Thongweed (*Himanthalia elongata*)

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

Nicola White

2008-05-29

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/1358]. All terms and the MarESA methodology are outlined on the website (https://www.marlin.ac.uk)

This review can be cited as:
White, N. 2008. *Himanthalia elongata* Thongweed. 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.1358.1

(page left blank)

Stand of *Himanthalia elongata* at Outer Hope.
Photographer: Paul Newland
Copyright: Paul Newland

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 Dagmar Stengel
Authority	(Linnaeus) S.F.Gray, 1821		
Other common names	-	**Synonyms**	-

Summary

Description

A common brown seaweed, which has a two stage morphology. Small button-like thalli are first produced, from which long strap-like reproductive fronds (receptacles) are formed in autumn. The strap-like reproductive fronds grow quickly between February and May, reaching a length of up to 2 m. The plant releases gametes from June until the winter when it starts to decay. Plants commonly live for 2-3 years and reproduce once before dying.

Recorded distribution in Britain and Ireland

All coasts of Britain and Ireland, except south east England.

Global distribution

Norway, Britain, Ireland, north west coast of France, northern Spain and Portugal.

Habitat

Himanthalia elongata is found attached to hard substrata on moderately exposed shores. It is found at the bottom of the shore, where it forms a band below *Fucus serratus* and above laminarians.

Depth range

Not relevant

Identifying features

- Thallus is button-like with a short stipe and is up to 3 cm in diameter.
- Strap-like reproductive bodies are produced from the centre of the button, which are dichotomously branched.
- Up to 2 meters in length.

Additional information

Also commonly known as sea thong.

Listed by

Further information sources

Search on:

G G NBN WoRMS

Biology review

Taxonomy

Phylum	Ochrophyta	Brown and yellow-green seaweeds
Class	Phaeophyceae	
Order	Fucales	
Family	Himanthaliaceae	
Genus	Himanthalia	
Authority	(Linnaeus) S.F.Gray, 1821	
Recent Synonyms	-	

Biology

Typical abundance	Moderate density
Male size range	Up to 2m
Male size at maturity	15mm
Female size range	15mm
Female size at maturity	
Growth form	Capitate / Clubbed
Growth rate	max. 16mm/day
Body flexibility	
Mobility	
Characteristic feeding method	Autotroph
Diet/food source	
Typically feeds on	Not relevant
Sociability	
Environmental position	Epifloral
Dependency	Independent.
Supports	None
Is the species harmful?	No

Biology information

- *Himanthalia elongata* has a two stage morphology. A small button-like frond is first produced, from which large strap-like reproductive fronds are formed. The button stage is clubbed shaped at first and then develops into a button shape 2-3 cm in diameter, which is connected to the substrate by a holdfast and short stipe. Each button typically produces 2 strap-like reproductive fronds in autumn, although plants have been observed with 1 to 4 straps.
- "Growth rate" refers to growth of reproductive straps at 10-12 degrees C, which is the optimum growing temperature in spring.
- "Size at maturity" refers to the minimum diameter of the button, which is required for it to produce receptacles.

Habitat preferences

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

Habitat Information

- The distribution of *Himanthalia elongata* appears to be controlled by the degree of wave exposure, presence of tidal currents and the availability of suitable substrata. The species grows best in areas with strong tidal currents and is most commonly found on semi-exposed shores where, it can be locally abundant. It is rarely found in exposed shores and occasionally forms dense stands on sheltered shores.
- The degree of exposure to waves is also important in determining the persistence of adult plants on the shore. On exposed sites, adult plants may only be present until October, whereas on sheltered sites, plants may be present until February.
- Zygotes of this species are intolerant of lowered salinity and silt, restricting the species' distribution. *Himanthalia elongata* is typically found in the lower eulittoral and sometimes extends into the shallow sublittoral. The species can tolerate the physical conditions found further up the shore, but it is prevented from growing there by grazing pressure.
- Plants from exposed sites tend to be shorter and have fewer, narrower receptacles. Plants grow well in the presence of a red algal turf, which offers protection to young vegetative stages from wave action.

