the east coast of Northern Ireland. Firth, et al (2021) describe the long term temporal changes in distribution of *S. alveolata* reef around Ireland, indicating two consistent reefs on the east coast of Northern Ireland at Glasdrumman and Coney Island. As part of DAERA's condition assessment monitoring programme for [Areas of Special Scientific Interest \(ASSI\)](#), *S. alveolata* reefs in [Tyrella and Minerstown ASSI](#) were monitored in 2014 and 2017, while the reefs in [Mournes Coast ASSI](#) were monitored in 2016 and 2017.

This report provides an updated assessment of the extent, condition and ecological quality of intertidal *S. alveolata* reef in Northern Ireland, using habitat mapping and characterisation methods consistent with current best practice guidance detailed by Natural Resources Wales (NRW) (Natural Resources Wales, 2019).

Ecosystem Services provided by *Sabellaria* Reef

Sabellaria reef provide important ecosystem services. The three-dimensional reef structure stabilises sediment, modifies hydrodynamic conditions and supports distinct biological communities that differ markedly from surrounding sediment or rock habitats.

Intertidal *S. alveolata* reef has shown to increase local biodiversity, with different stages of reef development supporting different associated assemblages. While living reef is often dominated by *Sabellaria* tubes, older or partially degraded reef can support a higher diversity of benthic fauna due to increased habitat complexity and

the availability of vacant tubes. (Dubois, et al., 2002; Firth, et al., 2021; Jones, et al., 2018)

S. alveolata reef is exploited for commercial species in St Michel, France (such as *Mytilus edulis* and *Cerastoderma edule*). Additionally, reefs can be exploited for bait, either for *S. alveolata* individuals themselves or reef associated polychaete species (*Nereis* and *Nephtys*) and periwinkle hand gathering (Firth, et al., 2021). Studies indicate the *S. alveolata* reef can increase benthic primary production, which may represent an important food source to other filter feeding species and highlights the importance of *S. alveolata* in nutrient cycling (Jones, et al., 2018). Studies also note the role *S. alveolata* reef plays in water filtration and its influence on local flow conditions (Dubois, et al., 2006).

Conservation Importance of *Sabellaria* Reef

S. alveolata reefs are recognised as priority marine habitats at regional, national and international levels and is included in the UK Biodiversity Action Plan. (BRIG (ed. Ant Maddock), 2008)

The *S. alveolata* reef at Glasdrumman is a notified feature of the Mourne Coast ASSI and therefore, benefits from direct statutory protection. While *S. alveolata* reef at Coney Island in Tyrella and Minerstown ASSI is not a designated feature, it is afforded indirect protection under the conservation objectives for intertidal habitats¹.

Northern Ireland Habitat Action plans have been in place since 2005 for both *S. alveolata* (DAERA, 2005) including recommendations to improve understanding of



Figure 257 – Biogenic reef habitat at Glasdrumman (2016)

¹ [Searching protected areas | Department of Agriculture, Environment and Rural Affairs](#)

the extent, quality and distribution *Sabellaria* reef.

Defining *Sabellaria* Reef

Habitat characterisation surveys have been developed by NRW to collect data necessary to define *Sabellaria* reefs. Sampling is conducted on specific ecological parameters to determine the stage of development of *Sabellaria* colonies. Guidance on the recommended categories for reef forming *Sabellaria* species is outlined in Table 1:

Table 1 - *S. alveolata* Reef Categories taken from NRW Guidance (2019)

Reef Category	Qualifying Extent	Thickness	Colony Structure	Habitat Character
Veneers	Do not qualify as reef	< 2 cm	Low-lying, encrusting colonies with overlapping tubes lying at an acute angle (often opposing wave action)	May cover large areas of rocky shore; often beneath fucoid algal canopy
Clumps	> 25 m ²	> 2 cm	Patchy or sheet-forming colonies with Vertical tubes	May coalesce to form sheets over mixed sediment.
Hummocks	> 25 m ²	> 2 cm	Rounded, ball-shaped colonies with Tubes radiating from a central point	Form continuous platforms when coalesced, intertidal pools may form between colonies.
Platforms	> 25 m ²	Often > 50 cm	Flat, continuous structures formed from fully coalesced hummocks	Continuous flat platforms formed over consolidated boulders or pebbles, outcompeting other sessile fauna.

