Spiral wrack (*Fucus spiralis*)

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/1337]. All terms and the MarESA methodology are outlined on the website (https://www.marlin.ac.uk)

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Detail of *Fucus spiralis* fronds.
Photographer: Keith Hiscock
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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**	Dr Graham Scott
Authority	Linnaeus, 1753		
Other common names	-	**Synonyms**	-

Summary

Description

An intertidal brown seaweed, found on the high shore. It grows up to 40 cm long, without air bladders and lives for up to 4 years. The species can tolerate a high level of desiccation. Fronds have a characteristic ridge along the edge of the receptacles.

Recorded distribution in Britain and Ireland

All coasts of Britain and Ireland

Global distribution

Iceland, Norway, Denmark, Netherlands, UK, Ireland, Atlantic coast of France, Spain, Morocco, Azores, East coast of America from New Jersey to Nova Scotia and isolated reports in the Northern Pacific.

Habitat

Fucus spiralis attaches to rocky substrata on sheltered to moderately exposed shores. It lives on the upper shore below the zone of *Pelvetia canaliculata* and above *Fucus vesiculosus* and *Ascophyllum nodosum*.

Depth range
Not relevant

Identifying features

- Frond with smooth margin.
- Prominent midrib.
- Without air bladders.
- Frond often twisted.
- Round reproductive bodies at ends of branches, which are almost round in outline and surrounded by a narrow rim of sterile frond.

Additional information

A number of discrete forms of this species have been recorded. In the UK, a diminutive form *Fucus spiralis nanus* is relatively common.

Listed by

Further information sources

Search on:

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Biology review

Taxonomy

Phylum	Ochrophyta	Brown and yellow-green seaweeds
Class	Phaeophyceae	
Order	Fucales	
Family	Fucaceae	
Genus	Fucus	
Authority	Linnaeus, 1753	
Recent Synonyms	-	

Biology

Typical abundance	High density
Male size range	Up to 40cm
Male size at maturity	3cm
Female size range	3cm
Female size at maturity	
Growth form	Foliose
Growth rate	1.1cm/month
Body flexibility	
Mobility	
Characteristic feeding method	Autotroph
Diet/food source	
Typically feeds on	
Sociability	
Environmental position	Epifloral
Dependency	Independent.
Supports	None
Is the species harmful?	No

Biology information

Fucus spiralis spends up to 90 percent of the time out of the water. It can tolerate a high level of desiccation, being able to survive 70 to 80 percent water loss. Distinct varieties of *Fucus spiralis* have been recognised, such as *Fucus spiralis* forma *nanus*, which is a dwarf form present on exposed shores. *Fucus spiralis* also hybridises with *Fucus vesiculosus* providing considerable difficulty in identification.

Habitat preferences

Physiographic preferences	Strait / sound, Sea loch / Sea lough, Ria / Voe, Estuary
Biological zone preferences	Lower littoral fringe
Substratum / habitat preferences	Bedrock, Cobbles, Large to very large boulders, 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 Weak (negligible), Weak < 1 knot (<0.5 m/sec.)
Wave exposure preferences	Moderately exposed, Sheltered, Very sheltered
Salinity preferences	Full (30-40 psu), Reduced (18-30 psu), Variable (18-40 psu)
Depth range	Not relevant
Other preferences	No text entered
Migration Pattern	Non-migratory / resident

Habitat Information

Fucus spiralis favours rocks with many cracks and fissures, which probably provide some protection for developing zygotes and adult plants. It can extend into estuaries up to the 10 psu isohaline. The presence or absence of suitable substrata is considered to be one of the most important factors determining the distribution of *Fucus spiralis*.

Life history

Adult characteristics

Reproductive type	Permanent (synchronous) hermaphrodite
Reproductive frequency	Annual episodic
Fecundity (number of eggs)	No information
Generation time	2-5 years
Age at maturity	2 years
Season	July - August
Life span	2-5 years

Larval characteristics

Larval/propagule type	-
Larval/juvenile development	Not relevant
Duration of larval stage	No information
Larval dispersal potential	No information
Larval settlement period	Insufficient information

Life history information

Fucus spiralis is hermaphroditic. Receptacles are initiated during late January to February, gametes discharged during July and August, and the receptacles shed by November, although exact timing of reproduction depends on location and the form of the plant. Young plants usually reach a length of 8 to 10 cm or more before they form receptacles. Reproduction usually begins before or during the second years growth. Vegetative recruitment occurs by the formation of new fronds from existing holdfasts. This form of reproduction is important in existing stands of the population, whereas recruitment by eggs is more important in disturbed areas or in areas where germlings are protected e.g. rock crevices.

