# A tubeworm (*Spirobranchus triqueter*)

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/1794]. All terms and the MarESA methodology are outlined on the website (https://www.marlin.ac.uk)

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**Calcareous tubes of two keel worms among several barnacles.**
**Photographer:** David Fenwick
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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 & Susie Ballerstedt | **Refereed by** | This information is not refereed. |
| **Authority** | (Linnaeus, 1758) | | |
| **Other common names** | - | **Synonyms** | *Pomatoceros triqueter* |

# Summary

## Description

The calcareous tube of *Spirobranchus triqueter* is 3.5 mm wide and up to 25 mm long. It is white, smooth and irregularly curved with a single, median ridge that ends in a projection over the anterior opening. The operculum bears a shallow, dish-shaped plug (ampulla) which is often conical distally, and may have projections on the crown. The colouration of the body is bright but variable, and the crown of tentacles (radioles) are banded with various colours.

## Recorded distribution in Britain and Ireland

Common and widespread on all coasts.

## Global distribution

Occurs from the coasts of north west Europe to the Mediterranean.

## Habitat

*Spirobranchus triqueter* encrusts stones, rocks and shells, and the carapace of some species of decapods. They are predominantly sublittoral to depths of 70 m.

## Depth range
Up to 70m

## Identifying features

- The operculum bears a shallow, dish-shaped plug (ampulla), the distal part is often conical and may have projections on the crown.
- The tube is up to 25 mm long.
- A single ridge runs along the top of the tube, ending in a projection over the anterior opening.
- Colouration of the worm is varied.

## Additional information

- May be confused with *Spirobranchus lamarcki*, the tube of which differs from *Spirobranchus triqueter* as it has two vestigial ridges, one on each side, in addition to the median keel. Further differences can only be seen when the worm is removed from its tube (Hayward & Ryland, 1995). Further distinction between the two species can be obtained by using biochemical genetics, as described by Ekaratne *et al.* (1982).
- Males are cream in colour whilst females are bright pink/orange in colour (Thomas, 1940).

## Listed by

## Further information sources

Search on:

NBN WoRMS

# Biology review

## Taxonomy

| | | |
|---|---|---|
| **Phylum** | Annelida | Segmented worms e.g. ragworms, tubeworms, fanworms and spoon worms |
| **Class** | Polychaeta | Bristleworms, e.g. ragworms, scaleworms, paddleworms, fanworms, tubeworms and spoon worms |
| **Order** | Sabellida | |
| **Family** | Serpulidae | |
| **Genus** | Spirobranchus | |
| **Authority** | (Linnaeus, 1758) | |
| **Recent Synonyms** | Pomatoceros triqueter | |

## Biology

| | |
|---|---|
| **Typical abundance** | No information found |
| **Male size range** | up to 25mm |
| **Male size at maturity** | |
| **Female size range** | Small(1-2cm) |
| **Female size at maturity** | |
| **Growth form** | Vermiform segmented |
| **Growth rate** | 1.5mm/month |
| **Body flexibility** | High (greater than 45 degrees) |
| **Mobility** | |
| **Characteristic feeding method** | Active suspension feeder, No information |
| **Diet/food source** | |
| **Typically feeds on** | Plankton and detritus |
| **Sociability** | |
| **Environmental position** | Epibenthic |
| **Dependency** | Independent. |
| **Supports** | No information |
| **Is the species harmful?** | No<br>No text entered |

## Biology information

### Growth

- Once settled onto the substratum the worm forms a temporary delicate semi-transparent tube, which, when calcareous material is later added at the anterior end (Hayward & Ryland, 1995) dissolves over time (Dons, 1927). The tube is formed by a secretion of calcium carbonate (obtained from sea water) from the collar (Thomas, 1940).
- Growth rate is usually measured by the increase in length of the tube over a period of time. Dons (1927) found that the youngest sessile stages of the animals in Trondheim occurred when the tubes were 800-1200µm long and the animal was approximately 500µ

in length.