Methodology

Survey Design

A desk review was conducted to identify sites where *Sabellaria* reef might be located. Sources included; historical records of *S. alveolata* on NBN Atlas, locations identified from the Littoral Survey Northern Ireland (NILS) 1984-1988, published scientific literature and previous DAERA condition assessment surveys. Sites identified are listed in Table 3.

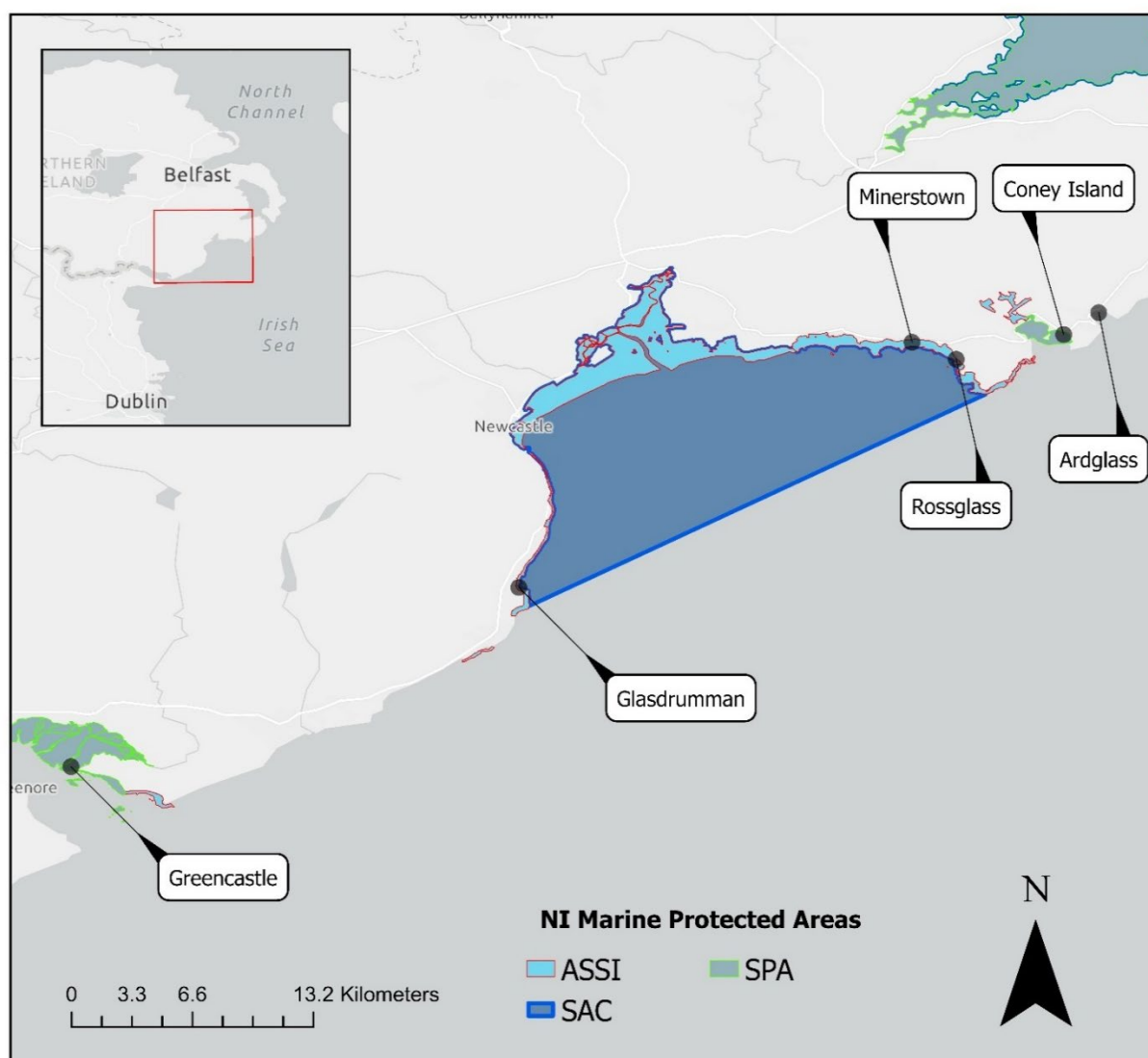


Figure 258 - South Down Coast with sites selected for investigation and MPA boundaries

Table 2 – List of Potential Intertidal *Sabellaria* Reef Sites

<i>Sabellaria</i> Intertidal Sites	Lat	Long
Ardglass	54.264757	-5.604594
Minerstown	54.25021	-5.696127
Rossglass	54.241875	-5.674528
Coney Island	54.25403	-5.621786
Glasdrumman	54.12985	-5.888992
Greencastle	54.041912	-6.108623

Site visits were conducted in 2022 to determine the presence or absence of *Sabellaria* reef. Where present, the reef was visually assessed to determine the suitability of habitat mapping methods. The methods outlined below were developed based on the guidance note from NRW (2019).

