A red seaweed (*Rhodothamniella floridula*)

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

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2005-11-15

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

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This review can be cited as:
Riley, K. 2005. *Rhodothamniella floridula* A red seaweed. In Tyler-Walters H. and Hiscock K. (eds) *Marine Life Information Network: Biology and Sensitivity Key Information Reviews*, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. DOI https://dx.doi.org/10.17031/marlinsp.1840.2

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Rhodothamniella floridula
Photographer: Mike Firth
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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	Karen Riley	**Refereed by**	This information is not refereed.
Authority	(Dillwyn) Feldmann, 1978		
Other common names	-	**Synonyms**	*Rhodochorton floridulum* (Dillwyn) Feldmann, 1978, *Audouinella floridula* (Dillwyn) Feldmann, 1978

Summary

Description

Rhodothamniella floridula is a perennial brownish red seaweed found on the lower shore. It usually covers large areas of rock in sandy habitats. At the base of the seaweed, filaments bind with sand to form a spongy, carpet like mass. The filaments are well-spaced and branch out up to 3 cm in length. Upright filaments of the seaweed uncovered by the ebbing tide appear as tufts of hair. When plants dry out they have a purplish tinge.

Recorded distribution in Britain and Ireland

Rhodothamniella floridula occurs on the coast of Scotland, the north east, south and south west coasts of England and in Wales and Northern Ireland.

Global distribution

Occurs in northwest Europe

Habitat

Rhodothamniella floridula usually occurs on sand-covered rocks in the littoral and sublittoral to about 5 m depth (as *Rhodochorton floridulum* and *Audouinella floridula* respectively) (Dickinson, 1963; Dixon & Irvine, 1997). *Rhodothamniella floridula* (as *Audouinella floridula*) inhabits areas in shelter, partly under larger seaweeds (Hayward *et al.*, 1996).

Depth range

5m

Identifying features

- Brownish red in colour
- The base forms a spongy, carpet like covering on rocks
- Fine branched filaments up to 3 cm in length
- Branches may be upright or creeping

Additional information

-none-

Listed by

Further information sources

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Biology review

Taxonomy

Phylum	Rhodophyta	Red seaweeds
Class	Florideophyceae	
Order	Palmariales	
Family	Rhodothamniellaceae	
Genus	Rhodothamniella	
Authority	(Dillwyn) Feldmann, 1978	
Recent Synonyms	Rhodochorton floridulum (Dillwyn) Feldmann, 1978Audouinella floridula (Dillwyn) Feldmann, 1978	

Biology

Typical abundance	See additional information
Male size range	maximum of 30mm
Male size at maturity	
Female size range	Small-medium(3-10cm)
Female size at maturity	
Growth form	Cushion
Growth rate	
Body flexibility	High (greater than 45 degrees)
Mobility	
Characteristic feeding method	Autotroph
Diet/food source	
Typically feeds on	
Sociability	
Environmental position	Epibenthic
Dependency	Independent.
Supports	None
Is the species harmful?	No

Biology information

Rhodothamniella floridula is perennial. The hair-like filaments are approximately 20-25µm in diameter. The species has been noted to trap sand and mud in a layer up to 5cm thick (Lobban & Wynne, 1981).

Dixon & Irvine (1977) observed that the growth of *Rhodothamniella floridula* (as *Audouinella floridula*) is much faster in winter, whilst in the summer the spongy cushion can become bleached or disrupted.

Habitat preferences

Physiographic preferences	Open coast, Strait / sound, Enclosed coast / Embayment
Biological zone preferences	Lower littoral fringe, Upper eulittoral, Upper littoral fringe
Substratum / habitat preferences	Bedrock, Large to very large boulders, Rockpools, Small boulders
Tidal strength preferences	Moderately Strong 1 to 3 knots (0.5-1.5 m/sec.), Weak < 1 knot (<0.5 m/sec.)
Wave exposure preferences	Moderately exposed, Sheltered, Very sheltered
Salinity preferences	Full (30-40 psu)
Depth range	5m
Other preferences	
Migration Pattern	Non-migratory / resident

Habitat Information

Rhodothamniella floridula has been found on substrata other than sandy rock. For example, in St. Andrews Bay, *Rhodothamniella floridula* (as *Rhodochorton* spp.) occurred in tufts on *Halidrys siliquosa* (a brown seaweed) and in pools where *Fabricia stellaris* (a polychaete worm) was common (Laverack & Blackler, 1974). In Co. Kerry, Ireland *Rhodothamniella floridula* (as *Audouinella floridula*) was also found growing on peat masses, where it binds the peat and sand together (Murphy, 1981).