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	High

Fucus spiralis is permanently attached to the substratum so would be removed upon substratum loss. The species has been observed to readily recruit to cleared areas (Holt *et al.*, 1997) so recovery rates are expected to be high.

	Intolerance	Recoverability	Sensitivity	Confidence
Smothering	High	High	Moderate	Moderate

The effects of smothering would depend on the state of the tide when the factor occurred. If smothering happened when the plant was emersed, all surfaces of the plant would be buried under the sediment preventing photosynthesis. If smothering occurred while the plant was immersed some of the plant would escape burial allowing the plant continue photosynthesis. The species has been observed to readily recruit to cleared areas (Holt *et al.*, 1997) so recovery rates are expected to be high.

	Intolerance	Recoverability	Sensitivity	Confidence
Increase in suspended sediment	Low	Very high	Very Low	Moderate

Increased siltation would cover some of the frond surfaces reducing photosynthesis and growth rates. Upon return to normal siltation levels the growth rate would be quickly restored.

Decrease in suspended sediment

	Intolerance	Recoverability	Sensitivity	Confidence
Dessication	High	High	Moderate	Moderate

Fucus spiralis can tolerate desiccation until the water content has been reduced to 10-20% (Lüning, 1990). If water is lost beyond this critical level irreversible damage occurs. As the plant lives at the upper limit of it's physiological tolerance the plant cannot tolerate increased desiccation and the upper limit of the species distribution on the shore would become depressed. Decreased desiccation may allow the plant to grow further up the shore and may result in the species being competitively displaced by faster growing species. The species has been observed to readily recruit to cleared areas (Holt *et al.*, 1997) so recovery rates are expected to be high.

	Intolerance	Recoverability	Sensitivity	Confidence
Increase in emergence regime	High	High	Moderate	Moderate

Fucus spiralis can tolerate an emersion period of 1-2 days. If emersion lasted for longer than this, the plant would suffer from desiccation and nutrient stress and the upper limit of the species distribution on the shore would become depressed. A reduction in the period of emersion may result in the species being competitively displaced by faster growing species and may allow *Fucus spiralis* to grow further up the shore. Recovery would be high because the species has been observed to rapidly recruit to cleared areas of the shore.

Decrease in emergence regime

	Intolerance	Recoverability	Sensitivity	Confidence
Increase in water flow rate	Intermediate	High	Low	Low

An increase in water flow rate may cause some of the plants to be torn off the substratum. Decreases in water flow rate are unlikely to have any effect. *Fucus spiralis* has been observed to readily recruit to cleared areas (Holt *et al*., 1997) so recovery rates are expected to be high.

Decrease in water flow rate

Increase in temperature	Low	Not relevant		High

Fucus spiralis can tolerate temperatures from -0.5 to 28 °C. The species is well within it's temperature range in the UK. Decreases in temperature are unlikely to have any effect because the species extends into northern Norway where water temperatures are cooler. Increase in temperature may be beneficial because the optimum temperature for growth of the species is 15 degrees C (Lüning, 1990). However the species showed suffered some damage during the unusually hot summer of 1983 when temperatures were on average 8.3 degrees C higher than normal (Hawkins & Hartnoll, 1985).

Decrease in temperature

Increase in turbidity	Low	High	Low	Moderate

The species would only be affected by turbidity when it is covered in water, due to a reduction in the light available for photosynthesis. However, *Fucus spiralis* spends up to 90 percent of it's time out of the water and can photosynthesise effectively in air, so it would not be affected significantly by a change in turbidity.

Decrease in turbidity

Increase in wave exposure	High	High	Moderate	Moderate

Fucus spiralis lives on sheltered to moderately exposed shores. Increases in wave exposure beyond this would result in plants and germlings being torn off the substratum or mobilisation of substratum with the plants attached. Decreases in waves exposure are unlikely to have any effect, because the species occurs in very sheltered conditions. *Fucus spiralis* has been observed to readily recruit to cleared areas (Holt *et al*., 1997) so recovery rates are expected to be high.

