Trembling sea mat (*Victorella pavida*)

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

Michelle Carter & Angus Jackson

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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/1302]. All terms and the MarESA methodology are outlined on the website (https://www.marlin.ac.uk)

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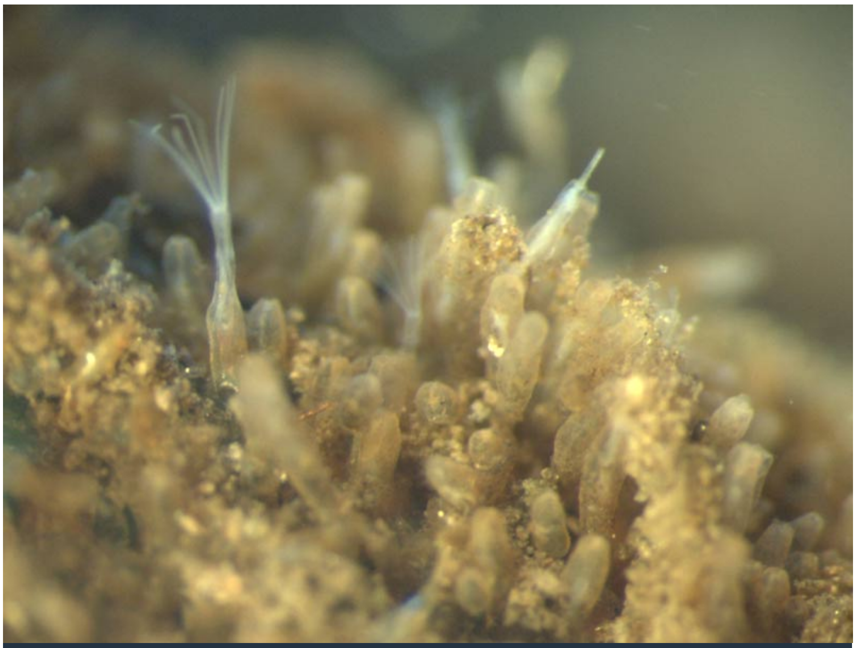

Zooids of *Victorella pavida* with lophophores everted.
Photographer: Michelle Carter

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	Michelle Carter & Angus Jackson	**Refereed by**	This information is not refereed.
Authority	Saville-Kent, 1870		
Other common names	-	**Synonyms**	-

Summary

Description

This creature looks more like a plant than an animal. It is a colonial bryozoan that may form either diffuse branching chains or develop into dense clumps. During the peak of the growth season (summer), colonies have the appearance and texture of velvet. Individuals within a colony vary in shape and size. Attached zooids posses a roughly oval base and a cylindrical peristome (erect tube). Erect zooids may be cylindrical of slightly bulbous at the base. In dense colonies the zooids may be as short as 0.3 mm and in diffuse colonies they may reach 1 mm long.

Recorded distribution in Britain and Ireland

In the British Isles, *Victorella pavida* is only found in Swanpool: a brackish water lagoon near Falmouth in Cornwall.

Global distribution

Various sites on the southern shores of the North Sea on the European Mainland. Common in the Mediterranean. Also reported from India, the Black Sea, the Baltic, Brazil, the eastern United States and Japan.

Habitat

Found in areas of low and fluctuating salinity such as estuaries and lagoons. The trembling sea mat grows in shallow water on submerged stones, plants and wood as well as artificial substrata such as concrete.

Depth range

5

Identifying features

- Colonies may consist of dense clumps or chains of zooids.
- Individual zooids may be up to 1 mm in size.
- Attached zooids posses a cylindrical base with a tubular extension (peristome).
- The sphincter is situated at the base of the gut.
- Gizzard absent.
- Eight tentacles.
- Embryos released through special intertentacular organ.

Produces dark brown/black hibernacula (dormant resting buds).

Additional information

No text entered

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Further information sources

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Biology review

Taxonomy

Phylum	Bryozoa	Sea mats, horn wrack & lace corals
Class	Gymnolaemata	
Order	Ctenostomatida	
Family	Victorellidae	
Genus	Victorella	
Authority	Saville-Kent, 1870	
Recent Synonyms	-	

Biology

Typical abundance	High density
Male size range	
Male size at maturity	
Female size range	Very small(<1cm)
Female size at maturity	
Growth form	Mat
Growth rate	8cm/month
Body flexibility	No information
Mobility	
Characteristic feeding method	Active suspension feeder
Diet/food source	
Typically feeds on	Microalgae, rotifers.
Sociability	
Environmental position	Epifaunal
Dependency	See additional information.
Supports	No information
Is the species harmful?	No

Biology information

Environmental position
At Swanpool, the trembling sea mat can be found growing on any hard surfaces such as stones, traffic cones, and concrete structures but has a particular predilection for submerged stems and rhizomes of *Phragmites australis*.