Life history

Adult characteristics

Reproductive type	Gonochoristic (dioecious)
Reproductive frequency	Semelparous / monotely
Fecundity (number of eggs)	No information
Generation time	2-5 years
Age at maturity	2 year
Season	June - December
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

- *Himanthalia elongata* has a life history and growth pattern unique among the Fucales. The species invests 98 percent of the total biomass in reproductive rather than vegetative tissue. It is usually has a biennial lifecycle, reproducing once and then dying.
- The reproductive bodies or receptacles take the form of long straps, which sprout from the centre of the button. When the plants are fertile the straps become mottled with brown spots, each spot with a pale centre marking the opening to the conceptacle.
- Gametes are released from June until winter. Usually germlings become visible on the shore in early March and form buttons with an average size of 10-25 mm by August. Those buttons which grow to 15 mm by November produce receptacles that autumn. The receptacles grow little in length during autumn and winter but increase rapidly between February and May. From June onwards, adult plants release gametes on a low tide by liberating them into mucus, which dribbles onto the substratum below. The time of reproduction is strongly site dependent, probably due to water temperature.
- Zygotes of the species are very large in comparison to most seaweeds. They are spherical, heavy and measure 0.2mm across so that they rapidly settle to the substratum. After fertilisation there is a long period of 5-7 days before attaching rhizoids develop. During this period the zygote is anchored to the substratum using the fertilization membrane, which is expanded into a wide brim. Zygotes are incapable of growing on silt, but germlings are tolerant of temporary cover by drifting sand.
- Gamete dispersal is thought to be limited so recruitment from external populations is probably low. Early germling growth is probably strongly influenced by the presence of adults, as reproductive thalli provide protection from desiccation and high irradiances, although shading could limit growth rate of germlings (Stengel, pers. comm.).

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

Himanthalia elongata is permanently attached to the substratum, so it would be removed upon substratum loss. The species recruited to concrete blocks placed in the intertidal zone (within an existent population of *Himanthalia elongata*) at an average level of 45 buttons per block (968 sq. cm in area) in March of the first year, dropping to only 4 or 5 buttons per block by early summer, but rising to 1500 buttons per block by March of the second year (Stengel *et al.*, 1999). However, the zygotes are relatively large, heavy and settle out rapidly (Moss *et al.* 1973) and probably have limited dispersal capability. Subsequent survival of early germlings is dependant on the presence of adult thalli or other foliose algae providing protection from desiccation, wave action and high irradiances, although shading probably limits growth rates of the germlings (Stengel *et al.*, 1999; Stengel pers. comm.). Dispersal of gametes is probably very limited (Stengel pers. comm.). Although the above suggests that recovery may take 1-2 years in the vicinity of populations of this species (depending on the time of year); recovery by recruitment from other populations may take longer. Therefore, recovery is reported as high; populations may take up to 5 years to re-establish.

Smothering	High	High	Moderate	Low

Smothering would cover and probably kill the button-like vegetative bodies of *Himanthalia elongata*. The species recruited to concrete blocks placed in the intertidal zone (within an existent population of *Himanthalia elongata*) at an average level of 45 buttons per block (968 sq. cm in area) in March of the first year, dropping to only 4 or 5 buttons per block by early summer, but rising to 1500 buttons per block by March of the second year (Stengel *et al.*, 1999). However, the zygotes are relatively large, heavy and settle out rapidly (Moss *et al.* 1973) and probably have limited dispersal capability. Subsequent survival of early germlings is dependant on the presence of adult thalli or other foliose algae providing protection from desiccation, wave action and high irradiances, although shading probably limits growth rates of the germlings (Stengel *et al.*, 1999; Stengel pers. comm.). Dispersal of gametes is probably very limited (Stengel pers. comm.). Although the above suggests that recovery may take 1-2 years in the vicinity of populations of this species (depending on the time of year); recovery by recruitment from other populations may take longer. Therefore, recovery is reported as high; populations may take up to 5 years to re-establish.