A ‘walkover’ survey was the most suitable method of mapping intertidal reefs, with the following broadscale ecological parameters selected for survey:

- Reef extent
- Reef elevation
- Reef percentage cover (patchiness)

Additionally, the below measures of reef condition were selected:

- Reef biota – Identification of macrofauna and macroalgae present
- Presence of live or dead *Sabellaria* individuals
- Estimation of the number of live *Sabellaria* worms present.
- Presence of faecal pellets between tubes

Field Survey Methodology

1. Using a GPS antennas and tablet, the perimeter of the *Sabellaria* colony was recorded; where only a small clump was present, a point and a photograph with a ruler for scale were taken. The average elevation in centimetres was measured.
2. Quadrats were placed at random points throughout the *Sabellaria* reef and percentage cover was estimated for each; point locations were recorded with a tablet and GPS antenna. The number of quadrats depended on the size of the reef, with a minimum of five recorded.
3. The species of macrofauna and macroalgae within each quadrat were identified and recorded.
4. The presence of live or dead *Sabellaria* individuals was recorded.
5. Where present, live individual *Sabellaria* worms were photographed and counted; if large numbers were present, percentage cover was estimated.
6. The presence or absence of faecal pellets was recorded.
7. Any apparent pressures impacting the *Sabellaria* reef were identified and recorded.

Results

Habitat Mapping and Characterisation

Of the five sites identified for investigation of *S. alveolata* reef habitat, only three were found to have reef present in 2022-2023.

Minerstown

Historic records indicated that *S. alveolata* reef had been recorded at Minerstown in 1985. In 2017 the reefs were surveyed as part DAERA's condition assessment monitoring programme, with a mixture of live and dead *Sabellaria* reef identified. Patches of reef extent totalling an area of 0.20 hectares were mapped using GPS devices. The return site visit in 2022 recorded only a single *S. alveolata* colony less than 1m² in extent which was unsuitable for extent mapping. Photographic records of the remaining reef are shown below.



Figure 259 - Remaining *Sabellaria alveolata* reef recorded at Minerstown, Co Down

Ardglass

S. alveolata reef was reported at a single location by DAERA staff in Ardglass harbour in 2022. On a return visit the reef extent measured less than 1m² square and therefore did not meet the minimum area outlined by NRW (2019) for reef and was not suitable for extent mapping.



Figure 4 - *Sabellaria* reef recorded at Ardglass harbour, Co. Down.

Glasdrumman

S. alveolata reef has been consistently recorded at Glasdrumman between 1985 and 2017. This is a designated feature of [Mourne Coast ASSI](#). As part of the statutory Marine Protected Areas monitoring programme, the extent of the *S. alveolata* reef was assessed and mapped in 2007, 2016 and 2017 (table 4). In the previous reporting period (2013-2018), the feature ‘*Sabellaria alveolata* reef’ was considered in Favourable condition. In 2022, ‘reef height’ was measured.

Table 3 - *Sabellaria* Extent per survey year

Survey Year	Extent Area (hectares)	Mean Percentage Cover (%)	Reef Height (cm)
2007	0.5036	NA	NA
2016	0.1220	NA	NA
2017	0.2777	NA	NA
2022	NA	NA	9.75
2023	1.6207	34.89	5.17