Associated fauna
Several taxa are consistently present living amongst *Victorella pavida* colonies, and on the *Phragmites* reeds, forming a community of aquatic organisms collectively termed 'Aufwuchs'. Taxa typically present include: chironomid larvae, nematodes, protozoans *Stentor* spp., and *Zoothamnium* spp., green and brown algae, mites, *Nais* spp., freshwater bryozoan *Plumatella repens*, and various small freshwater crustaceans including *Gammarus chevreuxi*.

Growth rate
Approximately 8 cm of linear growth over 1 month was observed in cultured colonies of *Victorella pavida* (Carter, 2004).

Habitat preferences

Physiographic preferences	Isolated saline water (Lagoon)
Biological zone preferences	Not relevant
Substratum / habitat preferences	Artificial (man-made), Mixed, Other species (see additional information)
Tidal strength preferences	No information
Wave exposure preferences	Not relevant, Ultra sheltered
Salinity preferences	See additional Information
Depth range	5
Other preferences	None known
Migration Pattern	Non-migratory / resident

Habitat Information

Salinity
The salinity of Swanpool is highly variable (0.5-22 psu) (Carter, 2004). A culvert connects the lagoon to the sea, with the incursion of seawater occurring on very high tides such as spring tides. At the northern end of Swanpool, the lagoon is fed freshwater from the Tregoniggie stream as well as diffuse drainage from a local catchment (Gainey, 1997; Evans, 2003).

Substratum/habitat
Victorella pavida can grow on any hard surface and in Swanpool can be found growing on concrete surfaces, stones, traffic cones and mainly *Phragmites australis*.

Life history

Adult characteristics

Reproductive type	Protandrous hermaphrodite
Reproductive frequency	See additional information
Fecundity (number of eggs)	See additional information
Generation time	<1 year
Age at maturity	8 weeks
Season	June - September
Life span	See additional information

Larval characteristics

Larval/propagule type	-
Larval/juvenile development	Lecithotrophic

Duration of larval stage	< 1 day
Larval dispersal potential	No information
Larval settlement period	

Life history information

Lifespan
The lifespan of an individual zooid has not been researched in this species. Generally, the polypides (combined lophophore and gut) of individual zooids within a bryozoan colony have the potential to undergo a cyclical degeneration and regeneration process. Polypides may last for one week up to 10 weeks (Reed, 1991). With respect to the lifespan of a *Victorella pavida* colony, new colonies emerge from dormancy during the spring and when temperatures are approximately 13°C. By November and the onset of winter, zooids begin to degenerate and eventually only the asexually produced dormant resting bodies (hibernacula) remain. The hibernacula germinate again in the spring and the cycle begins again (Carter, 2004).

Reproduction frequency
Reproduction is seasonal and eggs were observed in zooids from June to September. Following reproduction the colony will degenerate in preparation for winter dormancy (Carter, 2004).

Fecundity
Approximately 25 eggs can be produced per gravid zooid (Carter, 2004). Overall colony fecundity, therefore, varies with size of the colony.

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	Moderate	Moderate	Moderate

Victorella pavida requires hard substrata for larval settlement and growth and can grow on stones but has a particular predilection for *Phragmites australis*. Removal of any hard substrata could potentially remove a significant proportion of the Swanpool population permanently and is therefore considered highly intolerant of substratum loss. However, recoverability is considered moderate on the basis that it may be possible for residual hibernacula to germinate and any remaining colonies can potentially undergo clonal propagation. The possibility that *Phragmites australis* will be partially or fully removed is low due to the level of protection imposed on reedbed habitats (see IMU.NVC_S4) and Swanpool lagoon.

