Saccharina latissima, foliose red seaweeds, sponges and ascidians on tide-swept infralittoral rock

MarLIN – Marine Life Information Network
Marine Evidence–based Sensitivity Assessment (MarESA) Review

Dr Keith Hiscock

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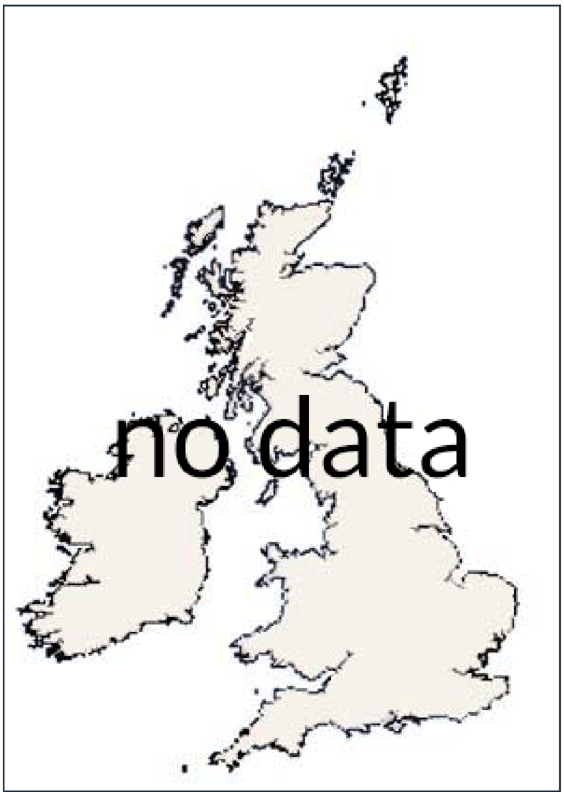

Biotope distribution data provided by EMODnet Seabed Habitats (www.emodnet-seabedhabitats.eu)

Researched by Dr Keith Hiscock **Refereed by** This information is not refereed.

Summary

UK and Ireland classification

EUNIS 2008
JNCC 2015
JNCC 2004
1997 Biotope

Description

Sheltered, tide-swept, rock with dense *Saccharina latissima* forest and an under-storey (sometimes sparse) of foliose seaweeds such as *Plocamium cartilagineum*, *Brongniartella byssoides*, *Ceramium nodulosum*, *Lomentaria clavellosa* and *Cryptopleura ramosa*. On the rock surface, a rich fauna comprising sponges (particularly *Halichondria panicea*) anemones (such as *Urticina felina*), colonial ascidians (*Botryllus schlosseri*) and the bryozoan *Alcyonidium diaphanum*. Areas that are scoured by sand or shell gravel may have a less rich fauna beneath the kelp, with the rock surface characterized by encrusting coralline algae, *Balanus crenatus* or *Spirobranchus triqueter*. Good examples of this biotope may have maerl gravel or rhodoliths between cobbles and boulders. (Information taken from the Marine Biotope Classification for Britain and Ireland, Version 97.06: Connor *et al.*, 1997a, b).

Depth range

-

Additional information

-

Listed By

- none -

Further information sources

Search on:

JNCC

Habitat review

Ecology

Ecological and functional relationships

Tide-swept areas provide favourable locations for rapid growth of a variety of suspension feeding species and therefore competition for space between them. The sponges *Halichondria panicea* and *Hymeniacidon perleve* together with other sponge species especially compete for space and may overgrow each other or, more often, grow against each other in a mutual stand-off whilst extensively overgrowing other encrusting fauna especially *Balanus crenatus*. Animals such as *Halichondria panicea* and *Botryllus schlosseri* are likely to predominate over algae in growing on kelp stipes and may engulf the fronds of red algae. Where massive growths of the sponge *Halichondria panicea* occur, they may provide a significant habitat for other species especially amphipods and *Caprella linearis* appears to be chemically attracted to the sponge. The fauna associated with sponges may be a significant food source for fish (Peattie & Hoare, 1981). Grazing species, especially chitons, do occur and may maintain rocks clear of epibiota except for encrusting coralline algae.