- Hayward & Ryland (1995) and Dons (1927) stated that growth is rapid and sexual maturity is reached in approximately 4 months. Growth rate has been observed by Dons (1927) to be 1.5 mm per month, although this varied with external conditions. Males and females exhibit the same growth rate (Castric-Fey, 1983). Animals settling during spring show the best growth rate and the rate is greatest during the first year (Castric-Fey, 1983).
- Castric-Fey (1983) reported that the number of segments of the worm increases with age, with a linear relationship being present within the first 6 months.

**Feeding & Respiration**

Thomas (1940) reviewed feeding and respiration in the polychaete. *Spirobranchus* (as *Pomatoceros*) *triqueter* never leaves its tube. Occasionally the posterior end of the tube becomes blocked by a calcareous plate with holes in. Respiration and excretion take place using cilia action to set up currents, bringing water in and down the length of the tube and flushing it back out the same way. Respiration occurs through the surface of the body and the branchial crown.

Feeding takes place by spreading apart its branchial filaments to expose a central groove. Using cilia action, it induces a current and transports food particles towards it mouth. If particles are too large or too numerous, the tip of a filament bends over and removes it. No sorting of food particles takes place.

## Habitat preferences

| | |
|---|---|
| **Physiographic preferences** | Enclosed coast / Embayment, Open coast |
| **Biological zone preferences** | Lower infralittoral, Sublittoral fringe, Upper circalittoral, Upper infralittoral |
| **Substratum / habitat preferences** | Artificial (man-made), Bedrock, Cobbles, Crevices / fissures, Gravel / shingle, Large to very large boulders, Pebbles, Small boulders |
| **Tidal strength preferences** | Moderately Strong 1 to 3 knots (0.5-1.5 m/sec.), Strong 3 to 6 knots (1.5-3 m/sec.), Very Weak (negligible), Weak < 1 knot (<0.5 m/sec.) |
| **Wave exposure preferences** | Exposed, Extremely sheltered, Moderately exposed, Sheltered, Very exposed, Very sheltered |
| **Salinity preferences** | Full (30-40 psu) |
| **Depth range** | Up to 70m |
| **Other preferences** | No text entered |
| **Migration Pattern** | Non-migratory / resident |

**Habitat Information**

- Segrove (1941) studied *Spirobranchus triqueter* in south England and found that there are usually ten times as many males as females present.
- The species has been noted to occur in very exposed to extremely sheltered wave action, very sheltered to exposed water flow rate, and in areas where there is little or no silt present (Price *et al.*, 1980).
- *Spirobranchus triqueter* is considered to be a primary fouling organism (Crisp, 1965),

colonizing artificial commercially important structures such as buoys, ships hulls, docks and offshore oil rigs (OECD, 1967).
- *Spirobranchus triqueter* is an opportunistic species, making use of available space quickly. In Bantry Bay, south-west Ireland, fouling by the tube worm caused a 65% mortality of scallops and prevented scallops from recolonizing the area after spat collection (Burnell *et al.*, 1991). They also reported that mussel farmers considered that most inner areas of the bay would be subject to this type of fouling.
- Rubin (1985) reported that *Spirobranchus* (syn. *Pomatoceros*) *triqueter* overgrew colonies of encrusting Bryozoa to become the dominant species on experimental panels. However, Bryozoa then grew on the tubes of the species, thereby avoiding exclusion.
- Dominance of *Spirobranchus lamarckii* over *Spirobranchus triqueter* is dependent on climatic conditions (Castric-Fey, 1983).

## Life history

### Adult characteristics

| | |
|---|---|
| **Reproductive type** | Protandrous hermaphrodite |
| **Reproductive frequency** | Annual episodic |
| **Fecundity (number of eggs)** | No information |
| **Generation time** | Insufficient information |
| **Age at maturity** | Approximately 4 months |
| **Season** | See additional information |
| **Life span** | See additional information |

### Larval characteristics

| | |
|---|---|
| **Larval/propagule type** | - |
| **Larval/juvenile development** | Planktotrophic |
| **Duration of larval stage** | 11-30 days |
| **Larval dispersal potential** | Greater than 10 km |
| **Larval settlement period** | See additional information |