Smothering	Intermediate	Moderate	Moderate	Moderate

The ability of *Victorella pavida* to tolerate or recover from a smothering incident would be dependent on the nature and duration of smothering event. As an active suspension feeder this sea mat is dependent on the orifice of the zooid remaining clear in order to evert a ring of tentacles to feed. Culturing *Victorella pavida* in low salinities (e.g. <18 psu) can promote the growth of a gromiid freshwater amoeba of the genus *Lecythium*. This organism produces a matrix of branching pseudopodia that extends between and over the zooids rendering the zooids unable to evert their tentacles to feed. Eventually all colonies died (Carter, 2004). No evidence of such activity exists in the wild population. Therefore, intolerance to smothering is recorded as intermediate and recoverability as moderate.

Increase in suspended sediment	Tolerant	Not relevant	Not sensitive	Moderate

In the event of high siltation due to severe disturbance, particles of silt can attach to the feeding tentacles or block the orifice and prevent the eversion of the tentacles. The freshwater run-off was diverted into Swanpool, by South West Water, from a new housing development in 1983. Subsequent development around Swanpool increased the freshwater input with a concomitant decrease in salinity, which may have a detrimental effect on the population (Gainey, 1997), as the trembling sea mat is intolerant of low salinity (<3.5 psu) for lengthy periods (see Salinity below). After rain, the freshwater stream entering Swanpool lagoon is heavily laden with silt. Additional silt enters the lagoon as run-off from surrounding roads. Trembling sea mat populations are at risk from smothering in the long term as a result of increased siltation (Gainey, 1997). During a survey of the lagoon in 2003 it was confirmed that the greatest sedimentation occurred at the freshwater inlet site at 500-5000 g/m^{-2} (Evans *et al*., 2003). The authors indicated such levels of sedimentation appear to have no detrimental effect on the abundance of *Victorella pavida* at the freshwater inlet site. However, any possible adverse effect of sedimentation on abundance at the freshwater inlet site is compounded by a reduction in salinity. Overall, it appears that siltation alone would not have a detrimental effect at the benchmark level and, therefore, tolerant has been suggested.

Decrease in suspended sediment	Tolerant	Not relevant	Not sensitive	Low

As an active suspension feeder this sea mat is dependent on the orifice of the zooid remaining clear in order to evert a ring of tentacles to feed. An increase in suspended sediment could potentially smother the colony rendering the zooids unable to evert their tentacles to feed. On this basis a decrease in suspended sediment would be beneficial to the growth colony. In addition, a reduction of particles is likely to encourage larval settlement and subsequent growth of the colony. Therefore, the trembling sea mat is considered tolerant.

Dessication High Moderate Moderate Moderate

Victorella pavida would be unable to tolerate emersion for extended periods of time. A permanent or semi-permanent reduction in water level in Swanpool, even by 1 metre, could have lethal implications with a severe decline in abundance. Devoid of any passing food particles, zooids would be unable to feed and grow and will eventually die. On this basis *Victorella pavida* is considered as highly intolerant of desiccation. However, this sea mat does have a 'safety net' in the form of hibernacula (asexually produced dormant resting buds), which provides a means of refuge for the duration of unfavourable conditions. Upon resumption of favourable conditions the hibernaculum will germinate giving rise to a new colony (Evans *et al*, 2003). Recoverability is defined as moderate and dependent on length of emersion as hibernacula are only short-term resting bodies, losing 80% viability in 10 months (Carter, 2004, pers. obs.).

Increase in emergence regime High Moderate Moderate Moderate

Increased emergence will expose populations to increased risk of desiccation (see above), increased extremes of temperature, and decreased length of time for feeding. Hence, a high intolerance of increased emergence has been recorded. During unfavourable conditions, *Victorella pavida* has the potential to regress into dormancy by producing resting buds called hibernacula, and re-emerge during favourable conditions. On this basis, recoverability is recorded as moderate and dependent on the length of emergence as hibernacula are short-term resting bodies and can potentially lose 50% viability in five months).

Decrease in emergence regime Tolerant* Not relevant Not sensitive* High

A decrease in emersion will decrease the risk of desiccation and effectively provide additional substrata for colonization, potentially allowing the *Victorella pavida* population to increase. Therefore, tolerant* has been recorded.

