A bristleworm (*Polydora ciliata*)

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

Jacqueline Hill

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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/1410]. All terms and the MarESA methodology are outlined on the website (https://www.marlin.ac.uk)

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Polydora ciliata.
Photographer: Keith Hiscock

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	Jacqueline Hill	**Refereed by**	This information is not refereed.
Authority	(Johnston, 1838)		
Other common names	-	**Synonyms**	-

Summary

Description

A sedentary, burrowing polychaete worm up to 3 cm long and 0.7-1 cm wide. The body has up to 180 segments but is not divided into distinct regions. *Polydora ciliata* has two very long, slender ciliated palps which protrude, waving vigorously and usually roll up spirally when the animal is disturbed. The tip of the posterior region is saucer shaped. *Polydora ciliata* is yellowish-brown in colour.

Recorded distribution in Britain and Ireland

Polydora ciliata is widely distributed around Britain and Ireland.

Global distribution

Widely distributed in north-west Europe.

Habitat

Polydora ciliata usually burrows into substrata containing calcium carbonate such as limestone and chalk and into clay as well as the shells of oysters, mussels and periwinkles and crusts of calcareous algae ('lithothamnia'). The species is also found in muddy sediments, wood and laminarian holdfasts.

Depth range

-

Identifying features

- Prostomium blunt in front, extending rearwards in a low crest.
- 5th chaetiger (segment) is enlarged and different from all the others, lacking gills and parapodial lobes but bearing six or seven extra-large chaetal spines, with a lateral tooth, dorsally.
- Gills present on dorsal surface from chaetiger 7 to all but the ten rearmost ones.
- Short, stout chaetae ventrally from seventh or eighth chaetiger, tipped with tow small hooded teeth; this type of chaeta absent dorsally.
- Longitudinal sensory grooves mid-dorsally.
- Anus surrounded by a membranous funnel.
- Number of eyes varies from zero to four (Mustaquim, 1986).

Additional information

There has been some confusion in the identification of *Polydora ciliata* because the characteristics used for separation of the species, such as the number of modified chaetae on the fifth segment, are not stable even in individuals from the same locality. It has been suggested that some other species of *Polydora* such as *P. ligni*, *P. websteri*, *P. cirrosa* and *P. nuchalis* may only be varieties of *Polydora ciliata* (Mustaquim, 1986).

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	Spionida	
Family	Spionidae	
Genus	Polydora	
Authority	(Johnston, 1838)	
Recent Synonyms	-	

Biology

Typical abundance	High density
Male size range	
Male size at maturity	
Female size range	Small(1-2cm)
Female size at maturity	
Growth form	Vermiform segmented
Growth rate	
Body flexibility	High (greater than 45 degrees)
Mobility	
Characteristic feeding method	Active suspension feeder, Surface deposit feeder
Diet/food source	
Typically feeds on	Detritus
Sociability	
Environmental position	Epibenthic
Dependency	Independent. See additional information
Supports	None
Is the species harmful?	No information

Biology information

- **Mode of life:** *Polydora ciliata* burrows into the shells of oysters, mussels and periwinkles as well as into limestone rock and stones and lithothamnia or other encrusting coralline algae.
- The species makes a U-shaped tube from small particles (usually of mud) but may be whitish and calcareous if excavating in lithothamnia or other encrusting coralline algae (Hayward & Ryland, 1995). Much of this tube may be embedded in a burrow excavated in limestone rock, shells and calcareous algae, and the two ends extend a few millimetres above the surface of the substratum. It has been suggested that burrowing is achieved by mechanical action of the chaetae, especially those of the 5th segment, but this is open to

some doubt as chemical action may also be involved (Fish & Fish, 1996).
- **Feeding method:** The species generally feeds on detritus that is removed from the sediment by the two long palps. It also feeds on suspended particles in the water, and on occasions has been observed to eat dead barnacles and other dead invertebrates.

Habitat preferences

Physiographic preferences	Open coast, Offshore seabed, Strait / sound, Estuary, Isolated saline water (Lagoon), Enclosed coast / Embayment
Biological zone preferences	Lower circalittoral, Lower eulittoral, Lower infralittoral, Mid eulittoral, Sublittoral fringe, Upper circalittoral, Upper infralittoral
Substratum / habitat preferences	Macroalgae, Artificial (man-made), Bedrock, Mud, Other species
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	Exposed, Extremely sheltered, Moderately exposed, Sheltered, Very sheltered
Salinity preferences	Full (30-40 psu), Low (<18 psu), Variable (18-40 psu)
Depth range	
Other preferences	No text entered
Migration Pattern	Non-migratory / resident

Habitat Information

The species makes a U-shaped tube from small particles (usually of mud) but may be whitish and calcareous if excavating in lithothamnia or other encrusting coralline algae (Hayward & Ryland, 1995). Much of this tube may be embedded in a burrow excavated in limestone rock, shells and calcareous algae, and the two ends extend a few millimetres above the surface of the substratum. It has been suggested that burrowing is achieved by mechanical action of the chaete, especially those of the 5th segment, but this is open to some doubt as chemical action may also be involved (Fish & Fish, 1996).