## Life history information

- Male *Spirobranchus triqueter* release spermatogonia or primary spermatocytes and females release primary oocytes through a pair of gonoducts, consisting of a ciliated funnel and tube (Thomas, 1940).
- Hayward & Ryland (1995) and Segrove (1941) suggested that breeding of *Spirobranchus triqueter* probably takes place throughout the year. However, Hayward & Ryland (1995) noted a breeding peak in spring and summer and records from Port Erin by Moore (1937) indicated that breeding only took place in April in this location.
- Castric-Fey (1983) studied variations in settlement rate and concluded that, although the species settled all year round, very rare settlement was observed during winter and maximum settlement occurred in April, June, August and Sept-Oct. Studies in Bantry Bay (Cotter *et al.*, 2003) revealed a single peak in recruitment during summer (especially July

and August) with very little recruitment at other times of the year. More individuals settled on panels at 7 m than at 4 m.
- Larvae are pelagic for about 2-3 weeks in the summer. However, in the winter this amount of time increases to about 2 months (Hayward & Ryland, 1995).

**Longevity**

Longevity has been recorded to be between 1.5 to 4 years. Hayward & Ryland (1995) noted that individuals lived approximately 1.5 years, with most individuals dying after breeding (Hayward & Ryland, 1995). Castric-Fey (1983) found that under laboratory conditions, individuals were still alive after 2.5 years. However, Castric-Fey (1983) also stated that under natural conditions it is probable that they do not live any longer than this. Whilst Dons (1927) found that, according to measured growth rate, some of the individuals he studied would have been at least 4 years old.

# 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 |

*Pomatoceros triqueter* is attached permanently to rocks, boulders or shingle. Removal of substratum will remove calcareous tubes and animals contained in them. Intolerance is assessed as high. Recoverability is likely to be high (see additional information below).

| | Intolerance | Recoverability | Sensitivity | Confidence |
|---|---|---|---|---|
| **Smothering** | High | High | Moderate | High |

Smothering with a 5 cm layer of sediment would completely cover the tubes of *Pomatoceros triqueter* that usually lie flat against the surface of the rock. It is also likely that too much sediment on the surface of rocks or shells would prevent settlement of larvae and impair the long term survival of populations. Intolerance has been assessed to be high. Recoverability is likely to be high (see additional information below).

| | Intolerance | Recoverability | Sensitivity | Confidence |
|---|---|---|---|---|
| **Increase in suspended sediment** | Low | High | Low | Low |

Records show confusion as to whether *Pomatoceros triqueter* is tolerant of high suspended sediment levels. According to Bacescu (1972), sabellids are accustomed to turbidity and silt. Stubbings & Houghton (1964) found *Pomatoceros triqueter* in Chichester harbour, a muddy harbour, therefore agreeing with the previous statement. However, *Pomatoceros triqueter* has been noted to occur in areas where there is little or no silt present (Price *et al.*, 1980) and according to Lewis (1957), *Pomatoceros triqueter* is highly susceptible to unfavourable conditions, always requiring stability and clean water. Moore (1937) and Nair (1962) agreed with this.
However, *Pomatoceros triqueter* has been recorded in areas where suspended sediment levels can be high; demonstrating that it can tolerate high suspended sediment concentrations. A supply of suspended sediment will probably also be important to *Pomatoceros triqueter* because the species requires a supply of particulate matter for suspension feeding. At the benchmark level of an increase of 100mg/l for one month, the likely impact would be an increase in cleaning costs. Intolerance has been assessed as low. Recoverability is likely to be high.

| | Intolerance | Recoverability | Sensitivity | Confidence |
|---|---|---|---|---|
| **Decrease in suspended sediment** | Low | High | Low | Moderate |

*Pomatoceros triqueter* has been noted to occur in areas where there is little or no silt present (Price *et al.*, 1980). The species is an active suspension feeder and will probably not be highly intolerant of suspended sediment concentrations. As an energetic cost would probably be entailed to create currents to transport food particles, intolerance has been assessed to be low. On return to normal conditions, recoverability is likely to be high.

| | Intolerance | Recoverability | Sensitivity | Confidence |
|---|---|---|---|---|
| **Dessication** | Intermediate | High | Low | Moderate |

As *Pomatoceros triqueter* occurs in the subtidal region it will be tolerant to a certain amount of desiccation. The species probably survives by closing the operculum of the tube, however, the amount of time available for feeding and respiration will be reduced, and therefore the population's viability may be reduced. Some individuals are also likely to die. Intolerance has been assessed to be intermediate. Recoverability is likely to be high (see additional information below).