Decrease in wave exposure

Noise	Tolerant	Not relevant	Not sensitive	Not relevant

Seaweeds have no known mechanisms for perception of noise.

Visual Presence	Tolerant	Not relevant	Not sensitive	Not relevant

Seaweeds have no known mechanism for visual perception.

Abrasion & physical disturbance	Intermediate	High	Low	Low

Abrasion may kill germlings and damage the fronds of established seaweeds. Fucoids are intolerant of abrasion from human trampling, which has been shown to reduce the cover of seaweeds on a shore (Holt *et al*., 1997). Germlings are probably particularly intolerant of this factor. *Fucus spiralis* has been observed to readily recruit to cleared areas (Holt *et al*., 1997) so recovery rates are expected to be high.

Displacement	High	High	Moderate	Moderate

Fucus spiralis is permanently attached to the substratum and would not be able to re-establish itself if removed. The species has been observed to readily recruit to cleared areas (Holt *et al*., 1997) so recovery rates are expected to be high.

Chemical Pressures

	Intolerance	Recoverability	Sensitivity	Confidence
Synthetic compound contamination		Not relevant		Not relevant

Insufficient information

	Intolerance	Recoverability	Sensitivity	Confidence
Heavy metal contamination	Intermediate	High	Low	Moderate

Adult fucoid algae accumulate heavy metals and are generally fairly robust in the face of chemical pollution (Holt *et al*., 1997). However, germlings appear to be intolerant of heavy metal pollution. Copper retarded the growth rate of *Fucus spiralis* sporelings at concentrations greater than 5.8 µg/l and caused permanent damage in sporelings exposed to concentrations of 12.24 µg/l for 10 days (Bond *et al*., 1999). The species has been observed to readily recruit to cleared areas (Holt *et al*., 1997) so recovery rates are expected to be high.

	Intolerance	Recoverability	Sensitivity	Confidence
Hydrocarbon contamination	High	High	Moderate	Low

Fucoids generally show limited intolerance to oils (Holt *et al*., 1997). However, *Fucus spiralis* disappeared from heavily oiled shores some months after the Amoco Cadiz oil spill. The species suffered less than *Pelvetia canaliculata* but more than fucoids further down the shore, probably due to it's position high on the shore, which means the oil can be present on the algae for a long time before being washed off (Floc'h & Diouris, 1980).

	Intolerance	Recoverability	Sensitivity	Confidence
Radionuclide contamination		Not relevant		Not relevant

Insufficient information

	Intolerance	Recoverability	Sensitivity	Confidence
Changes in nutrient levels	Intermediate	High	Low	Low

Decreases in nutrient concentration may decrease growth rate in *Fucus spiralis*. A slight increase in nutrient concentration may enhance growth rates but high concentrations of nutrients would lead to overgrowth of the plants by ephermeral green algae. However, Fucus spiralis is reported to be more common than other fucoids in the sewage polluted inner part of the Oslofjord, Norway (Fletcher, 1996). Recovery rate should be high because cleared areas of the shore are rapidly recruited by this species.

	Intolerance	Recoverability	Sensitivity	Confidence
Increase in salinity	Intermediate	Very high	Low	Moderate

Fucus spiralis can experimentally tolerate salinities of 3 to 34 psu, but it is only found in estuaries down to 10 psu so it may be affected by this factor.

Decrease in salinity

	Intolerance	Recoverability	Sensitivity	Confidence
Changes in oxygenation		Not relevant		Not relevant

Reduced oxygenation is unlikely to have an effect on the algae as it produces its own oxygen by photosynthesis. However, no studies have been found to confirm this.

Biological Pressures

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

Insufficient information

	Intolerance	Recoverability	Sensitivity	Confidence
Introduction of non-native species		Not relevant		Not relevant

Insufficient information

Extraction of this species	Intermediate	High	Low	Moderate

Fucus spiralis rapidly recruits to cleared areas (Holt *et al*., 1997) so would recover reasonably quickly from extraction of 50 percent of the area.

Extraction of other species		Not relevant		Not relevant

Insufficient information

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

Fucus spiralis does not support encrusting or sessile epifauna although the amphipod *Hyale* and the littorinids *Littorina obtusata* and *Littorina saxatilis* occur amongst fronds which provide shelter from desiccation. A range of epiphytes may also grow on the fronds.

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