Life history

Adult characteristics

Reproductive type	Gonochoristic (dioecious)
Reproductive frequency	Annual protracted
Fecundity (number of eggs)	1,000-10,000
Generation time	<1 year
Age at maturity	2-3 months
Season	February - June
Life span	<1 year

Larval characteristics

Larval/propagule type	-
Larval/juvenile development	Planktotrophic
Duration of larval stage	See additional information
Larval dispersal potential	Greater than 10 km
Larval settlement period	Insufficient information

Life history information

- Sperm are drawn into the burrow of the female in the respiratory current and the eggs are laid in a string of capsules. A single female produces many capsules, each containing up to about 60 eggs, the individual capsules being attached by two threads to the wall of the burrow. Capsules are brooded for about a week before the larvae are released into the water column.
- Spawning period varies, from February until June in northern England (Gudmundsson, 1985) and in the Black Sea spawning lasted from April - September (Murina, 1997). In Belgium (Daro & Polk, 1973) and northern England (Gudmundsson, 1985) three or even four generations succeeded one another during the spawning period. The number of offspring produced per female varied from 200 to 2200.
- After a week, the larvae emerge and are believed to have a pelagic life from two to six weeks before settling (Fish & Fish, 1996). Settlement and metamorphosis takes place when the larvae has 17-18 setigers.
- Larvae are substratum specific selecting rocks according to their physical properties or sediment depending on substrate particle size.
- Larvae of *Polydora ciliata* have been collected as far as 118km offshore (Murina, 1997) and along the Belgian coast were found in the plankton all year round with a peak in the summer (Daro & Polk 1973).

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, perhaps by dredging, would result in the loss of *Polydora ciliata* tubes and hence the loss of the animals so intolerance is assessed as high. However, if some individuals remain rapid recolonization is possible because the species is capable of tube building throughout its life. *Polydora ciliata* of all ages that were removed from their tubes on many occasions, all built new tubes (Daro & Polk, 1973). Recovery is likely to be high because the larvae of *Polydora ciliata* are planktonic and capable of dispersal over long distances and the reproductive period is of several months duration. In colonization experiments in Helgoland (Harms & Anger, 1983) *Polydora ciliata* settled on panels within one month in the spring.

	Intolerance	Recoverability	Sensitivity	Confidence
Smothering	Tolerant	Not relevant	Not sensitive	Moderate

Polydora ciliata is likely to tolerate smothering by 5 cm of sediment because the species inhabits a range of habitats including muddy sediment and larvae settle preferentially on substrates covered with mud (Lagadeuc, 1991). The species also plays an important part in the process of temporary sedimentation of muds in some estuaries, harbours or coastal areas (Daro & Polk, 1973). A *Polydora* mud can be up to 50cm thick, but the animals themselves occupy only the first few centimetres. They either elongate their tubes, or have left them to rebuild close to the surface.

	Intolerance	Recoverability	Sensitivity	Confidence
Increase in suspended sediment	Tolerant	Not relevant	Not sensitive	High

Polydora ciliata is tolerant to siltation because it normally inhabits waters with high levels of suspended sediment which it actively fixes in the process of tube making when in muddy habitats. Occasionally, in certain places siltation is speeded up when *Polydora ciliata* is present.

Decrease in suspended sediment

	Intolerance	Recoverability	Sensitivity	Confidence
Dessication	Intermediate	High	Low	Moderate

Polydora ciliata colonizes a wide range of littoral and sub-littoral habitats from rocks on the midshore to the subtidal and are therefore tolerant to a level of desiccation. For example, at Cullercoats in north east England, animals were present at the mid-shore level, where the worms are subjected to about equal time of exposure and submergence (Gudmundsson, 1985). Although soft bodies are likely to be intolerant of desiccation *Polydora ciliata* can retreat into its burrow to ameliorate the effects. Therefore, only those individuals at the upper limit of the population range are likely to be killed by an increase in desiccation and so intolerance has been assessed as intermediate.