**Increase in emergence regime** Intermediate High Low Low

An increase in the emergence regime will increase the amount of time some individuals are exposed to air. At the benchmark level of an increase of one hour over the period of a year, those higher on shore are likely to die. Intolerance has been assessed to be intermediate. Recoverability is likely to be high (see additional information below).

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

A decrease in the emergence regime may mean that more time can be spent feeding, but is unlikely to have any adverse effects. Therefore *Pomatoceros triqueter* is likely to tolerate a decrease in emergence, and may actually benefit.

**Increase in water flow rate** Tolerant* Not relevant Not sensitive* Not relevant

*Pomatoceros triqueter* has been noted to occur in areas with very sheltered to exposed water flow rates (Price *et al.*, 1980). Wood (1988) observed *Pomatoceros* sp. in strong tidal streams and Hiscock (1983) found that in strong tidal streams or strong wave action where abrasion occurs, fast growing species such as *Pomatoceros triqueter* occur. Therefore, the species is probably tolerant of an increase in water flow rate, and the species may actually increase in abundance.

**Decrease in water flow rate** Tolerant Not relevant Not sensitive Not relevant

*Pomatoceros triqueter* has been noted to occur in areas with very sheltered to exposed water flow rates (Price *et al.*, 1980). The species has been assessed to be tolerant.

**Increase in temperature** Tolerant* Not relevant Not sensitive* Not relevant

Maximum sea surface temperatures around the British Isles rarely exceed 20 °C (Hiscock, 1998) and, as *Pomatoceros triqueter* occurs as far south as the Mediterranean, it will therefore be subject to a wider range of temperatures than experienced in the British Isles. Further information also backs this up. Castric-Fey (1983) found that animals settling during spring showed the best growth rate and the best larval settlement occurred in the summer months. *Pomatoceros triqueter* has been assessed as tolerant* to an increase in temperature.

**Decrease in temperature** Intermediate High Low Moderate

Minimum surface sea water temperatures rarely fall below 5 °C around the British Isles (Hiscock, 1998). Below a temperature of 7°C *Pomatoceros triqueter* is unable to build calcareous tubes (Thomas, 1940). This means that, although adults may be able to survive a decrease in temperature, larvae would not be able to attach to the substratum. Intolerance has been assessed to be intermediate. Recoverability is likely to be high (see additional information below).

**Increase in turbidity** Tolerant Not relevant Not sensitive Not relevant

According to Bacescu (1972), sabellids are accustomed to turbidity and silt. *Pomatoceros triqueter* has also recently been recorded by De Kluijver (1993) from Scotland in the aphotic zone, indicating that the species would not be sensitive to an increase in turbidity.

**Decrease in turbidity** Tolerant Not relevant Not sensitive Not relevant

According to Bacescu (1972), sabellids are accustomed to turbidity and silt. According to

Lewis (1957), *Pomatoceros triqueter* is highly susceptible to unfavourable conditions, always requiring stability and clean water. Moore (1937) and Nair (1962) agreed with this. Therefore, *Pomatoceros triqueter* is unlikely to be sensitive to a decrease in turbidity.

| | | | | |
|---|---|---|---|---|
| **Increase in wave exposure** | Low | High | Low | Moderate |