Increase in water flow rate Intermediate High Low Moderate

The major source of water flow arises from the freshwater stream inlet. The flow rate at the inlet is low in the summer reaching a peak of 200 $m^3.h^{-1}$ in November (Evans *et al.*, 2003). Evans *et al.* (2003) found a significant positive correlation between flow rate and cumulative rainfall over 28 days. An increase in flow rate would disturb the sediment and increase the amount of suspended silt and particles, which may have deleterious consequences for feeding and growth (see suspended sediment above). The abundance of *Victorella pavida* is 30% less at the freshwater inlet site compared with the rest of the lagoon, any effect of increased flow rate and/ or increased silt as a result of heavy rain, would be compounded by decreases in salinity (Carter, 2004). <p>The incursion of seawater into the lagoon, via a culvert, tends to occur at very high tides (i.e. tides of a height >+5.64 m CD) (Evans *et al.*, 2003). The inflow of seawater into the lagoon has been recorded to be between 1100-3500 m^3 (Dorey *et al.*, 1973). Gainey (1997) recorded the abundance of the trembling sea mat as common to frequent around the culvert. Intolerance is recorded as intermediate, due to the dynamics of the lagoon extensive fluctuations in flow rate do not effect the whole lagoon. Recoverability is therefore recorded as high. </p>

Decrease in water flow rate Tolerant Not relevant Not sensitive Low

A degree of water flow is required for transportation of food particles. However, due to the dynamic nature of the lagoon (see above) the water in the lagoon is rarely stagnant for extended periods. Bryozoans have tiny hairs, or cilia, on each tentacle which beat and create a localised current around the colony (Ryland, 1970). This action provides a current to draw food towards the mouth. On this basis, tolerant has been recorded.

Increase in temperature Tolerant Not relevant Not sensitive Moderate

The growth rate of *Victorella pavida* increases with temperature. During laboratory culture, a two-fold increase in growth rate was observed in colonies initially cultured at 15°C followed by 19°C (Carter, 2004).
Jebram (1987) was able to culture *Victorella pavida* at 20 to 22°C.

In the Cochin Waters of India, *Victorella pavida* can survive monsoon and post-monsoon conditions and was recorded as occurring commonly during the post-monsoon season and surviving temperatures of around 30°C (Menon & Nair, 1971).

The growth cycle of *Victorella pavida* is seasonal and therefore temperature dependent. In the winter, colonies are dormant in the form of hibernacula; when temperatures reach 13°C, the hibernaculum will germinate giving rise to a new colony (Carter, 2004). It would be intuitive to suggest that a permanent/semi-permanent increase in temperature above 13°C would be conducive to the existence of a permanently active population. Menon & Nair (1967) examined the abundance of *Victorella pavida* in Cochin Waters. The temperature over a year ranged from 21.1 to 32.4, however, the abundance of *Victorella pavida* appeared to be influenced by the monsoon and hence salinity fluctuations; colonies were abundant during the monsoon and post-monsoon periods, which coincides with a low salinity but absent during pre-monsoon periods when a full salinity was recorded, therefore, a complete absence during pre-monsoon periods is due to salinity and not temperature (Menon & Nair, 1967). *Victorella pavida* appears tolerant of increases in temperature and no data exists to suggest that acute temperature change is detrimental. Recoverability is recorded as high.

Decrease in temperature Tolerant Not relevant Not sensitive High

In Swanpool, colonies of *Victorella pavida* die-off when exposed to temperatures below 12°C (Carter, 2004). However, this species produces resting stages called hibernacula that enable colonies to remain dormant for the duration of the winter (Ryland, 1970; Bushnell & Rao, 1974; Silen, 1977; Evans *et al*., 2003). Therefore, whilst this species may be tolerant of low temperatures an ability to recover from a period of cold would depend on the length of time in dormancy and whether favourable temperatures resume to allow for germination. Therefore recoverability is recorded as moderate.

Increase in turbidity Low Not relevant Moderate

An increase in turbidity is likely to result in a decrease in phytoplankton which may reduce food availability for *Victorella pavida*. Therefore an intolerance of low has been recorded.

Decrease in turbidity Tolerant Not relevant Not sensitive Moderate

A decrease in turbidity is likely to increase primary productivity and food availability for *Victorella pavida* and is unlikely to be adversely effected by a decrease in turbidity, so tolerant has been recorded.

Increase in wave exposure Not relevant Not relevant Not relevant Not relevant

Swanpool is considered as an extremely sheltered site and the movement of water as a result of high winds would be negligible. An increase in exposure, and therefore wind/wave exposure, as a result of habitat degradation is also unlikely due to the protected status of the reed bed and lagoon.

