Furbelows (*Saccorhiza polyschides*)

MarLIN – Marine Life Information Network
Biology and Sensitivity Key Information Review

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A report from:
The Marine Life Information Network, Marine Biological Association of the United Kingdom.

Please note. This MarESA report is a dated version of the online review. Please refer to the website for the most up-to-date version [https://www.marlin.ac.uk/species/detail/1370]. All terms and the MarESA methodology are outlined on the website (https://www.marlin.ac.uk)

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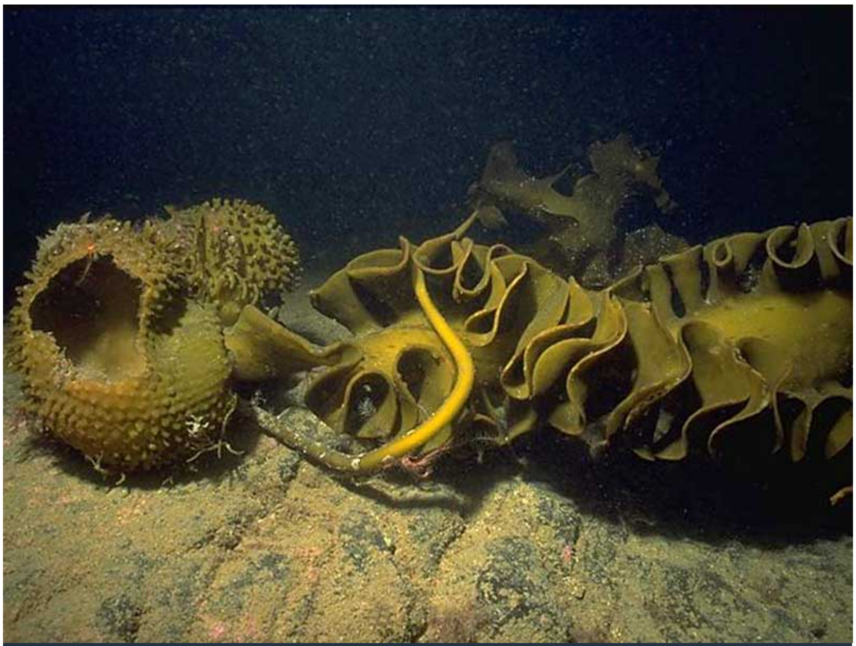

Base of blade and stipe of *Saccorhiza polyschides*.
Photographer: Sue Scott

See online review for distribution map

Distribution data supplied by the Ocean Biogeographic Information System (OBIS). To interrogate UK data visit the NBN Atlas.

Researched by	Nicola White	**Refereed by**	This information is not refereed.
Authority	(Lightfoot) Batters, 1902		
Other common names	-	**Synonyms**	*Saccorhiza bulbosa* (Lightfoot) Batters, 1902, *Laminaria polyschides*

Summary

Description

Saccorhiza polyschides is kelp species with a distinctive large warty holdfast and a flattened stipe with a frilly margin. The stipe is twisted at the base and widens to form a large flat lamina, which is divided into ribbon-like sections. The species is an annual, and very fast growing. It is opportunistic and colonizes available hard substrata in the sublittoral.

Recorded distribution in Britain and Ireland

Recorded from the all coasts of Britain and Ireland, but absent from Northumberland to the Solent.

Global distribution

Furbelows' recorded distribution extends from Ghana northwards along the European coastline, with the most northerly recorded location at Rorvik, Norway. It has also been reported in the Eastern Mediterranean extending to the Greek coastline, and Italy.

Habitat

Saccorhiza polyschides grows from extreme low water springs to a depth of 35 m. It normally attaches to rocks but is occasionally found loose-lying on small stones or shells. It can form dense stands in sheltered areas and can tolerate strong currents.

Depth range

0 -35m

Identifying features

- Stipe flat, broad with conspicuously frilled margin and twisted at base.
- Wide frond, without midrib and divided into ribbon-like sections.
- Large bulbous holdfast with warty appearance.
- Up to 4 m in length.