*Pomatoceros triqueter* has been noted to occur in areas with variable wave action; extremely sheltered to very exposed (Price *et al*., 1980). The hard calcareous tube is resistant to abrasion from sand, gravel and boulders (Wood, 1988; Hiscock, 1983) that are mobilised by wave action. With an increase in wave exposure over a period of a year the viability of the population may be reduced due to a reduction in feeding and larval settlement. Therefore intolerance of *Pomatoceros triqueter* to an increase in wave exposure is likely to be low. On return to normal conditions, recoverability is likely to be high.

| | | | | |
|---|---|---|---|---|
| **Decrease in wave exposure** | Tolerant | Not relevant | Not sensitive | Not relevant |

*Pomatoceros triqueter* has been noted to occur in areas with variable wave action; extremely sheltered to very exposed (Price *et al*., 1980). As the species can tolerate very low wave exposure, it is therefore probably tolerant of a decrease in wave exposure.

| | | | | |
|---|---|---|---|---|
| **Noise** | Tolerant | Not relevant | Not sensitive | Not relevant |

Polychaetes may be able to detect vibration, and withdraw into their tube. However, at the benchmark level the species is unlikely to be sensitive to noise.

| | | | | |
|---|---|---|---|---|
| **Visual Presence** | Tolerant | Not relevant | Not sensitive | Not relevant |

Shadows detected by the photoreceptive surface of serpulid polychaetes may result in withdrawal of the worm back into its tube (Kinne, 1970). However, at the benchmark level the species is unlikely to be sensitive to visual presence.

| | | | | |
|---|---|---|---|---|
| **Abrasion & physical disturbance** | Intermediate | High | Low | Not relevant |

*Pomatoceros triqueter* has a hard calcareous tube that is resistant to sand and gravel abrasion (Wood, 1988). Hiscock (1983) noted that a community, under conditions of scour and abrasion from stones and boulders moved by storms, developed into a community consisting of fast growing species such as *Pomatoceros triqueter*. Off Chesil Bank, the epifaunal community dominated by *Pomatoceros triqueter*, *Balanus crenatus* and *Electra pilosa*, decreased in cover in October, was scoured away in winter storms, and was recolonized in May to June (Warner, 1985). Warner (1985) reported that the community did not contain any persistent individuals, being dominated by rapidly colonizing organisms. But, while larval recruitment was patchy and varied between the years studied, recruitment was sufficiently predictable to result in a dynamic stability and a similar community was present in 1979, 1980, and 1983. Scour due to winter storms is probably greater than the benchmark level. Scour and abrasion will probably remove a proportion of the population, suggesting an intolerance of intermediate. However, it demonstrates rapid growth and recruitment so that it is not considered to be sensitive. The abundance of *Pomatoceros triqueter* may increase due to decreased competition from other species.

| | | | | |
|---|---|---|---|---|
| **Displacement** | Low | High | Low | High |

If tubes containing the worm are removed, the tubes will not be able to be reattached to the substratum surface. However, Thomas (1940) found that if *Pomatoceros triqueter* is removed from its tube, it will start to make a new one in a few hours. Therefore, it is likely that the worm will be able to leave the old tube to start constructing another. This would probably involve an added energetic cost, therefore population viability may be affected. Intolerance has been assessed to be low. Recoverability is likely to be high.

## Chemical Pressures

| | Intolerance | Recoverability | Sensitivity | Confidence |
|---|---|---|---|---|
| **Synthetic compound contamination** | | Not relevant | | Not relevant |

There is insufficient information to assess the intolerance of *Pomatoceros triqueter* to synthetic chemicals.

| | Intolerance | Recoverability | Sensitivity | Confidence |
|---|---|---|---|---|
| **Heavy metal contamination** | | Not relevant | | Not relevant |

Bryan (1984) suggested that, on evidence available for several species, that polychaetes are fairly resistant to heavy metals. However, there is insufficient information available to assess intolerance of *Pomatoceros triqueter* to heavy metal contamination.

| | Intolerance | Recoverability | Sensitivity | Confidence |
|---|---|---|---|---|
| **Hydrocarbon contamination** | | Not relevant | | Not relevant |

Large numbers of dead polychaetes and other fauna were washed up at Rulosquet marsh near Isle de Grand following the Amoco Cadiz oil spill in 1978 (Cross *et al.*, 1978). However, no information was found relating to *Pomatoceros triqueter* in particular. Therefore, insufficient information was available to assess the species intolerance.