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

Polydora ciliata colonizes a wide range of littoral and sub-littoral habitats from rocks on the midshore to the subtidal and are therefore tolerant to a level of emergence. For example, at

Cullercoats in north east England, animals were present at the mid-shore level, where they are subjected to about equal time of exposure and submergence (Gudmundsson, 1985). An increase in emergence may cause the death of some individuals at the upper limit of the species range because of increased desiccation. Sub-tidal populations are unlikely to experience emergence.

Decrease in emergence regime

Increase in water flow rate	Intermediate	High	Low	Moderate

Polydora ciliata was present and colonized test panels in Helgoland in three areas, two exposed to strong tidal currents and one site sheltered from currents (Harms & Anger, 1983). In very strong tidal currents little sediment deposition will take place resulting in coarse sediments retaining little organic matter and therefore, not suitable for the deposit feeding *Polydora ciliata*. However, where suspended sediment levels are high, deposition of fine sediment may occur even in strong flows providing suitable conditions for the species. Animals living in burrows in rock are not likely to be washed away but strong water flow rate may interfere with feeding and tube building by removing sediments. Recovery is good because animals can re-build tubes and because the larvae of *Polydora ciliata* are planktonic and capable of dispersal over long distances and the reproductive period is of several months duration. In colonization experiments in Helgoland (Harms & Anger, 1983) *Polydora ciliata* settled on panels within one month in the spring.

Decrease in water flow rate

Increase in temperature	Low	High	Low	Moderate

Murina (1997) categorised *Polydora ciliata* as a eurythermal species because of its ability to spawn in temperatures ranging from 10.6-19.9°C. This is consistent with a wide global distribution. In the western Baltic Sea Gulliksen (1977) recorded high abundances of *Polydora ciliata* in temperatures of 7.5 to 11.5°C. Rapid changes in hydrographical conditions occurred when temperatures dropped from 11.5°C to 7.5°C in the course of 15 hours (Gulliksen, 1977) and so it appears the species is tolerant of short term changes in temperature. During the extremely cold winter of 1962/63 when temperatures dropped below freezing point for several weeks, *Polydora ciliata* was apparently unaffected (Crisp (ed.), 1964). Recovery of the species is good because the larvae of *Polydora ciliata* are planktonic and capable of dispersal over long distances and the reproductive period is of several months duration.

Decrease in temperature

Increase in turbidity	Tolerant	Not relevant	Not sensitive	Moderate

The species is probably tolerant of changes in turbidity because it is able to colonize a range of habitats including muddy sediments and soft rock substratum that vary in turbidity.

Decrease in turbidity

Increase in wave exposure	Low	High	Low	Low

In the intertidal, *Polydora ciliata* generally inhabits a burrow within rocks and so is unlikely to be damaged or removed by exposure to wave action and so intolerance is assessed as low. Changes in wave exposure may influence the supply of particulate matter for suspension feeding.

Decrease in wave exposure

Noise	Tolerant	Not relevant	Not sensitive	Moderate

Polydora ciliata may respond to vibrations from predators or bait diggers by retracting their palps into their tubes. However, the species is unlikely to be sensitive to noise.

Visual Presence	Low	High	Low	Moderate

Polydora ciliata exhibits shadow responses withdrawing its palps into its burrow, believed to be a defence against predation. However, since the withdrawal of the palps interrupts feeding and possibly respiration the species also shows habituation of the response (Kinne, 1970). The species is, therefore, likely to have very low intolerance to visual disturbance by boats, humans or other factors not normally present in the marine environment.

Abrasion & physical disturbance	Intermediate	High	Low	Moderate

As a soft bodied species, *Polydora ciliata* is likely to be crushed and killed by an abrasive force or physical blow. However, some individuals are likely to survive as individuals can withdraw into burrows and so intolerance has been assessed as intermediate. Recovery is good because *Polydora ciliata* has planktonic larvae that are capable of dispersal over long distances and the reproductive period is of several months duration. In colonization experiments in Helgoland (Harms & Anger, 1983) *Polydora ciliata* settled on panels within one month in the spring.

Displacement	Low	High	Low	Moderate

Polydora ciliata is capable of tube building throughout its life and so is able to re-establish attachment on displacement. In experimental removal of *Polydora ciliata* individuals of all ages which were removed from their tubes on many occasions, all built new tubes (Daro & Polk, 1973). Recovery is likely to be high because *Polydora ciliata* has planktonic larvae that are capable of dispersal over long distances and the reproductive period is of several months duration. In colonization experiments in Helgoland (Harms & Anger, 1983) *Polydora ciliata* settled on panels within one month in the spring.