Increase in suspended sediment	High	High	Moderate	Moderate

Silt may settle out on the fronds of *Himanthalia elongata*, reducing light available for photosynthesis and lowering growth rates. Young stages of the species are very intolerant of siltation (Moss *et al.*, 1973) so the impact of the factor would depend on the time of year when it happened. If siltation occurred from June to December, when gametes are released, the population would be highly intolerant because zygotes cannot grow on silt (Moss *et al.*, 1973). The species recruited to concrete blocks placed in the intertidal zone (within an existent

population of *Himanthalia elongata*) at an average level of 45 buttons per block (968 sq. cm in area) in March of the first year, dropping to only 4 or 5 buttons per block by early summer, but rising to 1500 buttons per block by March of the second year (Stengel *et al.*, 1999). However, the zygotes are relatively large, heavy and settle out rapidly (Moss *et al.* 1973) and probably have limited dispersal capability. Subsequent survival of early germlings is dependant on the presence of adult thalli or other foliose algae providing protection from desiccation, wave action and high irradiances, although shading probably limits growth rates of the germlings (Stengel *et al.*, 1999; Stengel pers. comm.). Dispersal of gametes is probably very limited (Stengel pers. comm.). Although the above suggests that recovery may take 1-2 years in the vicinity of populations of this species (depending on the time of year); recovery by recruitment from other populations may take longer. Therefore, recovery is reported as high; populations may take up to 5 years to re-establish.

Decrease in suspended sediment

Dessication High High Moderate Moderate

Himanthalia elongata can tolerate some increase in desiccation because the upper limit of the algae is controlled by biological interactions rather than physiological tolerance. After the Torrey Canyon oil spill, which killed limpets, *Himanthalia elongata* extended temporarily 2m vertically up the shore (Southward & Southward, 1978). The species also suffered no damage during the unusually hot summer of 1983 (Hawkins & Hartnoll, 1985), when it suffered increased desiccation. However, vegetative and reproductive plants died during hot weather during spring tides in Co. Clare (Stengel, pers. comm.). Therefore intolerance to desiccation is reported as high. The species recruited to concrete blocks placed in the intertidal zone (within an existent population of *Himanthalia elongata*) at an average level of 45 buttons per block (968 sq. cm in area) in March of the first year, dropping to only 4 or 5 buttons per block by early summer, but rising to 1500 buttons per block by March of the second year (Stengel *et al.*, 1999). However, the zygotes are relatively large, heavy and settle out rapidly (Moss *et al.* 1973) and probably have limited dispersal capability. Subsequent survival of early germlings is dependant on the presence of adult thalli or other foliose algae providing protection from desiccation, wave action and high irradiances, although shading probably limits growth rates of the germlings (Stengel *et al.*, 1999; Stengel pers. comm.). Dispersal of gametes is probably very limited (Stengel pers. comm.). Although the above suggests that recovery may take 1-2 years in the vicinity of populations of this species (depending on the time of year); recovery by recruitment from other populations may take longer. Therefore, recovery is reported as high; populations may take up to 5 years to re-establish.

Increase in emergence regime Intermediate High Low Moderate

Himanthalia elongata may physiologically tolerate an increase in the period of emergence because it has been found to grow 2m vertically further up the shore in the absence of limpets (Southward & Southward, 1978). However, an increase in the period of emergence would probably result in a depression of the species upper limit on the shore. A reduction in the period of emersion would conversely allow the upper limit of the species to extend further up the shore. The species recruited to concrete blocks placed in the intertidal zone (within an existent population of *Himanthalia elongata*) at an average level of 45 buttons per block (968 sq. cm in area) in March of the first year, dropping to only 4 or 5 buttons per block by early summer, but rising to 1500 buttons per block by March of the second year (Stengel *et al.*, 1999). However, the zygotes are relatively large, heavy and settle out rapidly (Moss *et al.* 1973) and probably have limited dispersal capability. Subsequent survival of early germlings is dependant on the presence of adult thalli or other foliose algae providing protection from

desiccation, wave action and high irradiances, although shading probably limits growth rates of the germlings (Stengel *et al.*, 1999; Stengel pers. comm.). Dispersal of gametes is probably very limited (Stengel pers. comm.). Although the above suggests that recovery may take 1-2 years in the vicinity of populations of this species (depending on the time of year); recovery by recruitment from other populations may take longer. Therefore, recovery is reported as high; populations may take up to 5 years to re-establish.