| | Intolerance | Recoverability | Sensitivity | Confidence |
|---|---|---|---|---|
| **Radionuclide contamination** | | Not relevant | | Not relevant |

There is insufficient information to assess the intolerance of *Pomatoceros triqueter* to radionuclides.

| | Intolerance | Recoverability | Sensitivity | Confidence |
|---|---|---|---|---|
| **Changes in nutrient levels** | | Not relevant | | Not relevant |

There is insufficient information to assess the intolerance of *Pomatoceros triqueter* to nutrient levels.

| | Intolerance | Recoverability | Sensitivity | Confidence |
|---|---|---|---|---|
| **Increase in salinity** | Tolerant | Not relevant | Not sensitive | Not relevant |

*Pomatoceros triqueter* occurs in fully saline waters and is probably relatively tolerant of an increase in salinity.

| | Intolerance | Recoverability | Sensitivity | Confidence |
|---|---|---|---|---|
| **Decrease in salinity** | High | High | Moderate | Low |

*Pomatoceros triqueter* occurs in fully saline coastal waters and has not been recorded from brackish or estuarine waters. Therefore, it is likely that the species will be very intolerant of a decrease in salinity. However, Dixon (1985) views the species as able to withstand significant reductions in salinity. The degree of reduction in salinity and time that the species could tolerate those levels were not recorded. Therefore, there is insufficient information available to assess the intolerance of *Pomatoceros triqueter* to a reduction in salinity.

| | Intolerance | Recoverability | Sensitivity | Confidence |
|---|---|---|---|---|
| **Changes in oxygenation** | | Not relevant | | Not relevant |

Cole *et al.* (1999) suggest possible adverse effects on marine species below 4 mg/l and probable adverse effects below 2 mg/l. However, no information was found relating to intolerance of *Pomatoceros triqueter* to oxygen levels. Insufficient information was available to assess intolerance of the species at the benchmark level of 2 mg/l for a week.

## Biological Pressures

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

Thomas (1940) recorded parasites of *Pomatoceros triqueter*. *Trichodina pediculus* (a ciliate) was observed in fair numbers moving over the branchial crown. However, this is a commensal, not a parasite. Parasites found in the worm include gregarines & ciliated protozoa and parasites that had the appearance of sporozoan cysts. However, no information was found about the effects of microbial pathogens on *Pomatoceros triqueter*.

| | | | | |
|---|---|---|---|---|
| **Introduction of non-native species** | Tolerant | Not relevant | Not sensitive | Not relevant |

Although several species of serpulid polychaetes have been introduced into British waters none are reported to compete with *Pomatoceros triqueter* (Eno *et al*., 1997).

| | | | | |
|---|---|---|---|---|
| **Extraction of this species** | Not relevant | Not relevant | Not relevant | Not relevant |

No extraction of *Pomatoceros triqueter* is known to occur.

| | | | | |
|---|---|---|---|---|
| **Extraction of other species** | Not relevant | Not relevant | Not relevant | Not relevant |

No extraction of other species is likely to have any effect on *Pomatoceros triqueter*.

## Additional information

The species is fairly widespread, reaches sexual maturity within 4 months (Hayward & Ryland, 1995; Dons, 1927) and longevity has been recorded to be between 1.5 and 4 years (Hayward & Ryland, 1995; Castric-Fey, 1983; Dons, 1927). Larvae are pelagic for about 2-3 weeks in the summer and about 2 months in the winter (Hayward & Ryland, 1995), enabling them to disperse widely. Recovery is therefore likely to be high.

# Importance review

## Policy/legislation

- no data -

## Status

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

## Non-native

| Native | - | | |
|---|---|---|---|
| Origin | - | Date Arrived | - |

## Importance information

*Pomatoceros triqueter* is an opportunistic species that can live on a variety of substrates; from rocks, boulders and pebbles to man-made structures. The fouling of the tube worm can compete with and exclude other species.

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