Seasonal and longer term change

No specific information has been found in relation to this biotope. However, red algae are likely to show a seasonal change in condition of the fronds.

Habitat structure and complexity

There are a wide range of microhabitats within this biotope. They include sediments, sometimes maerl, where infauna will occur, underboulder habitats, the sides and tops of boulder which often have different dominant species, the interstices of massive sponge growths, the holdfasts of kelp plants and the fronds of kelps and other algae.

Productivity

No specific information found has been found but the communities in this biotope are likely to be highly productive. The biotope occurs in shallow depths where both high light intensity and, because of tidal flow, high supply of nutrients to algae will result in high primary productivity. Secondary productivity will also be high as the flow of suspended food is high.

Recruitment processes

The characterizing species in this biotope all have planktonic larvae and are fairly short-lived. There is therefore high recruitment and high turnover.

Time for community to reach maturity

The community would probably reach maturity within 3-4 years although recruitment of additional species to the biotope would continue for some further time.

Additional information

This biotope is remarkable because, even in shallow depths where algae normally predominate, animals - especially sponges - are likely to be dominant. It seems that sponges will out-compete algae where food supply is sufficient.

Preferences & Distribution

Habitat preferences

Depth Range	
Water clarity preferences	
Limiting Nutrients	No information found
Salinity preferences	
Physiographic preferences	
Biological zone preferences	
Substratum/habitat preferences	
Tidal strength preferences	
Wave exposure preferences	
Other preferences	

Additional Information

Species composition

Species found especially in this biotope

Rare or scarce species associated with this biotope

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Additional information

Sensitivity review

Explanation

The species selected to assess sensitivity in this biotope are predominantly space occupiers that characterize the biotope. *Saccharina latissima* does and *Halichondria panicea* may include important structural features supporting other species. *Delesseria sanguinea* is selected as a representative red algae which, although not listed as characterizing species in the biotope classification, does occur in the biotope and has significant research information that should represent other red algal species. Although encrusting red algae occur in scoured situations in this biotope, they are not included as representative species here as a distinctive feature of this biotope is that overgrowth by animals is extensive.

Species indicative of sensitivity

Community Importance	Species name	Common Name
Important other	*Botryllus schlosseri*	Star sea squirt
Important characterizing	*Delesseria sanguinea*	Sea beech
Important functional	*Halichondria panicea*	Breadcrumb sponge
Key structural	*Saccharina latissima*	Sugar kelp

Physical Pressures

	Intolerance	Recoverability	Sensitivity	Richness	Confidence
Substratum Loss	High	High	Moderate	Major decline	Moderate

Most of the species characteristic of this biotope are permanently attached to the substratum so would be removed upon substratum loss. For recoverability, see Additional Information.

	Intolerance	Recoverability	Sensitivity	Richness	Confidence
Smothering	Intermediate	High	Low	Decline	Moderate

Some species, especially *Saccharina latissima*, are likely to protrude above smothering material. Others such as the active suspension feeders and foliose algae are likely to be killed by smothering. For recoverability, see Additional Information.

	Intolerance	Recoverability	Sensitivity	Richness	Confidence
Increase in suspended sediment	Low	Very high	Very Low	No change	Moderate

Increased suspended sediment levels will reduce the amount of light reaching the seabed and may therefore inhibit photosynthesis of the algal component of the biotope. However, the biotope occurs in very shallow depths and algae are likely to survive. Increased suspended sediment is unlikely to have a significant effect in terms of smothering by settlement in the regime of strong water flow typical of this biotope. However, silt may clog respiratory and feeding organs (especially sea squirts). Since many of the species in this biotope live in areas of high silt content (turbid water) it is expected that they would survive increased levels of silt in the water. Both algae and animals would suffer some decrease in viability. On return to lower suspended sediment levels it is expected that recovery of condition will be rapid.

	Intolerance	Recoverability	Sensitivity	Richness	Confidence
Decrease in suspended sediment	Low	High	Moderate	Minor decline	Moderate

Decreased suspended sediment levels will increase the amount of light reaching the seabed and may therefore increase competitiveness of the algal component of the biotope. Suspended sediment may include organic matter and a decrease may reduce the amount of food available to suspension feeding animals. Both algae and animals would suffer some decrease in viability. On return to higher suspended sediment levels it is expected that recovery of condition will be rapid.