Additional information

No text entered

Listed by

Further information sources

Search on:

NBN WoRMS

Biology review

Taxonomy

Phylum	Ochrophyta	Brown and yellow-green seaweeds
Class	Phaeophyceae	
Order	Tilopteridales	
Family	Phyllariaceae	
Genus	Saccorhiza	
Authority	(Lightfoot) Batters, 1902	
Recent Synonyms	Saccorhiza bulbosa (Lightfoot) Batters, 1902Laminaria polyschides	

Biology

Typical abundance	Moderate density
Male size range	
Male size at maturity	
Female size range	Large(>50cm)
Female size at maturity	
Growth form	Forest
Growth rate	145mm/week
Body flexibility	
Mobility	
Characteristic feeding method	Autotroph
Diet/food source	
Typically feeds on	
Sociability	
Environmental position	Epilithic
Dependency	Independent.
Supports	No information
Is the species harmful?	No

Biology information

- *Saccorhiza polyschides* is a fast growing, annual and opportunistic species. The obvious plant is a gender-less sporophyte which grows up to 4 m long and may grow at 2 m a month at the peak of the growth season in late spring. The large sporophytes are present on the shore from May until winter. In autumn they commence fruiting and start to decay, leaving behind the bulbous holdfast, which remains on the shore until it is washed off in late winter.
- The unusual holdfast of *Saccorhiza polyschides* is formed from a hollow bulbous growth above the sapling holdfast which expands to overwhelm it, sending out secondary haptera to attach to the substratum.
- The shape of the frond varies with the degree and nature of water movement. In sites of low water current plants produce broad undivided fronds, while those in areas of strong currents have long deeply divided fronds. Plants from wave exposed locations have short

fronds divided into few sections. Experiments have shown that these variations are due to phenotypic rather than genotypic variation (Norton, 1978).

Habitat preferences

Physiographic preferences	Open coast, Offshore seabed, Strait / sound, Sea loch / Sea lough, Ria / Voe
Biological zone preferences	Sublittoral fringe, Upper infralittoral
Substratum / habitat preferences	Bedrock, Cobbles, Large to very large boulders, Pebbles, Small boulders
Tidal strength preferences	Moderately Strong 1 to 3 knots (0.5-1.5 m/sec.), Strong 3 to 6 knots (1.5-3 m/sec.), Very Strong > 6 knots (>3 m/sec.), Very Weak (negligible), Weak < 1 knot (<0.5 m/sec.)
Wave exposure preferences	Extremely sheltered, Moderately exposed, Sheltered, Ultra sheltered, Very sheltered
Salinity preferences	Full (30-40 psu)
Depth range	0 -35m
Other preferences	No text entered
Migration Pattern	Non-migratory / resident

Habitat Information

- *Saccorhiza polyschides* colonizes abraded surfaces such as sand-scoured rocks or boulders that are mobile in winter and is characteristic of much disturbed substrata.
- Plants grow to a maximum depth of 35 metres in Cornwall. The lower depth limit of the plants may be controlled by grazing from the sea urchin *Echinus esculentus*. When urchins have been removed, the lower limit of *Saccorhiza polyschides* has been found to extend by 3m.
- The species is not found in areas of reduced salinity. Lowered salinity reduces the rate of development and growth is irreversibly inhibited below 9 psu. The species competes for space with *Laminaria hyperborea* and the upper limit of *Saccorhiza polyschides* is related to the lower limit of *Laminaria hyperborea*. Where *Laminaria hyperborea is absent the species may extend up to the extreme low water springs mark.*

Life history

Adult characteristics

Reproductive type	Alternation of generations
Reproductive frequency	Semelparous / monotely
Fecundity (number of eggs)	No information
Generation time	<1 year
Age at maturity	8-14 months
Season	October - May
Life span	<1 year

Larval characteristics

Larval/propagule type	-
Larval/juvenile development	Spores (sexual / asexual)
Duration of larval stage	< 1 day
Larval dispersal potential	100 -1000 m
Larval settlement period	Insufficient information