Life history

Adult characteristics

Reproductive type	Oogamous
Reproductive frequency	Annual protracted
Fecundity (number of eggs)	No information
Generation time	Insufficient information
Age at maturity	Insufficient information
Season	See additional information
Life span	See additional information

Larval characteristics

Larval/propagule type	-
Larval/juvenile development	Spores (sexual / asexual)
Duration of larval stage	No information
Larval dispersal potential	No information
Larval settlement period	Insufficient information

Life history information

Lifespan

No information was found concerning the longevity of *Rhodothamniella floridula*. However, it is likely to have a lifespan of 5-10 years, similar to other red seaweeds, such as *Furcellaria lumbricalis*.

Reproductive type
Dickinson (1963) and Dixon & Irvine (1977) found that asexual *Rhodothamniella floridula* (as *Rhodochorton floridulum* and *Audouinella floridula* respectively) plants bear cruciate tetrasporangia. The tetrasporangia are ovoid and are arranged on the upper parts of the erect axes, occurring singly or in clusters (Dixon & Irvine, 1977). Stegenga (1978) found that tetraspores of cultured *Rhodothamniella floridula* (as *Rhodochorton floridulum*) measured up to 35 x 30 µm. He also noted that these were formed under all combinations of temperatures from 4 °C to 16 °C at any length of daylight. A tetrasporophyte, rather than a carposporophyte, of *Rhodothamniella floridula* (as *Rhodochorton floridulum*) develops directly from the fertilised carpogonium with only one erect filament and one rhizoid (Lobban & Wynne, 1981, Cole & Sheath, 1990). Stegenga (1978) observed that gametophytes of *Rhodothamniella floridula* (as *Rhodochorton floridulum*) were unisexual and possessed a unicellular base from which only one filament arose. It is also known that the subclass Florideophyceae specialise in oogamous reproduction in which the zygote is returned on the female gametophyte, giving rise to complex post-fertilisation development, known as the carposporophyte. Observations on *Rhodothamniella floridula* (as *Rhodochorton floridulum*) showed that the tetraspores germinate to give gametangial plants which were small compared with the tetrasporangial phase (Knaggs & Conway, 1964)

Fecundity
Red algae are typically high fecund, but their spores are non-motile (Norton, 1992) and therefore highly reliant on the hydrodynamic regime for dispersal. Stegenga (1978) noted that tetrasporangia germinated in 'rather low numbers', but most abundantly at high temperatures and long days.

Timing of reproduction
Dixon & Irvine (1977) noted that the greatest abundance of tetrasporangia occurred between November and March. Furthermore, *Rhodothamniella floridula* (as *Rhodochorton* spp.) are present throughout the year (Laverack & Blackler, 1974). However, Stegenga (1978) found that there were no tetrasporangia present during the winter.

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

Removal of the substratum would also remove the *Rhodothamniella floridula* growing on it. Intolerance has therefore been assessed as high. Recoverability is likely to be high (see additional information below).

Smothering	High	High	Moderate	High

The plant would be completely buried under 5 cm of sediment and would be unlikely to survive. Intolerance has been assessed as high. Recoverability is likely to be high (see additional information below).

Increase in suspended sediment	Intermediate	Very high	Low	Low

Rhodothamniella floridula binds sand, mud or peat to it's filaments to form a sponge-like turf. A slight increase in suspended sediment may mean that there is more sand to bind with the plant and will probably have little adverse effect on it. However, it is not known how much of an increase in suspended sediment concentration could be withstood. An increase in suspended sediment concentration above this threshold will increase light attenuation (considered in 'turbidity') and siltation. Furthermore, Connor *et al.* (1997b) noted that, although the species is sand-tolerant, where sand scour is more severe, *Rhodothamniella floridula* may be rare or absent and ephemeral algae such as *Ulva* spp. and *Porphyra* spp. dominate the substratum. Therefore intolerance has been assessed as intermediate. Recoverability is likely to be very high.

Decrease in suspended sediment	Low	Very high	Very Low	Moderate

Rhodothamniella floridula is unlikely to be affected by a small decrease in suspended sediment. However, the species needs sediment to bind to and will therefore need enough available to do so. Intolerance has therefore been assessed as low. Recoverability is likely to be very high.