Dessication	Intermediate	High	Low	Minor decline	Moderate

The biotope is predominantly sublittoral but does extend onto the shore and therefore has some ability to resist desiccation. On a sunny day at low water of spring tides, damage (bleaching) is likely to occur to the *Saccharina latissima* plants but not destroy them completely. Species living below the kelp fronds will be protected by them from the worst effects of desiccation. Sponges, such as *Halichondria panicea*, are likely to withstand some desiccation as they hold water.

Increase in emergence regime	High	High	Moderate	Major decline	Low

The biotope is predominantly sublittoral and the dominant species (*Saccharina latissima*) and many of the subordinate species, especially solitary sea squirts, are unlikely to survive an increased emergence regime. Several mobile species are likely to move away. However, providing that suitable substrata are present, the biotope is likely to re-establish further down the shore within a similar emergence regime to that which existed previously. For recoverability, see additional information below.

Decrease in emergence regime	Tolerant*		Not sensitive	No change	High

The biotope is subtidal and thrives in fully submerged conditions.

Increase in water flow rate	Intermediate	High	Low	Minor decline	Low

Increase in tidal flow rates may dislodge substrata (especially where large plants of *Saccharina latissima* subject to drag are attached to cobbles). Also, increased water flow rate may result in certain species being unable to feed when water flow is likely to damage feeding organs (see Hiscock 1983). However, it is unlikely that species attached to non-mobile substrata in the biotope will be killed by an increase in flow rate. Therefore a decline in the abundance of some species that are swept away is suggested with some reduction in viability of others depending on whether the current velocity reaches a high enough level to inhibit feeding.

Decrease in water flow rate			Not sensitive*	Not relevant	

Decreased water flow will lead to a reduced competitive advantage for suspension feeding animals especially sponges which will decline in growth rate so that seaweeds will tend to become more dominant. Reduction in water flow rate will also allow settlement of silt with associated smothering. It is therefore expected that, although there might be only a minor decline in species, the biotope will change, possibly to SIR.Lsac.Cod (Sparse *Laminaria saccharina* with *Codium* spp. and sparse red seaweeds on heavily silted very sheltered infralittoral rock). Because the biotope is likely to change, an intolerance of high is given. For recoverability, see Additional Information.

Increase in temperature	Low	Very high	Very Low	No change	Low

The biotope occurs in warmer and colder parts of Britain and Ireland and similar assemblages of species are known to occur in Scandinavia and in Brittany so that long-term temperature change is unlikely to cause a significant impact. However, exposure to high temperatures for several days may produce stress in some component species but recovery would be expected to be rapid.

Decrease in temperature	Low	Very high	Moderate	No change	Low

The biotope occurs in warmer and colder parts of Britain and Ireland and similar assemblages of species are known to occur in Scandinavia and in Brittany so that long-term temperature change is unlikely to cause a significant impact. There is a single record of *Halichondria panicea* being adversely affected by frost during the 1963/64 winter (Crisp, 1964).

Increase in turbidity	Low	High	Low	Minor decline	Moderate

Several of the characteristic species are algae that rely on light for photosynthesis. Reduction in light penetration as a result of higher turbidity is unlikely to be fatal to algae in the short term but in the long term will result in a reduction in downward extent and therefore overall extent of the biotope. Species richness may decline in the long-term as algae are unable to survive high turbidity and low light but reduced extent of the biotope (depth limits) is the most significant likely decline.

Decrease in turbidity	Tolerant*		Not sensitive	No change	Low

Decreased turbidity and the subsequent increase in light levels is likely to result in an extension of the downward extent of the biotope. Not sensitive* is therefore indicated.

Increase in wave exposure	High	High	Moderate	Major decline	Moderate

This is a fundamentally sheltered coast biotope with species that do not appear to occur in wave exposed situations. Increased wave action is likely to dislodge *Saccharina latissima* plants and interfere with feeding in solitary tunicates. Massive growths of *Halichondria panicea* are likely to be displaced. Although 'major decline' is indicated with regard to species richness, the results of increased wave exposure would be replacement of biotope-characteristic species with others and the development of a different biotope. A change of biotope means high intolerance. On return to previous conditions, the 'new' biotope would have to degrade before SIR.Lsac.T developed. Nevertheless, such a change should occur within five years and a recoverability of high is indicated (see additional information below). For recoverability, see Additional Information.