Life history information

- *Saccorhiza polyschides* has a typical Laminarian life history in which a macroscopic diploid sporophyte alternates with a microscopic haploid gametophyte.
- The species is an annual. Sporophytes typically have a lifespan of less than 10 months. However, plants produced late in the season may overwinter and live for 14-16 months.
- The base of the lamina, the stipe frills and the bulb are covered in unilocular sporangia, which produce zoospores by meiosis. Each sporangia contains 128 zoospores. The flagellated zoospores are about 5 microns in diameter and possess an eyespot which makes them strongly phototactic. The zoospores may be transported at least 200 m from the parent and they loose their flagella after 24 hrs and settle on the available substrata. 75% of the zoospores settle on the substrata with 24 hours.
- The zoospores develop into microscopic dioecious gametophytes. Gametophytes take the form of unicellular or filamentous structures. The male gametophytes are more branched than the females and have more numerous, smaller and paler cells. These become fertile in under 10 days in optimal conditions. Male gametophytes release motile sperm that fertilize eggs of female gametophytes, the resultant zygote develops into the new sporophyte.

Sensitivity review

This MarLIN sensitivity assessment has been superseded by the MarESA approach to sensitivity assessment. MarLIN assessments used an approach that has now been modified to reflect the most recent conservation imperatives and terminology and are due to be updated by 2016/17.

Physical Pressures

	Intolerance	Recoverability	Sensitivity	Confidence
Substratum Loss	High	High	Moderate	Moderate

Saccorhiza polyschides is permanently attached to the substratum so will be removed upon substratum loss. Experiments have shown that *Saccorhiza polyschides* colonizes cleared areas of the substratum within 26 weeks. However, if clearance takes place in August, when no spores of the species are released, the substratum may become colonized by red algae potentially blocking colonization by *Saccorhiza polyschides* (Kain, 1975).

Smothering	Low	Immediate	Not sensitive	Low

Smothering could reduce light availability and therefore lower growth rates of the sporophyte but would not damage the plant. The microscopic sporophytes and gametophytes are likely to be more intolerant and if smothered growth would be inhibited, except on vertical surfaces where development appears to be unaffected (Norton, 1978).

Increase in suspended sediment	Intermediate	High	Low	Low

Siltation is unlikely to affect the adult sporophytes but microscopic juvenile stages may be harmed. Norton (1978) observed that when spores settled on silt they continued development but failed to form attachments and would be easily washed off. Silt settling out on already attached spores prevented the formation of gametophytes and sporophytes. However, Birkett *et al.* (1998b), states that the species is found in areas of siltation and Santos (1993) observed that *Saccorhiza polyschides* is abundant in areas of high siltation, so the species may tolerate siltation. Recovery should be high because experiments have shown that *Saccorhiza polyschides* colonizes cleared areas of the substratum within 26 weeks. However, if clearance takes place in August, when no spores of the species are released the substratum may become colonized by red algae (Kain, 1975).

Decrease in suspended sediment

Dessication	High	High	Moderate	Moderate

The species is intolerant of desiccation. Norton (1970) observed that when sporophytes were exposed to air by an extreme low water springs on a hot summers day, they rapidly dried out and died. An increase in the level of desiccation would depress the upper limit of the species distribution. Recovery should be high because experiments have shown that *Saccorhiza polyschides* colonizes cleared areas of the substratum within 26 weeks and it has a very fast growth rate. However, if clearance takes place in August, when no spores of the species are released the substratum may become colonized by red algae (Kain, 1975).

Increase in emergence regime	High	High	Moderate	Moderate

Saccorhiza polyschides is intolerant of aerial exposure. Norton (1970) observed that when sporophytes were exposed to air by an extreme low water spring tide on a hot summers day, they rapidly dried out and died. An increase in the period of emersion would depress the upper limit of the species distribution. Recovery should be high because experiments have shown that *Saccorhiza polyschides* colonizes cleared areas of the substratum within 26 weeks and it has a very fast growth rate. However, if clearance takes place in August, when no spores of the species are released the substratum may become colonized by red algae (Kain, 1975).

Decrease in emergence regime

Increase in water flow rate	Low	High	Low	Moderate

Saccorhiza polyschides occurs in a wide range of water flow rates. It is found in areas of high water flow such as rapids in Lough Hyne (Ine), Ireland, but also grows in almost stationary water, where it can form extensive loose-lying populations in the absence of turbulence (Norton, 1978). The species is therefore unlikely to be affected by a change in water flow.