Dessication	Intermediate	Very high	Low	Moderate

Rhodothamniella floridula is subject to some desiccation on the lower shore where Dickinson (1963) observed that plants may dry out and develop a purplish tinge. It seems likely that at the benchmark level that the upper parts of plants may be adversely affected. However, the habit of the alga living in sponge-like masses suggests that lower parts may be kept moist and regrowth would be expected. Therefore, intolerance has been assessed as intermediate and recoverability is likely to be very high.

Increase in emergence regime	Intermediate	High	Low	Moderate

The benchmark increase in emergence would result in the individuals furthest up the shore experiencing greater risk of desiccation and greater fluctuations in temperature and salinity. Some mortality is likely and therefore intolerance has been assessed as intermediate. Recoverability has been recorded as high (see additional information below).

Decrease in emergence regime Tolerant Not relevant Not sensitive High

Rhodothamniella floridula occurs predominantly in the littoral and sublittoral to about 5m depth (Dickinson, 1963; Dixon & Irvine, 1997) (as *Rhodochorton floridulum* and *Audouinella floridula* respectively) and is often found in rockpools. It is therefore the species would probably tolerate a decrease in emergence.

Increase in water flow rate Tolerant Not relevant Not sensitive High

Moderate water movement is beneficial to seaweeds as it carries a supply of nutrients and gases to the plants and removes waste products. However, if flow becomes too strong , plants may become displaced. Additionally, an increase to stronger flows may inhibit settlement of spores and remove adults or germlings. *Rhodothamniella floridula* has a compact solid 'mat' or 'cushion'. Whilst the biotope with which it is associated occurs in 'moderately strong' or 'weak' tidal flows, the compact nature of the mat probably makes it resistant to displacement by an increase in water flow. The species has been assessed as tolerant of an increase in water flow.

Decrease in water flow rate Low Very high Very Low High

The biotope with which *Rhodothamniella floridula* is associated occurs in areas where the water flow rate is either 'moderately strong' or 'weak' (Connor *et al.*, 1997b). If a decrease in water flow rate to 'weak' or 'very weak (negligible)' may mean that the supply of nutrients to the seaweed would be depleted. However, adverse effects would probably only be seen in plants inhabiting the 'very weak' water flow areas. Intolerance has therefore been assessed as low. Recoverability is likely to be very high.

Increase in temperature Low Very high Very Low High

Maximum sea surface temperatures around the British Isles rarely exceed 20 °C (Hiscock, 1998) and, as *Rhodothamniella floridula* occurs throughout north west Europe it will therefore be subject to a wider range of temperatures than experienced in the British Isles. It is therefore expected that an increase in temperature will not result in mortality of the species.

However, high temperatures may cause photosynthesis and growth to be impaired. For instance, Dixon & Irvine (1977) observed that the growth of *Rhodothamniella floridula* (as *Audouinella floridula*) is much faster in winter, whilst in the summer the spongy cushion can become bleached or disrupted. Stegenga (1978) found that tetraspores of cultured *Rhodothamniella floridula* (as *Rhodochorton floridulum*) were formed under all combinations of temperatures from 4 °C to 16 °C at any length of daylight, although they were most abundant at high temperatures and long days.

Rockpool temperatures could also rise significantly and some mortality may occur in exceptional conditions. Intolerance has been assessed as low. Physiological processes should quickly return to normal when temperatures return to their original levels so recoverability has been assessed as very high.

Decrease in temperature Low Very high Very Low High

Minimum surface sea water temperatures rarely fall below 5 °C around the British Isles (Hiscock, 1998) and, as *Rhodothamniella floridula* occurs throughout north west Europe it will therefore be subject to a wider range of temperatures than experienced in the British Isles. It is therefore expected that a decrease in temperature will not result in mortality of the species.

Dixon & Irvine (1977) observed that the growth of *Rhodothamniella floridula* (as *Audouinella floridula*) is much faster in winter, whilst in the summer the spongy cushion can become

bleached or disrupted. It is therefore likely that a reduction in temperature will increase the growth rate of the species.

However, low temperatures may delay or slow reproduction. Stegenga (1978) found that tetraspores of cultured *Rhodothamniella floridula* (as *Rhodochorton floridulum*) were formed under all combinations of temperatures from 4 °C to 16 °C at any length of daylight, although they were most abundant at high temperatures and long days. intolerance has therefore been assessed as low. The reproductive rate should quickly return to normal when temperatures return to their original levels so recoverability has been recorded as very high.

