A hydroid (*Obelia longissima*)

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

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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	Dr Harvey Tyler-Walters	**Refereed by**	This information is not refereed.
Authority	(Pallas, 1766)		
Other common names	-	**Synonyms**	*Obelia flabellata* (Pallas, 1766), *Obelia plana* (Pallas, 1766)

Summary

Description

A long, flexible hydroid colony with a prominent main stem and branches. Usually up to 20 cm in length but may reach 35 cm in British waters. Side branches of uniform length but shorter distally giving the colony a tapering outline. Main stem is long, dark and unforked but may become forked in older colonies. The main stem is reddish brown in colour, becoming dark brown to black with age. The segments of the stem, the internodes, are nearly straight, or slightly curved and perfectly tubular. Side branches usually divide into two just after the origin, occasionally into three, with subsequent branches arranged in a zigzag. In young branches the point where the internodes meet, the nodes, are dark, giving a characteristic alternating light and dark pattern. Side branches are usually lighter in colour than the main stem, and decrease in length along the length of the colony.

The polyps are borne in a thin chitinous cup, the hydrotheca. Hydrothecae are elongate (ca 320-500 µm), inverted conical or bell shaped, with a distinctly tapering low portion. The rim of the hydrotheca is either shallow castellate or shallow blunt-cusped but usually rubbed smooth. The base of the hydrothecae attach to the stem by a pedicel composed of up to 20 rings. The reproductive polyps (gonothecae) are elongate and flask shaped, ca 700-1050 µm in length, and release medusae in spring.

Recorded distribution in Britain and Ireland

Probably occurs throughout the British Isles but may be confused with *Obelia dichotoma* so that its recorded distribution may be inaccurate.

Global distribution

Nearly cosmopolitan. Recorded north to the New Siberian Island and south to the South Orkney Isles in the Atlantic, penetrates the Baltic Sea and the Black Sea, with numerous records in the Indo-Pacific (Cornelius, 1995b; Stepanjants, 1998).

Habitat

Found growing on algae and hard substrata in the subtidal. Occasionally found growing in intertidal rockpools and at extreme low water of spring tides. Detached subtidal colonies may continue to grow if washed up into rockpools and entangled with other species such as mussels.

Depth range

See additional information

Identifying features

- Main stem long, dark, flexible, usually single and unbranched (monosiphonic).
- Side branches lighter in colour.
- Side branches roughly uniform in length but shorter distally giving the colony a tapering outline.
- Internodes tubular and nearly straight.

Additional information

Obelia longissima may be confused with other *Obelia* species. For example, *Obelia dichotoma* may also be elongate but lacks the regular shape and extreme length of *Obelia longissima* (Cornelius, 1995b). *Obelia bidentata* has multiple branched stems even when young. Colonies of *Obelia dichotoma* may be distinguished from *Obelia longissima* growing in rockpools in spring by its long tubular, nearly straight and darkening internodes (Cornelius, 1995b). No reliable key is available to distinguish between the medusae of *Obelia* species (for discussion see Cornelius, 1995b).

Listed by

Further information sources

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Biology review

Taxonomy

Phylum	Cnidaria	Sea anemones, corals, sea firs & jellyfish
Class	Hydrozoa	White weeds, sea firs, sea beard and siphonophores; hydroids
Order	Leptothecata	
Family	Campanulariidae	
Genus	Obelia	
Authority	(Pallas, 1766)	
Recent Synonyms	Obelia flabellata (Pallas, 1766)Obelia plana (Pallas, 1766)	

Biology

Typical abundance	High density
Male size range	2.5 -6mm
Male size at maturity	
Female size range	Medium-large(21-50cm)
Female size at maturity	
Growth form	Arborescent / Arbuscular
Growth rate	See additional information
Body flexibility	High (greater than 45 degrees)
Mobility	
Characteristic feeding method	Passive suspension feeder, See additional information
Diet/food source	
Typically feeds on	Small zooplankton, small crustaceans, oligochaetes, insect larvae and probably detritus.
Sociability	
Environmental position	Epibenthic
Dependency	Independent.
Supports	Host larval pycnogonids (see sensitivity to disease and parasites).
Is the species harmful?	No

Biology information

Obelia longissima exhibits a typical leptolid life cycle consisting of a sessile colonial, vegetative hydroid stage, a free-living sexual medusoid stage, and a planula larval stage. For the sake of this review, the relatively long-lived and easily visible hydroid stage is regarded as the adult stage, while the medusa stage is considered to be a dispersive larval stage and the planula another larval stage specialized for settlement. The size range for males and females above relates to the medusa (see general biology larval). However, the definition of adult and larval stages in leptolids is a matter of debate (see Gili & Hughes, 1985).