Chemical Pressures

	Intolerance	Recoverability	Sensitivity	Confidence
Synthetic compound contamination	Low	High	Low	Low

Polydora ciliata was abundant at polluted sites close to acidified, halogenated effluent discharge from a bromide-extraction plant in Amlwch, Anglesey (Hoare & Hiscock, 1974). Spionid polychaetes were found by McLusky (1982) to be relatively tolerant of distilling and petrochemical industrial waste in Scotland.

Heavy metal contamination	Intermediate	High	Low	Low

Experimental studies with various species suggests that polychaete worms are quite tolerant to heavy metals (Bryan, 1984). *Polydora ciliata* occurs in an area of the southern North Sea polluted by heavy metals but was absent from sediments with very high heavy metal levels (Diaz-Castaneda *et al*., 1989).

Hydrocarbon contamination	Intermediate	High	Low	Not relevant

In analysis of kelp holdfast fauna following the *Sea Empress* oil spill in Milford Haven the fauna present, including *Polydora ciliata*, showed a strong negative correlation between numbers of species and distance from the spill (SEEEC, 1998). After the extensive oil spill in West Falmouth, Massachusetts, Grassle & Grassle (1974) followed the settlement of polychaetes in this environmental disturbed area. Species with the most opportunistic life histories, including *Polydora ligni*, were able to settle in the area. This species has some brood protection which enables larvae to settle almost immediately in the nearby area (Reish, 1979).

Radionuclide contamination				Not relevant

Insufficient information.

Changes in nutrient levels	Low	High	Low	High

Polydora ciliata is often found in environments subject to high levels of nutrients (Sordino *et al*, 1989). For example, the species was abundant in areas of the Firth of Forth exposed to high levels of sewage pollution (Smyth, 1968). However, *Polydora ciliata* is also common in organically poor areas (Pearson & Rosenberg, 1978) and so is likely to have low intolerance to changes in nutrient concentrations. In colonization experiments in an organically polluted fjord receiving effluent discharge from Oslo, *Polydora ciliata* had settled in large numbers within the first month (Green, 1983, Pardal *et al*., 1993).

Increase in salinity	Low	High	Low	High

Polydora ciliata is a euryhaline species inhabiting fully marine and estuarine habitats. In an area of the western Baltic Sea, where bottom salinity was between 11.1 and 15.0psu *Polydora ciliata* was the second most abundant species with over 1000 individuals per m^2 (Gulliksen, 1977).

Decrease in salinity

Changes in oxygenation	Low	High	Low	High

Polydora ciliata is assessed as having low intolerance to changes in oxygenation because the species is repeatedly found at localities with oxygen deficiency (Pearson & Rosenberg, 1978). For example, in polluted harbours in Los Angeles and Long Beach harbours *Polydora ciliata* was present in the oxygen range 0.0-3.9 mg/l and the species was abundant in hypoxic fjord habitats (Rosenberg, 1977). Recovery is good because the species is able to rapidly recolonize suitable habitats.

Biological Pressures

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

No information on diseases of *Polydora ciliata* was found.

Introduction of non-native species				Not relevant

No known non-native species compete with *Polydora ciliata*.

Extraction of this species	Low	High	Low	Moderate

Extraction of the species is unlikely although dredging may remove populations in some habitats. Recovery is good because *Polydora ciliata* is iteroparous and larvae can disperse over long distances. Recolonization is rapid, usually taking place within several months of the reproductive period in the summer.

Extraction of other species	Not relevant	Not relevant	Not relevant	Not relevant

Although *Polydora ciliata* is often associated with oysters and mussels it is not dependent on another species.

Additional information

Importance review

Policy/legislation

- no data -

Status

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

Non-native

Native	-		
Origin	-	**Date Arrived**	-

Importance information

- *Polydora ciliata* is a serious pest of oysters and mussels, but invades only the shell and does not eat the soft tissue. When infestation is heavy, the shell is weakened and this makes the mollusc more susceptible to predation by crabs. Occasionally, the inner surface of the shell is damaged by the worms and the mollusc secretes a nacreous substance to seal the perforation. The resulting blisters are an indication of attack by the species, and mussels heavily infested with the polychaete have reduced flesh content, possibly as a result of some impact on the metabolism of the mussel.
- In areas of mud tubes built by *Polydora ciliata* can agglomerate and form layers of mud up to an average of 20cm thick, occasionally to 50cm. These layers can eliminate the original fauna and flora, or at least can be considered as a threat to the ecological balance achieved by some biotopes (Daro & Polk, 1973).

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