Increase in turbidity Intermediate High Low Moderate

In general, subtidal red algae are able to exist at relatively low light levels (Gantt, 1990). *Rhodothamniella floridula* (as *Audouinella floridula*) inhabits areas in shelter, partly under larger seaweeds (Hayward *et al.*, 1996) and is probably adapted to growth in low light conditions. Stegenga (1978) found that tetraspores of cultured *Rhodothamniella floridula* (as *Rhodochorton floridulum*) were formed at any length of daylight, although they were most abundant at high temperatures and long days. This suggests that a decrease in the amount of light reaching the plant will result in a decrease in the reproductive potential of the species. No information is available concerning mortality associated with an increase in turbidity, but is likely that at high levels of turbidity some mortality will occur. Therefore, intolerance has been assessed as intermediate. Recoverability is likely to be high (see additional information below).

Decrease in turbidity Tolerant Not relevant Not sensitive High

Stegenga (1978) found that tetraspores of cultured *Rhodothamniella floridula* (as *Rhodochorton floridulum*) were formed at any length of daylight, although they were most abundant at high temperatures and long days. This suggests that an increase in the amount of light reaching the plant will result in an increase in the reproductive potential of the species, if there is no overriding temperature effect. Therefore, *Rhodothamniella floridula* is recorded as being 'tolerant' to a decrease in turbidity, with the potential to benefit from the factor.

Increase in wave exposure Intermediate High Low High

The biotope with which *Rhodothamniella floridula* is mostly associated occurs in 'Moderately exposed', 'Sheltered' and 'Very sheltered' conditions (Connor *et al.*, 1997b). Stronger wave action is likely to cause damage to filaments, resulting in reduced photosynthesis and compromised growth, but more likely dislodgement by the force of wave action and by scouring from sand and gravel mobilised by increased wave action (Hiscock, 1983). The deepest living individuals are likely to avoid the worst impact of wave exposure, but some mortality in the total population is likely. Therefore, intolerance has been assessed as intermediate. Recoverability is likely to be high (see additional information below).

Decrease in wave exposure Tolerant Not relevant Not sensitive High

As the biotope with which *Rhodothamniella floridula* is mostly associated occurs in 'Moderately exposed', 'Sheltered' and 'Very sheltered' conditions (Connor *et al.*, 1997b) the species is unlikely to be affected by a decrease in wave exposure. It is therefore recorded as 'tolerant'.

Noise Tolerant Not relevant Not sensitive High

Algae have no mechanisms for detection of sound and, therefore would be not sensitive to disturbance by noise.

Visual Presence Tolerant Not relevant Not sensitive High

Algae have no visual acuity and, therefore would not be affected by visual disturbance.

Abrasion & physical disturbance	Intermediate	High	Low	Moderate

No information was found concerning the effects of abrasion on *Rhodothamniella floridula*. However, this species is characteristic of sand scoured habitats and is probably tolerant. But an anchor, or similar impact, is likely to rip through the mat and remove a proportion of population. Intolerance has been assessed to be intermediate. Recoverability is likely to be high (see additional information below).

Displacement	High	High	Moderate	Moderate

It is unlikely that the holdfast would survive removal from the substratum and be able to attach to a new substratum. Intolerance has therefore been assessed as high. Recoverability is likely to be high (see additional information below).

Chemical Pressures

	Intolerance	Recoverability	Sensitivity	Confidence
Synthetic compound contamination	High	High	Moderate	Moderate

No information was found relating to the effects of synthetic chemicals on *Rhodothamniella floridula*. However, inferences may be drawn from the sensitivities of red algal species generally. O'Brien & Dixon (1976) suggested that red algae were the most sensitive group of algae to oil or dispersant contamination, possibly due to the susceptibility of phycoerythrins to destruction. They also reported that red algae are effective indicators of detergent damage since they undergo colour changes when exposed to a relatively low concentration of detergent. Laboratory studies of the effects of oil and dispersants on several red algal species concluded that they were all sensitive to oil/dispersant mixtures, with little difference between adults, sporelings, diploid or haploid stages (Grandy, 1984, cited in Holt *et al.*, 1995). Cole *et al.* (1999) suggested that herbicides, such as simazine and atrazine were very toxic to macrophytes. The evidence suggests that in general red algae are very intolerant of synthetic chemicals. Intolerance has therefore been recorded as high. Recoverability has been assessed as high (see additional information below).