Decrease in water flow rate

Increase in temperature	Intermediate	High	Low	Moderate

The minimum temperature required for growth and reproduction of *Saccorhiza polyschides* is 5 degrees C and the maximum temperature is 23 degrees C. The 'northern lethal boundary' of the species occurs where the temperature falls below 4 degrees C for a period of 2 months and the southern lethal boundary occurs where temperatures rise above 25 degrees C for more than a few weeks (Hoek van den, 1982). The species is in the middle of its geographic range in the UK so is unlikely to be affected by a change of 2 degrees C for a year. However, a change in 5 degrees may put the species outside its lethal limits damaging the plant. Recovery should be high because the species has a fast growth rate and rapidly colonizes cleared areas of the substratum.

Decrease in temperature

Increase in turbidity	Low	High	Low	Low

Light penetration influences the depth at which kelps can grow. An increase in turbidity would reduce light available for photosynthesis, lower growth rates and result in a decrease of the maximum depth at which it could grow. A reduction in the turbidity levels would allow *Saccorhiza polyschides* to grow at greater depths but the upper limit of the species distribution would be depressed due to increased competition with *Laminaria hyperborea*. On return to normal turbidity levels the growth rate and depth distribution would be quickly resumed

Decrease in turbidity

Increase in wave exposure	Tolerant	Not relevant	Not sensitive	Moderate

Saccorhiza polyschides is found at all wave exposures (Hawkins & Jones, 1992) so is not likely to be intolerant of this factor. Increases in wave exposure which cause substrata to be mobilized and for abrasion to occur might be favourable to *Saccorhiza*.

Decrease in wave exposure

Noise	Tolerant	Not relevant	Not sensitive	Moderate

Seaweeds have no known mechanism for the perception of noise.

Visual Presence	Tolerant	Not relevant	Not sensitive	Moderate

Seaweeds have no known mechanism for visual perception.

Abrasion & physical disturbance	Intermediate	High	Low	Moderate

The fronds of *Saccorhiza polyschides* could be damaged by abrasion and gametophytes could be crushed. A passing scallop dredge or anchor is likely to rip off the plant and its holdfast, and remove a proportion of the population. Therefore, intolerance has been assessed as intermediate. However, the species has a fast growth rate, settles and grows to full size annually and, therefore, recovers very quickly from disturbance.

Displacement	Low	Very high	Very Low	Moderate

Transplantation experiments have shown that plants can be transplanted to other sites with the rocks that they are attached to, with no adverse effects (Norton, 1978). The species could not tolerate displacement if the attachment to the rock was broken.

Chemical Pressures

	Intolerance	Recoverability	Sensitivity	Confidence
Synthetic compound contamination	Intermediate	High	Low	Very low

The effects of chemicals on *Saccorhiza polyschides* have not been studied. *Laminaria hyperborea*, a related species of kelp, is thought to be fairly robust in terms of chemical pollution (Holt *et al.*, 1995). Both species contain alginates which seem capable of storing chemicals in inert forms. However, it is likely that the gametophytes and very young sporophytes are more intolerant. Hopkin & Kain (1978) observed that growth of gametophytes and very young sporophytes of *Laminaria hyperborea* was inhibited at low levels of atrazine, sodium pentachlorophenate and phenol.

Heavy metal contamination	Intermediate	High	Low	Very low

The effects of heavy metals on *Saccorhiza polyschides* have not been studied. *Laminaria hyperborea*, a related species of kelp, is thought to be fairly robust in terms of chemical pollution (Holt *et al.*, 1995). Both species contain alginates which seem capable of storing metals in inert forms. However, it is likely that the gametophytes and very young sporophytes are more intolerant. Hopkin & Kain (1978) observed that growth of gametophytes and very young sporophytes of *Laminaria hyperborea* was inhibited at low levels of mercury, cadmium, copper and zinc.

Hydrocarbon contamination	Low	High	Low	Very low

A number of workers have reported little effect of oil on sublittoral kelp, due to the lack of penetration of oil into the water column (Holt *et al.*, 1995). Drew *et al.* (1967) recorded that the kelp forest escaped undamaged after the 'Torrey Canyon' oil spillage. Kelp may also be protected by the mucilaginous slime which covers the frond, by preventing damage from coating by oil (Birkett *et al.*, 1998b). No studies have been carried out specifically on the impact on *Saccorhiza polyschides* but the alga is probably tolerant of this factor. Recovery rates would be high due to the fast growth rate of the species and its ability to rapidly colonize cleared areas of the substratum.