Decrease in emergence regime

Increase in water flow rate	Intermediate	High	Low	Low

Himanthalia elongata can tolerate fairly strong currents, as evidenced by its presence in tidal rapids in Lough Ine, Ireland. An increase in tidal strength may lead to plants being torn off the substratum resulting in poor settlement of germlings. Alternatively the substratum with plants attached may be mobilised. The species recruited to concrete blocks placed in the intertidal zone (within an existent population of *Himanthalia elongata*) at an average level of 45 buttons per block (968 sq. cm in area) in March of the first year, dropping to only 4 or 5 buttons per block by early summer, but rising to 1500 buttons per block by March of the second year (Stengel *et al.*, 1999). However, the zygotes are relatively large, heavy and settle out rapidly (Moss *et al.* 1973) and probably have limited dispersal capability. Subsequent survival of early germlings is dependant on the presence of adult thalli or other foliose algae providing protection from desiccation, wave action and high irradiances, although shading probably limits growth rates of the germlings (Stengel *et al.*, 1999; Stengel pers. comm.). Dispersal of gametes is probably very limited (Stengel pers. comm.). Although the above suggests that recovery may take 1-2 years in the vicinity of populations of this species (depending on the time of year); recovery by recruitment from other populations may take longer. Therefore, recovery is reported as high; populations may take up to 5 years to re-establish.

Decrease in water flow rate

Increase in temperature	Intermediate	High	Low	Low

Germination and vegetative growth in *Himanthalia elongata* are highly intolerant of reductions in temperature and are limited at temperatures below 15 degrees C (Stengel, 2000 in prep.). This species is less intolerant of increases in temperature as plants survived the unusually hot summer of 1983 apart from a slight bleaching of buttons (Hawkins & Hartnoll, 1985).

Decrease in temperature

Increase in turbidity	Low	Very high	Very Low	Moderate

An increase in turbidity would reduce the light available for photosynthesis and therefore lower growth rates. A prolonged occurrence of increased turbidity will delay vegetative growth and may result in a failure to become fertile in autumn (Stengel, pers. comm.) On return to normal turbidity levels the growth rate would be quickly restored.

Decrease in turbidity

Increase in wave exposure	High	High	Moderate	Moderate

Himanthalia elongata is mostly found on moderately exposed shores. An increase in wave action would result in plants and germlings being torn off the substratum and cause a shift in the community to barnacles. A decrease in the level of wave action would result in the species being displaced by faster growing fucoids such as *Fucus serratus*. The species recruited to concrete blocks placed in the intertidal zone (within an existent population of *Himanthalia*

elongata) at an average level of 45 buttons per block (968 sq. cm in area) in March of the first year, dropping to only 4 or 5 buttons per block by early summer, but rising to 1500 buttons per block by March of the second year (Stengel *et al.*, 1999). However, the zygotes are relatively large, heavy and settle out rapidly (Moss *et al.* 1973) and probably have limited dispersal capability. Subsequent survival of early germlings is dependant on the presence of adult thalli or other foliose algae providing protection from desiccation, wave action and high irradiances, although shading probably limits growth rates of the germlings (Stengel *et al.*, 1999; Stengel pers. comm.). Dispersal of gametes is probably very limited (Stengel pers. comm.). Although the above suggests that recovery may take 1-2 years in the vicinity of populations of this species (depending on the time of year); recovery by recruitment from other populations may take longer. Therefore, recovery is reported as high; populations may take up to 5 years to re-establish.