Heavy metal contamination		Not relevant		Not relevant

Bryan (1984) suggested that the general order for heavy metal toxicity in seaweeds is: Organic Hg > inorganic Hg > Cu > Ag > Zn > Cd > Pb. Cole *et al.* (1999) reported that Hg was very toxic to macrophytes. The sub-lethal effects of Hg (organic and inorganic) on the sporelings of an intertidal red algae, *Plumaria elegans*, were reported by Boney (1971). 100% growth inhibition was caused by 1 ppm Hg. No information was found concerning the effects of heavy metals on *Rhodothamniella floridula* specifically, and therefore an intolerance assessment has not been attempted.

Hydrocarbon contamination	High	High	Moderate	Moderate

No evidence was found specifically relating to the intolerance of *Rhodothamniella floridula* to hydrocarbon contamination. However, inferences may be drawn from the sensitivities of red algal species generally. O'Brien & Dixon (1976) suggested that red algae were the most sensitive group of algae to oil or dispersant contamination, possibly due to the susceptibility of phycoerythrins to destruction. Laboratory studies of the effects of oil and dispersants on several red algal species concluded that they were all sensitive to oil/dispersant mixtures, with little difference between adults, sporelings, diploid or haploid life stages (Grandy, 1984, cited in Holt *et al.*, 1995). Intolerance has been assessed as high. Recoverability has been recorded as high (see additional information below).

Radionuclide contamination Not relevant Not relevant

No evidence was found concerning the intolerance of *Rhodothamniella floridula* to radionuclide contamination.

Changes in nutrient levels Intermediate High Low Low

A moderate increase in nutrient levels may enhance the growth of *Rhodothamniella floridula*. However, excessive eutrophication would probably result in the species being out-competed by ephemeral species with rapid growth rates, such as filamentous green and brown algae. Therefore intolerance has been assessed as intermediate. Recoverability has been recorded as high (see additional information below).

Increase in salinity Not relevant Not relevant Not relevant High

Rhodothamniella floridula occurs in full salinity conditions. Although no information has been found on survival in hypersaline conditions, the species occurs in rockpools where evaporation may occasionally lead to higher than normal salinities. However, occurrence of the species in full salinity leads to an intolerance assessment of 'not relevant'.

Decrease in salinity High High Moderate Moderate

No information was found on the effects of reduced salinity on *Rhodothamniella floridula*. However, as this species occurs only in full salinity conditions it is probable that a proportion of the population would die in lower salinities. Therefore, intolerance has been assessed as high. Recoverability is likely to be high (see additional information below).

Changes in oxygenation Not relevant Not relevant

The effects of reduced oxygenation on algae are not well studied. Plants require oxygen for respiration, but this may be provided by production of oxygen during periods of photosynthesis. Lack of oxygen may impair both respiration and photosynthesis (see review by Vidaver, 1972). A study of the effects of anoxia on another red alga, *Delesseria sanguinea*, revealed that specimens died after 24 hours at 15°C but that some survived at 5°C (Hammer, 1972). Insufficient information is available to make an intolerance assessment for *Rhodothamniella floridula*.

Biological Pressures

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

No information has been found.

Introduction of non-native species Not relevant Not relevant

No information on the effects of alien species on *Rhodothamniella floridula* were found.

Extraction of this species Not relevant Not relevant Not relevant Not relevant

There is no extraction of *Rhodothamniella floridula* known to occur.

Extraction of other species Not relevant

No information was found concerning effects of harvesting other species on *Rhodothamniella floridula*.

Additional information

No information was found relating to colonization or recolonization rates of *Rhodothamniella floridula*. Red algae are typically high fecund, but their spores are non-motile (Norton, 1992) and therefore highly reliant on the hydrodynamic regime for dispersal. Kain (1975) reported that after displacement some Rhodophyceae were present after 11 weeks, and after 41 weeks, in June, Rhodophyceae species predominated. However, Stegenga (1978) noted that tetrasporangia of *Rhodothamniella floridula* (as *Rhodochorton floridulum*) germinated in 'rather low numbers'. The species is therefore probably going to recover within the 'high' category, although recovery of remote populations will be more protracted and dependent upon favourable currents bringing spores.

Importance review

Policy/legislation

- no data -

Status

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

Non-native

Native	-		
Origin	-	**Date Arrived**	-

Importance information

-none-

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