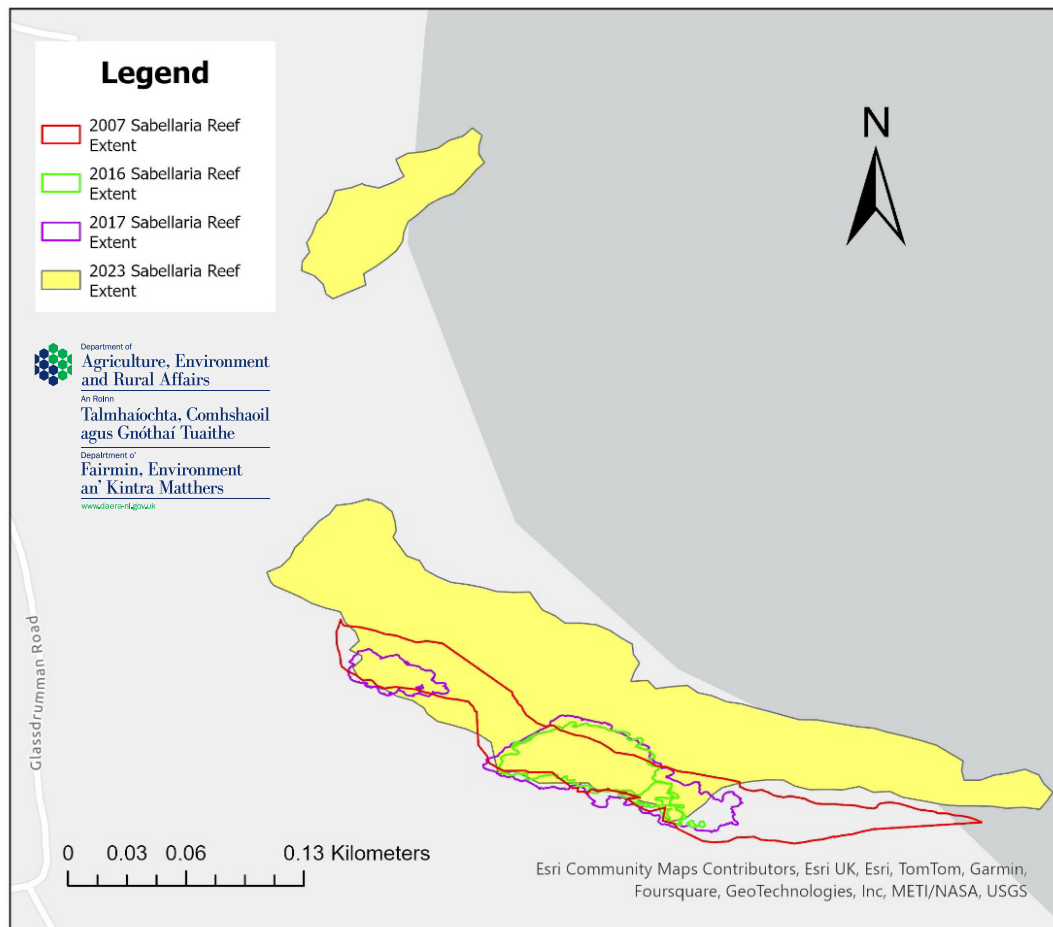


Figure 260 - Glasdrumman Sabellaria Reef Extent per year monitored from 2007-2023

Reef extent in 2023 was determined to be 1.6207 hectares, a significant increase from previous years (table 4). During the 2023 habitat characterisation survey, 27 quadrats points were taken throughout the reef to estimate percentage cover and record colony elevation. Average percentage cover over the reef area in 2023 was estimated at 34.89%, while mean colony elevation was determined to be 5.17cm. This suggests a decrease in mean elevation from 2022, which was 9.75cm.

A list of associated flora and fauna was recorded (Appendix A) along with the presence of live or dead *Sabellaria* individuals. Although there were no live individuals recorded, the presence of crisp intact tube apertures indicates that portions of the reef are indeed live.

Using the reef form definitions recommended by NRW the Glasdrumman, *S. alveolata* colonies can be considered a reef as the mean colony elevation is greater

than 2cm², the extent exceeds 25m² and the average percentage cover exceeds 10%.

The reef form at Glasdrumman appears to be a combination of veneers and more substantial clumps that have coalesced to form sheet formations.



Figure 261 - Examples of *Sabellaria* reef at Glasdrumman, Co. Down. A veneer under a canopy of furoid algae (left) and coalesced clumps over mixed sediment (right).

Discussion

Of the intertidal *Sabellaria* reef sites investigated, the Glasdrumman site represents the only remaining example of an established *S. alveolata* reef in Northern Ireland. Colonies recorded at Ardglass harbour and Minerstown did not qualify as reef habitat under recognised criteria (Gubbay, 2007; Natural Resources Wales, 2019; Duncan, et al., 2022).

The Glasdrumman reef is made up of portions of live reef and portions in retrograde. Although portions of the reef may not be living, research indicates that degraded reef in fact supports a greater diversity of benthic fauna than living reef (Dubois, et al., 2002; Firth, et al., 2021). It is, therefore, important to consider that while the reef is in retrograde it is still providing habitat for a unique community of infauna.