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	Low

Physical disturbance by anchors or a passing scallop dredge may damage fronds of established seaweeds and kill germlings. Abrasion may be caused by human trampling, which has been shown to reduce algal cover on shores (Holt *et al.*, 1997). However, *Himanthalia elongata* is unlikely to be subject to heavy trampling because it only occurs near the low water springs mark. Therefore, intolerance has been assessed as intermediate.
The species recruited to concrete blocks placed in the intertidal zone (within an existent population of *Himanthalia elongata*) at an average level of 45 buttons per block (968 sq. cm in area) in March of the first year, dropping to only 4 or 5 buttons per block by early summer, but rising to 1500 buttons per block by March of the second year (Stengel *et al.*, 1999). However, the zygotes are relatively large, heavy and settle out rapidly (Moss *et al.* 1973) and probably have limited dispersal capability. Subsequent survival of early germlings is dependant on the presence of adult thalli or other foliose algae providing protection from desiccation, wave action and high irradiances, although shading probably limits growth rates of the germlings (Stengel *et al.*, 1999; Stengel pers. comm.). Dispersal of gametes is probably very limited (Stengel pers comm.). Although the above suggests that recovery may take 1-2 years in the vicinity of populations of this species (depending on the time of year); recovery by recruitment from other populations may take longer. Therefore, recovery is reported as high; populations may take up to 5 years to re-establish.

Displacement	High	High	Moderate	Moderate

Himanthalia elongata is permanently attached to the substratum and once removed it cannot survive. The species recruited to concrete blocks placed in the intertidal zone (within an existent population of *Himanthalia elongata*) at an average level of 45 buttons per block (968 sq. cm in area) in March of the first year, dropping to only 4 or 5 buttons per block by early summer, but rising to 1500 buttons per block by March of the second year (Stengel *et al.*, 1999). However, the zygotes are relatively large, heavy and settle out rapidly (Moss *et al.* 1973) and probably have limited dispersal capability. Subsequent survival of early germlings is dependant on the presence of adult thalli or other foliose algae providing protection from desiccation, wave action and high irradiances, although shading probably limits growth rates

of the germlings (Stengel *et al.*, 1999; Stengel pers. comm.). Dispersal of gametes is probably very limited (Stengel pers. comm.). Although the above suggests that recovery may take 1-2 years in the vicinity of populations of this species (depending on the time of year); recovery by recruitment from other populations may take longer. Therefore, recovery is reported as high; populations may take up to 5 years to re-establish.

Chemical Pressures

	Intolerance	Recoverability	Sensitivity	Confidence
Synthetic compound contamination	Low	High	Low	Low

Himanthalia elongata was not affected by dispersants used after the 'Torrey Canyon' oil spill. Indeed the species increased its vertical range as a result of the loss of grazing gastropods (Southward & Southward, 1978).

Heavy metal contamination		Not relevant		Not relevant

Insufficient information

Hydrocarbon contamination	Intermediate	High	Low	Low

Himanthalia elongata survived the 'Torrey Canyon' oil spill and indeed extended 2 m vertically up the shore, due to the absence of grazers (Southward & Southward, 1978). The species lives in the lower eulittoral and sublittoral fringe, which means that oil will rapidly be washed off the fronds. It also usually occurs in areas with strong currents, so oil would be dispersed more quickly. Therefore, it is predicted that oil does not have a substantial impact on the species.

Radionuclide contamination		Not relevant		Not relevant

Insufficient information

Changes in nutrient levels	Intermediate	High	Low	Low

Nutrients are required for algal growth. A small increase in nutrient levels may enhance growth rates but large increases have a detrimental effect by leading to overgrowth of brown seaweeds by green algae (Fletcher, 1996). Decreases in nutrient levels may slow down algal growth. The species recruited to concrete blocks placed in the intertidal zone (within an existent population of *Himanthalia elongata*) at an average level of 45 buttons per block (968 sq. cm in area) in March of the first year, dropping to only 4 or 5 buttons per block by early summer, but rising to 1500 buttons per block by March of the second year (Stengel *et al.*, 1999). However, the zygotes are relatively large, heavy and settle out rapidly (Moss *et al.* 1973) and probably have limited dispersal capability. Subsequent survival of early germlings is dependant on the presence of adult thalli or other foliose algae providing protection from desiccation, wave action and high irradiances, although shading probably limits growth rates of the germlings (Stengel *et al.*, 1999; Stengel pers. comm.). Dispersal of gametes is probably very limited (Stengel pers. comm.). Although the above suggests that recovery may take 1-2 years in the vicinity of populations of this species (depending on the time of year); recovery by recruitment from other populations may take longer. Therefore, recovery is reported as high; populations may take up to 5 years to re-establish.