Radionuclide contamination		Not relevant		Not relevant

Insufficient information

Changes in nutrient levels	Low	High	Low	Very low

Nutrients are required for algal growth. A slight increase in nutrient levels may enhance growth rates but a large increase may have a detrimental effect. Eutrophication could reduce the lower depth limit of the species distribution by reducing light penetration through an increase in turbidity. There may also be increased competition with mussels for available substratum space and plants may be overgrown by ephemeral green algae (Birkett *et* *al.*,1998b). However, *Saccorhiza polyschides* has a very fast growth rate and can probably effectively compete with these species, so it is only has low intolerance to this factor and recovery rates would be high.

Increase in salinity	High	High	Moderate	High

Saccorhiza polyschides is not found in areas of reduced salinity. In culture, lowered salinities have been found to reduce growth rate and development is irreversibly inhibited below 9 psu (Norton & South, 1969), so the species is regarded as highly intolerant of this factor. Recovery rates should be high because the species has a high growth rate and quickly colonizes cleared areas of the substratum (Kain, 1975).

Decrease in salinity

Changes in oxygenation	Low	High	Low	Very low

The effect of low oxygen levels on kelp is poorly studied. *Saccorhiza polyschides* can grow in almost stationary water (Norton, 1978) and can generate its own oxygen by photosynthesis, so it is likely to tolerate changes in this factor. The species can quickly recover from disturbance as it has a fast growth rate and rapidly colonizes cleared areas of the substratum (Kain, 1975).

Biological Pressures

	Intolerance	Recoverability	Sensitivity	Confidence
Introduction of microbial pathogens/parasites		Not relevant		Not relevant

Insufficient information

Introduction of non-native species	Intermediate	High	Low	Low

The Japanese kelp *Undaria pinnatifida* has recently spread to the south coast of England from Brittany, where it was introduced for aquaculture. It is thought that *Undaria* may compete with *Saccorhiza polyschides* (Birkett *et al.*, 1998b). The potential introduction of *Macrocystis* spp. from America could have an enormous impact on native kelps due to the very fast growth rate of the species.

Extraction of this species	Intermediate	Very high	Low	Moderate

Saccorhiza polyschides has a fast growth rate and rapidly colonizes cleared areas of the substratum, so it would be able to quickly recover from harvesting.

Extraction of other species	Tolerant*	Not relevant	Not sensitive*	Moderate

Grazing urchins, such as *Echinus esculentus* and *Paracentrotus lividus* are important in determining the lower depth limit of *Saccorhiza polyschides*. The removal of these species may enable *Saccorhiza* to grow at greater depths, for example Kain & Jones (1966) found that removal of grazing urchins at Port Erin, Isle of Man, enabled *Saccorhiza polyschides* to extend its depth range by 3 m. Likewise, the upper limit of the species distribution is related to *Laminaria hyperborea* and the extraction of this species would enable *Saccorhiza* to grow in shallower water. Where beds of *Laminaria hyperborea* or *Laminaria digitata* have been cleared, they are usually replaced by *Saccorhiza polyschides* (Norton, 1970).

Additional information

Importance review

Policy/legislation

- no data -

Status

National (GB) importance	-	**Global red list (IUCN) category**	-

Non-native

Native	-		
Origin	-	**Date Arrived**	-

Importance information

Saccorhiza polyschides is not harvested for alginate production at present, but may be of interest in the future because of its high growth rate. The culture of this species has been undertaken experimentally, without successful results (Guiry & Blunden, 1991). The sporophytes of *Saccorhiza polyschides* support rich communities of epifauna and epiflora. However, no species are known to be confined to *Saccorhiza polyschides*. The holdfasts of *Saccorhiza polyschides* are known to shelter large animals such as large polychaetes, squat lobsters and fish which shelter inside the bulbous holdfast, while amphipods, brittle stars and polychaetes occur in the space between the base of the bulb and the rock surface to which it is attached (McKenzie & Moore, 1981). The composition of the epifauna and epiflora varies with the degree of water current that the plant is exposed to (Ebling *et al.*, 1948). The fronds are grazed by urchins such as *Echinus esculentus* and *Paracentrotus lividus*, and the blue-rayed limpet *Patella pellucida*

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