The reef extent and distribution at Glasdrumman have varied considerably over the years for which data exists. The reef extent is currently three times larger than its earliest measurement, 1.6207 hectares in 2023 compared to 0.5036 hectares in 2007 and has fluctuated significantly in the years between. The recorded reef elevation also varies between 2022 and 2023, decreasing from 9.75cm mean elevation to 5.17cm. This may indicate that while the reef appears to have increased in extent, some colonies may be only recently established while others may be degraded. It should be noted that this variation is characteristic of *Sabellaria* reef, which is known to be a dynamic habitat, capable of varying greatly from year to year (Firth, et al., 2021) and with different stages of reef evolution existing within the same overall structure (Dubois, et al., 2006).

Recent research in Ireland indicates that the North Eastern region, including the Co. Down coast, is particularly vulnerable to local extinctions possibly associated with increased wave height (Firth, et al., 2021). The study mentions 3 local extinctions in the North East and includes a 1953 report from Rossglass of a “*Sabellaria* belt approximately 1.8m in depth that extends 185m”. A return site visit to Rossglass confirmed the absence of any *Sabellaria* colony at present. Without clear evidence of disturbance, it is not possible to say what has caused local extinctions, although recent periods of winter storms may have been a factor.

While local extinctions have occurred, it should be noted that *S. alveolata* larvae will preferentially resettle on the tubes of conspecific adults, including vacant tubes on portions of retrograde reef (Natural Resources Wales, 2019; Dubois, et al., 2002). This highlights the importance of retrograde portions of reef at Glasdrumman, as well as the smaller colonies at Ardglass and Minerstown. While these small colonies may not constitute a reef today, with settlement of larvae they may reach the threshold to be considered reefs in the future.

The main biotope recorded at Glasdrumman was [LS.LBR.Sab.Salv](#) and [LS.LBR.Sab](#) with *Steromphala umbilicalis*, *Semibalanus balanoides*, *Nucella lapillus* and *Littorina* species found within. The biotopes above the intertidal *Sabellaria* reef included rockpools dominated by *Corallina* species, fucoid mosaics and sand with *Arenicola*. Species found within quadrats are listed in the appendix A.

Conclusion

This investigation provides the first comprehensive habitat characterisation of intertidal *Sabellaria alveolata* reef in Northern Ireland. The survey confirms that the Glasdrumman reef meets the qualifying criteria for reef habitat and is currently the only confirmed intertidal *Sabellaria* reef in the region.

Given the ecological importance, rarity and dynamic nature of this habitat, continued monitoring is recommended to ensure that existing conservation measures within the Mourne Coast ASSI remain effective.

Subtidal *Sabellaria* reefs remain outside the scope of this report; however, investigations into their extent and condition are ongoing through DAERA and AFBI subtidal monitoring programmes.

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Appendix A.

Species recorded

Table A.1: List of species found within quadrats

Type	Species	Common name
Algae	<i>Fucus ceranoides</i>	Horned wrack
Algae	<i>Fucus serratus</i>	Toothed wrack
Algae	<i>Fucus vesiculosus</i>	Bladder wrack
Algae	<i>Hildenbrandia rubra</i>	R Rusty rock
Algae	<i>Palmaria palmata</i>	Dulse
Algae	<i>Ulva compressa</i>	Enteromorpha compressa
Algae	<i>Ulva linza</i>	Doubled ribbon weed
Algae	<i>Ulva prolifera</i>	Green sea lettuce
Annelida	<i>Arenicola marina</i>	Blow lug
Crustacea	<i>Austrominius modestus</i>	Modest barnacle
Crustacea	<i>Carcinus maenas</i>	Common shore crab
Crustacea	<i>Chthamalus stellatus</i>	Poli's stellate barnacle
Crustacea	<i>Psidia longicornis</i>	Long-clawed porcelain crab
Crustacea	<i>Semibalanus balanoides</i>	Common rock barnacle
Fish	<i>Pholis gunnellus</i>	Butterfish
Mollusca	<i>Littorina littorea</i>	Common periwinkle
Mollusca	<i>Littorina obtusata</i>	Common flat periwinkle

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Mollusca	<i>Littorina saxatilis</i>	Rough periwinkle
Mollusca	<i>Patella vulgata</i>	Common limpet
Mollusca	<i>Phorcus lineatus</i>	Thick top shell
Mollusca	<i>Steromphala umbilicalis</i>	Flat top shell

Appendix B.

Pressures Impacting *Sabellaria* Reef

In addition to direct physical pressures, climate-driven changes such as increased storm frequency, wave energy and sea-level rise are considered to represent significant ongoing pressures for intertidal *S. alveolata* reef habitats.