Decrease in wave exposure	Not relevant	Not relevant	Not relevant	Not relevant

A decrease in wave exposure would have no impact on *Victorella pavida*. Swanpool lagoon is a very sheltered site and a further decrease in wave exposure is unlikely.

Noise	Intermediate	Immediate	Very Low	Moderate

The trembling sea mat is very sensitive to touch and vibration (Carter, 2004. pers. obs) and will retract their tentacles as a result, disrupting feeding. Therefore, colonies may react to local vibrations as a result of acute transmissions of sound. On this basis a intolerance of low has been recorded.

Visual Presence	Not relevant	Not relevant	Not relevant	Not relevant

Some bryozoans may posses photoreceptors as evidence has shown that germination of the dormant resting buds of some freshwater bryozoans is dependent on light (Mukai, 1974; Oda, 1980). However, the visual acuity of bryozoans would be negligible.

Abrasion & physical disturbance	Intermediate	High	Moderate	Moderate

As a ctenostome bryozoan, the body wall of *Victorella pavida* is composed of a non-calcified, flexible cuticle (Hayward, 1985). The body wall is potentially easily penetrable and any contact with a firm object will have lethal consequences therefore an intolerance of intermediate has been recorded. Recoverability is likely to be high.

Displacement	High	Moderate	Moderate	Moderate

Removal of a colony from its substratum would probably be fatal, yet *Victorella pavida* can potentially extend the growth of the pseudostolon towards the substratum to re-attach. Intolerance has been assessed as high with a moderate recoverability.

Chemical Pressures

	Intolerance	Recoverability	Sensitivity	Confidence
Synthetic compound contamination	Intermediate	Very high	Low	Low

Bryozoans are common members of the fouling community, and amongst those organisms most resistant to antifouling measures, such as copper containing anti-fouling paints (Soule & Soule, 1977; Holt *et al*., 1995). Bryan & Gibbs (1991) reported that there was little evidence regarding TBT toxicity in Bryozoa with the exception of the encrusting *Schizoporella errata*, which suffered 50% mortality when exposed for 63 days to 100ng/l TBT. Rees *et al*. (2001) reported that the abundance of epifauna (including bryozoans) had increased in the Crouch estuary in the five years after TBT was banned from use on small vessels. This last report suggests that bryozoans may be at least inhibited by the presence of TBT. Therefore, an intolerance of intermediate has been recorded. Recoverability is probably high.

Heavy metal contamination	Low	Immediate	Not sensitive	Low

Bryozoans are common members of the fouling community, and amongst those organisms most resistant to antifouling measures, such as copper containing anti-fouling paints (Soule & Soule, 1977; Holt *et al*., 1995). Bryozoans were shown to bioaccumulate heavy metals to a certain extent (Holt *et al*., 1995). For example, *Bowerbankia gracialis* and *Nolella pusilla* accumulated Cd, exhibiting sublethal effects (reduced sexual reproduction and inhibited resting spore formation) between 10-100 g Cd /l and fatality above 500 g Cd/l (Kayser, 1990).

Given the tolerance of bryozoans to copper based anti-fouling treatments, and assuming similar physiology between species, an intolerance of low has been recorded albeit with very low confidence.

Hydrocarbon contamination High Moderate Moderate Very low

Little information on the effects of hydrocarbons on bryozoans was found. Ryland & de Putron (1998) did not detect adverse effects of oil contamination on the bryozoan *Alcyonidium* spp. or other sessile fauna in Milford Haven or St. Catherine's Island, south Pembrokeshire. Houghton *et al.* (1996) reported a reduction in the abundance of intertidal encrusting Bryozoa (no species given) at oiled sites after the *Exxon Valdez* oil spill. Soule & Soule (1979) reported that the encrusting bryozoan *Membranipora villosa* was not found in the impacted area for 7 months after the December 1976 Bunker C oil spill in Los Angeles Harbour. Of the eight species of bryozoan recorded on the nearby breakwater two weeks after the incident, only three were present in April and by June all had been replaced by dense growths of the erect bryozoan *Scrupocellaria diegensis*. Mohammad (1974) reported that *Bugula* spp. and *Membranipora* spp. were excluded from settlement panels near a Kuwait oil terminal subject to minor but frequent oil spills. Encrusting bryozoans are also probably intolerant of the smothering effects of oil pollution, resulting in suffocation of colonies. Therefore, given the above evidence of intolerance in other bryozoans, a intolerance of high has been recorded, albeit at low confidence. Recoverability is probably moderate.