Increase in salinity	High	High	Moderate	Moderate

Himanthalia elongata is intolerant of salinity because reduced salinity has an adverse effect on zygote development. When salinity is below 21 psu few eggs survive (Moss et al., 1973). The species recruited to concrete blocks placed in the intertidal zone (within an existent population of *Himanthalia elongata*) at an average level of 45 buttons per block (968 sq. cm in area) in March of the first year, dropping to only 4 or 5 buttons per block by early summer, but

rising to 1500 buttons per block by March of the second year (Stengel *et al.*, 1999). However, the zygotes are relatively large, heavy and settle out rapidly (Moss *et al.* 1973) and probably have limited dispersal capability. Subsequent survival of early germlings is dependant on the presence of adult thalli or other foliose algae providing protection from desiccation, wave action and high irradiances, although shading probably limits growth rates of the germlings (Stengel *et al.*, 1999; Stengel pers. comm.). Dispersal of gametes is probably very limited (Stengel pers. comm.). Although the above suggests that recovery may take 1-2 years in the vicinity of populations of this species (depending on the time of year); recovery by recruitment from other populations may take longer. Therefore, recovery is reported as high; populations may take up to 5 years to re-establish.

Decrease in salinity

Changes in oxygenation Not relevant Not relevant

Insufficient information

Biological Pressures

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

Insufficient information

Introduction of non-native species		Not relevant		Not relevant

Insufficient information

Extraction of this species	Intermediate	High	Low	Low

Himanthalia elongata rapidly recruits to cleared areas of the shore (Stengel *et al.*, 1999), so provided not too much of the shore is harvested the species would be able to recover relatively quickly.

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

Extraction of grazers from semi-exposed shores, such as limpets and littorinids, could cause the upper limit of *Himanthalia elongata* to extend up the shore. This species could also be affected by trampling from humans harvesting red algae in the vicinity.

Additional information

Importance review

Policy/legislation

- no data -

Status

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

Non-native

Native	-		
Origin	-	**Date Arrived**	Not relevant

Importance information

- *Himanthalia elongata* is eaten as a food in Ireland and France. It is sold dried and pickled or may be eaten fresh in a salad. The species is harvested commercially on the west coast of Ireland on a small scale (Stengel *et al*., 1999). Large quantities have also been harvested in Brittany for use in the cultivation of artichokes (Guiry & Blunden, 1991) and it is used in beauty products such as facial cleansers.
- The epifauna and epiflora of *Himanthalia elongata* was described by Kitching (1987). He recorded 105 species of flora and fauna on *Himanthalia* plants in Lough Hyne. The upper surface of the buttons are very resistant to colonization by epiphytes while the underside of the buttons are usually colonized by Bryozoa and spirorbid worms. The straps are frequently covered in a microforest of filamentous algae, such as *Ectocarpus siliculosus*, *Ceramium pedicellatum* and *Ulva prolifera*. Fauna such as the gastropods *Rissoa pavida* & juvenile *Patella pellucida* and amphipods, are often associated with the above filamentous epiphytes.

Bibliography

Fletcher, R.L., 1996. The occurrence of 'green tides' - a review. In *Marine Benthic Vegetation. Recent changes and the Effects of Eutrophication* (ed. W. Schramm & P.H. Nienhuis). Berlin Heidelberg: Springer-Verlag. [Ecological Studies, vol. 123].

Guiry, M.D. & Blunden, G., 1991. *Seaweed Resources in Europe: Uses and Potential*. Chicester: John Wiley & Sons.

Hardy, F.G. & Guiry, M.D., 2003. *A check-list and atlas of the seaweeds of Britain and Ireland*. London: British Phycological Society

Hawkins, S.J. & Hartnoll, R.G., 1985. Factors determining the upper limits of intertidal canopy-forming algae. *Marine Ecology Progress Series*, **20**, 265-271.

Kitching, J.A., 1987. The fauna and flora associated with *Himanthalia elongata* (L) S. F. Gray in relation to water current and wave action in the Lough Hyne Marine Nature Reserve. *Estuarine, Coastal and Shelf Science*, **25**, 663-676.

Moss, B., Mercer, S., & Sheader, A., 1973. Factors Affecting the Distribution of *Himanthalia elongata* (L.) S.F. Gray on the North-east Coast of England. *Estuarine and Coastal Marine Science*, **1**, 233-243.