Sabellaria reef may be impacted by new developments in the marine environment and activities associated with construction (Natural Resources Wales, 2019), commercial or recreational fishing (Pearce, et al., 2011) or bait digging (Firth, et al., 2021). Further pressures are likely to result from changes to sea surface temperatures and storminess driven by global climate change (Firth, et al., 2021).

A sensitivity analysis of *Sabellaria* reef habitat conducted using the MarESA (Marine Evidence based Sensitivity Assessment) method (Tyler-Walters, et al., 2018) is available at the [MarLIN](#) website (MarLIN, 2024). *Sensitivity* is defined as the likelihood of damage due to a pressure and is considered a function of the species inherent *resistance* to change and its *resilience* (ability to recover from damage).

Table 1 (below) presents a list of pressures that could impact *Sabellaria* habitat, along with the associated sensitivity, resistance and resilience. Example activities related to key pressures are listed below, further information is available from [JNCC Marine Pressures and Activities Database](#) (Robson, et al., 2018)

Table B.1 – Key pressures where sensitivity has been assessed for *S. alveolata* and *S. spinulosa* reef (Ref. MARLIN)

JNCC Code	EUNIS Code	EUNIS Name	Pressure	Sensitivity
LS.LBR.Sab.Salv	A2.711	[<i>Sabellaria alveolata</i>] reefs on sand-abraded eulittoral rock	Sea level rise (extreme)	High
LS.LBR.Sab.Salv	A2.711	[<i>Sabellaria alveolata</i>] reefs on sand-abraded eulittoral rock	Sea level rise (high)	High
LS.LBR.Sab.Salv	A2.711	[<i>Sabellaria alveolata</i>] reefs on sand-abraded eulittoral rock	Physical loss (to land or freshwater habitat)	High
LS.LBR.Sab.Salv	A2.711	[<i>Sabellaria alveolata</i>] reefs on sand-abraded eulittoral rock	Physical change (to another seabed type)	High
LS.LBR.Sab.Salv	A2.711	[<i>Sabellaria alveolata</i>] reefs on sand-abraded eulittoral rock	Introduction or spread of non-indigenous species	High
LS.LBR.Sab.Salv	A2.711	[<i>Sabellaria alveolata</i>] reefs on sand-abraded eulittoral rock	Sea level rise (middle)	Medium

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LS.LBR.Sab.Salv	A2.711	[<i>Sabellaria alveolata</i>] reefs on sand-abraded eulittoral rock	Emergence regime changes - local	Medium
LS.LBR.Sab.Salv	A2.711	[<i>Sabellaria alveolata</i>] reefs on sand-abraded eulittoral rock	Habitat structure changes - removal of substratum (extraction)	Medium
LS.LBR.Sab.Salv	A2.711	[<i>Sabellaria alveolata</i>] reefs on sand-abraded eulittoral rock	Changes in suspended solids (water clarity)	Medium
LS.LBR.Sab.Salv	A2.711	[<i>Sabellaria alveolata</i>] reefs on sand-abraded eulittoral rock	Removal of non-target species	Medium
LS.LBR.Sab.Salv	A2.711	[<i>Sabellaria alveolata</i>] reefs on sand-abraded eulittoral rock	De-oxygenation	Low
LS.LBR.Sab.Salv	A2.711	[<i>Sabellaria alveolata</i>] reefs on sand-abraded eulittoral rock	Abrasion / disturbance of the substratum on the surface of the seabed	Low
LS.LBR.Sab.Salv	A2.711	[<i>Sabellaria alveolata</i>] reefs on sand-abraded eulittoral rock	Barrier to species movement	Low

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CR.MCR.CSab	A4.22	[<i>Sabellaria</i>] reefs on circalittoral rock	Physical loss (to land or freshwater habitat)	High
CR.MCR.CSab	A4.22	[<i>Sabellaria</i>] reefs on circalittoral rock	Physical change (to another seabed type)	High
CR.MCR.CSab	A4.22	[<i>Sabellaria</i>] reefs on circalittoral rock	Abrasion / disturbance of the substratum on the surface of the seabed	Medium
CR.MCR.CSab	A4.22	[<i>Sabellaria</i>] reefs on circalittoral rock	Removal of non-target species	Medium
CR.MCR.CSab	A4.22	[<i>Sabellaria</i>] reefs on circalittoral rock	Barrier to species movement	Low

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