Decrease in wave exposure			Not sensitive*	Not relevant	

This biotope occurs in locations not subject to any significant wave exposure so that decrease in wave exposure is considered not relevant.

Noise	Tolerant	Not relevant	Not relevant	No change	High

The macroalgae characterizing the biotope have no known sound or vibration sensors. The response of macroinvertebrates is not known.

Visual Presence	Tolerant	Not relevant	Not relevant	No change	High

Macrophytes have no known visual sensors. Most macroinvertebrates have poor or short range perception and are unlikely to be affected by visual disturbance such as shading.

Abrasion & physical disturbance	High	High	Moderate	Major decline	High

Saccharina latissima, other algae, sponges and the large solitary tunicates are likely to be removed from the substratum by physical disturbance. Physical disturbance will also overturn boulders and cobbles so that the epibiota becomes buried. Mortality of species is therefore likely to be high although many, particularly mobile species, will survive. For recoverability, see additional information.

Displacement	Intermediate	High	Low	Decline	Moderate

Although many of the species in the biotope are sessile and would therefore be killed if removed from their substratum, displacement will often be of the boulders or cobbles on which the community occurs in which case survival will be high. The 'Intermediate' ranking given here supposes that some individual sessile organisms will be removed and die. Mobile organisms such as the prosobranchs in the biotope are likely to survive displacement. Recovery rate assumes that the characteristic species of the biotope will remain, albeit in lower numbers. However, where species have been removed, most have a planktonic larva and/or are mobile and so can migrate into the affected area. For recoverability, see Additional Information.

Chemical Pressures

	Intolerance	Recoverability	Sensitivity	Richness	Confidence
Synthetic compound contamination	High	High	Moderate	Decline	Moderate

Several of the species characteristic of the biotope are reported as having high intolerance to synthetic chemicals. For instance, Cole *et al.* (1999) suggested that herbicides such as Simazine and Atrazine were very toxic to macrophytic algae. Hiscock & Hoare (1974) noted that almost all red algal species and many animal species were absent from Amlwch Bay in North Wales adjacent to an acidified halogenated effluent. Red algae have also been found to be sensitive to oil spill dispersants (O'Brien & Dixon 1976; Grundy quoted in Holt *et al.*, 1995). Recovery is likely to occur fairly rapidly. For recoverability, see Additional Information.

	Intolerance	Recoverability	Sensitivity	Richness	Confidence
Heavy metal contamination		Not relevant		Insufficient information	Not relevant

Insufficient information.

	Intolerance	Recoverability	Sensitivity	Richness	Confidence
Hydrocarbon contamination	Intermediate	High	Low	Decline	Low

Red algae have been found to be sensitive to oil and oil spill dispersants (O'Brien & Dixon, 1976; Grundy quoted in Holt *et al.*, 1995). Foliose red algae in the biotope may therefore be subject to bleaching and death. Holt *et al.* (1995) reported that *Saccharina latissima* (studied as *Laminaria saccharina*) had been observed to show no discernible effects from oil spills. The shallow nature of this biotope suggests that oil might diffuse in significant quantities to the biota. However, the presence of strong tidal flow makes it likely that oil will be flushed away. Overall, an intolerance of intermediate is suggested.

	Intolerance	Recoverability	Sensitivity	Richness	Confidence
Radionuclide contamination		Not relevant		Insufficient information	Not relevant

Insufficient information.

	Intolerance	Recoverability	Sensitivity	Richness	Confidence
Changes in nutrient levels	Low	High	Low	Minor decline	Low

Evidence is equivocal. For *Saccharina latissima* (studied as *Laminaria saccharina*), Conolly & Drew (1985) found that plants at the most eutrophic site in a study on the east coast of Scotland where nutrient levels were 25% higher than average exhibited a higher growth rate. However, Read *et al.* (1983) reported that, after removal of a major sewage pollution in the Firth of Forth, *Saccharina latissima* (studied as *Laminaria saccharina*) became abundant where previously it had been absent. Increased nutrients may increase the abundance of ephemeral algae and result in smothering or changing the character of the biotope. Any recovery is likely to be high as species are unlikely to be completely lost and have planktonic larvae and high growth rates. See also Additional Information.