Radionuclide contamination Not relevant Not relevant

Insufficient information.

Changes in nutrient levels Not relevant Not relevant

A moderate increase in nutrient levels may increase the food available to *Victorella pavida*, either in the form of phytoplankton or detritus. However, no effects of nutrient enrichment were found.

Increase in salinity Tolerant Very high Not sensitive High

Victorella pavida is considered to be a euryhaline species (Ryland, 1970). The salinity in Swanpool is highly variable, ranging from zero to 22 psu (Evans *et al.*, 2003). Recent experiments on hibernacula germination found that germination will occur quite readily in 3.5 and 18 psu (68 and 69% respectively) but is severely retarded in 36 psu (20%). However, after a month exposed to the three salinities, extensive colony growth occurred in 18 psu and also in the 36 psu whilst zooids exposed to 3.5 psu all died (Carter, 2004). Whilst hibernacula germination is severely retarded in 36 psu, subsequent colony growth is quite extensive and therefore zooids are very tolerant of full salinity.

Decrease in salinity Low High Moderate High

In Swanpool, colonies of *Victorella pavida* are 30% less abundant at the freshwater stream inlet than other sites around the lagoon (Carter, 2004). This decrease in abundance may be due to the periodic low salinity in that area as a result of increased freshwater input from heavy rainfall. Experiments on the germination of hibernacula (see above) found that zooids of *Victorella pavida* are highly intolerant of low salinities (<3.5 psu) for extended periods. Whilst hibernacula will germinate readily in 3.5 psu, colony growth did not extend beyond the primary zooid and after 20 days, all zooids had died (Carter, 2004). Further experimentation found 5 psu to be lethal also, and the optimum salinity for germination and growth appeared to be 13 psu (Carter, 2004). On this basis, intolerance to decreased salinity is low and also recoverability would be high.

Changes in oxygenation	Not relevant	Not relevant	Not relevant	Not relevant

No information on the tolerance of *Victorella pavida* to changes in oxygen was found.

Biological Pressures

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

During culturing of wild populations of *Victorella pavida* at low salinities (3.5 and 5 psu), the colony can be overcome by a freshwater gromiid amoeba of the genus *Lecythium*. The *Lecythium* sp. produces branching pseudopodia that extend between and over the zooids to the extent that the zooids are unable to evert their tentacles to feed and subsequently died (Carter, 2004). However, there is no information available on the impact of microbes on wild populations of *Victorella pavida*.

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

No information found.

	Intolerance	Recoverability	Sensitivity	Confidence
Extraction of this species	Not relevant	Not relevant	Not relevant	Not relevant

As a protected species, *Victorella pavida* is unlikely to be removed to the extent of the benchmark level.

	Intolerance	Recoverability	Sensitivity	Confidence
Extraction of other species	High	Low	High	Low

Victorella pavida is commonly found growing on *Phragmites australis*, which extends around the periphery of Swanpool. Complete removal of this habitat would effectively be a removal of approximately 70% of available substrata for *Victorella pavida*, this would certainly have deleterious consequences for the population. Therefore intolerance of extraction is high and recoverability is low. However, extraction of this reedbed is unlikely to occur due to the protected status of the lagoon (County Wildlife Site, SSSI, and Local Nature Reserve).

Additional information

Recoverability

Victorella pavida has a short-lived planktonic larvae, which probably settle from July to September. *Victorella pavida* can colonize a wide variety of substrata and is a common member of the fouling communities. Therefore, it is able to colonize new habitats or free space rapidly, probably in 6 months or less. Upon emergence from dormancy during the spring, subsequent growth and development is rapid and by approximately 8 weeks from emergence, sexual reproduction commences. Subsequent expansion can then be quite rapid and a new population can be established within a year.

Importance review

Policy/legislation

Wildlife & Countryside Act	Schedule 5, section 9
UK Biodiversity Action Plan Priority	✓
Species of principal importance (England)	✓
Features of Conservation Importance (England & Wales)	✓

Status

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

Non-native

Native	Non-native		
Origin	Unknown	**Date Arrived**	1868

Importance information

There is insufficient information available to give an IUCN category but the species has been listed as a Red Data Book species. However, *Victorella pavida* is listed in the UK Biodiversity Action Plan long list of species of conservation concern (Biodiversity Steering Group, 1995).

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