Southward, A.J. & Southward, E.C., 1978. Recolonisation of rocky shores in Cornwall after use of toxic dispersants to clean up the *Torrey Canyon* spill. *Journal of the Fisheries Research Board of Canada*, **35**, 682-706.

Stengel, D.B., Wilkes, R.J. & Guiry, M.D., 1999. Seasonal growth and recruitment of *Himanthalia elongata* (Fucales, Phaeophycota) in different habitats on the Irish west coasts. *European Journal of Phycology*, **34**, 213-221.

Datasets

Centre for Environmental Data and Recording, 2018. Ulster Museum Marine Surveys of Northern Ireland Coastal Waters. Occurrence dataset https://www.nmni.com/CEDaR/CEDaR-Centre-for-Environmental-Data-and-Recording.aspx accessed via NBNAtlas.org on 2018-09-25.

Cofnod – North Wales Environmental Information Service, 2018. Miscellaneous records held on the Cofnod database. Occurrence dataset: https://doi.org/10.15468/hcgqsi accessed via GBIF.org on 2018-09-25.

Environmental Records Information Centre North East, 2018. ERIC NE Combined dataset to 2017. Occurrence dataset: http://www.ericnortheast.org.uk/home.html accessed via NBNAtlas.org on 2018-09-38

Fenwick, 2018. Aphotomarine. Occurrence dataset http://www.aphotomarine.com/index.html Accessed via NBNAtlas.org on 2018-10-01

Fife Nature Records Centre, 2018. St Andrews BioBlitz 2014. Occurrence dataset: https://doi.org/10.15468/erweal accessed via GBIF.org on 2018-09-27.

Fife Nature Records Centre, 2018. St Andrews BioBlitz 2015. Occurrence dataset: https://doi.org/10.15468/xtrbvy accessed via GBIF.org on 2018-09-27.

Fife Nature Records Centre, 2018. St Andrews BioBlitz 2016. Occurrence dataset: https://doi.org/10.15468/146yiz accessed via GBIF.org on 2018-09-27.

Kent Wildlife Trust, 2018. Kent Wildlife Trust Shoresearch Intertidal Survey 2004 onwards. Occurrence dataset: https://www.kentwildlifetrust.org.uk/ accessed via NBNAtlas.org on 2018-10-01.

Manx Biological Recording Partnership, 2017. Isle of Man wildlife records from 01/01/2000 to 13/02/2017. Occurrence dataset: https://doi.org/10.15468/mopwow accessed via GBIF.org on 2018-10-01.

Manx Biological Recording Partnership, 2018. Isle of Man historical wildlife records 1995 to 1999. Occurrence dataset: https://doi.org/10.15468/lo2tge accessed via GBIF.org on 2018-10-01.

National Trust, 2017. National Trust Species Records. Occurrence dataset: https://doi.org/10.15468/opc6g1 accessed via GBIF.org on 2018-10-01.

NBN (National Biodiversity Network) Atlas. Available from: https://www.nbnatlas.org.

OBIS (Ocean Biogeographic Information System), 2019. Global map of species distribution using gridded data. Available from: Ocean Biogeographic Information System. www.iobis.org. Accessed: 2019-03-21

Outer Hebrides Biological Recording, 2018. Non-vascular Plants, Outer Hebrides. Occurrence dataset: https://doi.org/10.15468/goidos accessed via GBIF.org on 2018-10-01.

Royal Botanic Garden Edinburgh, 2018. Royal Botanic Garden Edinburgh Herbarium (E). Occurrence dataset: https://doi.org/10.15468/ypoair accessed via GBIF.org on 2018-10-02.

South East Wales Biodiversity Records Centre, 2018. SEWBReC Algae and allied species (South East Wales). Occurrence dataset: https://doi.org/10.15468/55albd accessed via GBIF.org on 2018-10-02.

The Wildlife Information Centre, 2018. TWIC Biodiversity Field Trip Data (1995-present). Occurrence dataset: https://doi.org/10.15468/ljc0ke accessed via GBIF.org on 2018-10-02.