Increase in salinity	Tolerant	Not relevant	Not relevant	No change	Moderate

The biotope occurs in full or variable salinity conditions and does not include species that are characteristically found in low salinity and that would be lost by an increase in salinity.

Decrease in salinity	Intermediate	High	Low	Minor decline	Moderate

The biotope occurs in situations that are naturally subject to fluctuating or low salinities: it grows in areas where freshwater run-off dilutes near-surface waters and most components are likely to survive reduced salinity conditions. For instance, *Saccharina latissima* (studied as *Laminaria saccharina*) can survive in salinities of 8 psu although growth is retarded below 16 psu (Kain, 1979). *Delesseria sanguinea* is also tolerant of salinities as low as 11 psu in the North Sea whilst *Halichondria panicea* occurs in the reduced salinity of the western Baltic probably as low as 14 psu. Most characteristic species are likely to survive reduced salinity but species that are lost are likely to have planktonic larvae and recolonize rapidly. See also Additional Information.

Changes in oxygenation	Intermediate	High	Low	Decline	Moderate

The biotope occurs in areas where still water conditions do not occur and so some species may be intolerant of hypoxia. Cole *et al.* (1999) suggest possible adverse effects on marine species below 4 mg/l and probable adverse effects below 2mg/l. However, on return to oxygenated conditions, rapid recovery is likely.

Biological Pressures

	Intolerance	Recoverability	Sensitivity	Richness	Confidence
Introduction of microbial pathogens/parasites	Low	High	Low	No change	Moderate

There is little information on microbial pathogen effects on the characterizing species in this biotope. However, *Saccharina latissima* may be infected by the microscopic brown alga *Streblonema aecidioides*. Infected algae show symptoms of Streblonema disease, i.e. alterations of the blade and stipe ranging from dark spots to heavy deformations and completely crippled thalli (Peters & Scaffelke, 1996). Infection can reduce growth rates of host algae. It is likely that microbial pathogens will have only a minor possible impact on this biotope.

Introduction of non-native species	Low	High	Low	Minor decline	Moderate

The non-native species currently (October 2000) most likely to colonize this biotope is *Sargassum muticum* which is generally considered to be a 'gap-filler'. However, it may displace some native species. Potential non-native colonists are the kelp *Undaria pinnatifida* which may significantly displace *Saccharina latissima* but not change other components.

Extraction of this species	Low	High	Low	Minor decline	Moderate

Extraction of *Saccharina latissima* may occur but the plant rapidly colonizes cleared areas of the substratum: Kain (1975) recorded that *Saccharina latissima* (studied as *Laminaria saccharina*) was abundant six months after the substratum was cleared so recovery should be rapid. Associated species are unlikely to be affected by removal of *Saccharina latissima* unless protection from desiccation on the lower shore is important.

Extraction of other species	Low	High	Low	Minor decline	Moderate

Additional information

Recoverability

The main characterizing species, *Saccharina latissima*, rapidly colonizes cleared areas of the substratum and Kain (1975) recorded that *Saccharina latissima* (studied as *Laminaria saccharina*) was abundant six months after the substratum was cleared so recovery should be rapid. The main species covering rock, *Lithophyllum incrustans*, grows at a rate of only <7 mm a year (Irvine & Chamberlain, 1994) and will take much longer to colonize. Most other characterizing species have a planktonic larva and/or are mobile and so can migrate into the affected area. Many or most of the species in the biotope grow rapidly (for instance, *Halichondria panicea* increases in size by about 5% per week (Barthel, 1988). However, coralline encrusting algae and maerl, where present, are likely to recover more slowly as growth rates are low. Although some species might not have recovered full abundance within five years, the appearance of the biotope will be much as before the impact. Overall, the community is likely to recolonize rapidly and a recoverability of high is given.

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