Growth form

The hydroid stage takes the form of a long, flexible colony with uniform side branches that shorten distally, arising from a basal stolon or hydrorhiza. However, the size and degree of branching vary with the environmental conditions and the availability of food.

In species of *Obelia*, a single basal stolon growing along the substratum may give rise to upright branches and feeding hydranths along its length. As it progresses the older hydranths regress proximally and new branches and hydranths develop distally, so that the stolon appears to migrate across the substratum. Branching increases as the colony receives more food than the stolons and stalks can use, and the colony turns from stolonic growth and occupation of its substratum, to upright growth and hydranth development to exploit the available resources (Berrill, 1949; Kosevich & Marfenin, 1986; Marfenin, 1997; Gili & Hughes, 1995; Stepanjants, 1998). The colony may be composed of several upright colonies of varying size and length interconnected by basal stolons (see Kosevich & Marfenin, 1986).

In *Obelia longissima* branching begins earliest behind the newest internodes of stolons at the periphery of the colony, in closest contact with the environment, and only if there is adequate food does branching continue in the central older parts of the colony (Marfenin, 1997). If food supply decreases then parts of the colony can be reabsorbed (Marfenin, 1997).

Growth rates

Many hydroids exhibit rapid growth, partially because the number of feeding hydranths, and hence the food catching potential, increases with size (Gili & Hughes, 1995). Growth rate is therefore, dependant on food supply (Marfenin, 1997). However, growth is also dependant on temperature. Berrill (1949) reported that stolons grew, under optimal nutritive conditions, at less than 1 mm in 24 hrs at 10-12 °C, 10 mm in 24 hrs at 16-17 °C, and as much as 15-20 mm in 24 hrs at 20 °C. Overall, growth is expected to be rapid, for example in experiments, Standing (1976) clipped the stems of *Obelia* back to the surface of his settlement plates every eight days since they grew back rapidly. Similarly, Cornelius (1992) stated that *Obelia longissima* and *Obelia dichotoma* could form large colonies within a matter of weeks.

The hydranths of the colony demonstrate a regular cycle of development and regression with, in general, older hydranths regressing before younger ones (Crowell, 1953). Each hydranth takes about 24 hrs to develop at 20 °C and lives for a few days before it regresses (less in unfavourable conditions) (Berrill, 1949; Crowell, 1953; Kosevich & Marfenin, 1986).

Feeding

Hydroids are passive carnivores that capture prey that swim into, or are brought into contact with their tentacles by currents. Prey are then killed or stunned by the nematocysts born on the tentacles and swallowed. Diet varies but is likely to include small zooplankton (e.g. nauplii, copepods), small crustaceans, chironomid larvae, detritus and oligochaetes, but may include a wide variety of other organisms such as the larvae or small adults of numerous groups (see Gili & Hughes, 1995). In experiments, Hunter (1989) fed *Obelia longissima* on plankton consisting of larval crustaceans, eggs, veligers, echinoderm plutei, copepods and other invertebrate larvae between 50 -200 µm.

Seasonal change

Seasonal changes in the composition of *Obelia* colonies (no species stated) was examined by

Hammett & Hammett (1945) and Hammett (1951a,b,c,d,e) in the Massachusetts area . They reported that budding peaked in April, complete hydranths in August and free-living medusae in July. Hammett & Hammett (1945) suggested that seasonal decline was common, colonies declining in June in North Carolina and after July in Woods Hole. Berrill (1949) noted that rapid growth continued at temperatures as high as 25 °C but ceased at 27 °C. Brault & Bourget (1985) noted that *Obelia longissima* exhibited a annual cycle of biomass, measured as colony length, on settlement plates in the St Lawrence estuary. Colony length increased from settlement in June, reaching a maximum in November to March and then decreasing again until June, although the decline late in the year was attributed to predation, and data was only collected over a two year period.

Habitat preferences

Physiographic preferences	Open coast, Strait / sound, Sea loch / Sea lough, Ria / Voe, Estuary, Enclosed coast / Embayment
Biological zone preferences	Lower circalittoral, Lower eulittoral, Lower infralittoral, Sublittoral fringe, Upper circalittoral, Upper infralittoral
Substratum / habitat preferences	Macroalgae, Artificial (man-made), Bedrock, Biogenic reef, Coarse clean sand, Cobbles, Large to very large boulders, Other species (see additional information), Pebbles, Rockpools, 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 exposed, Moderately exposed, Sheltered, Very exposed, Very sheltered
Salinity preferences	Full (30-40 psu), Reduced (18-30 psu), Variable (18-40 psu)
Depth range	See additional information
Other preferences	No text entered
Migration Pattern	Non-migratory / resident

Habitat Information

Substrata
Most hydroids do not show a high specificity of substrata (Gili & Hughes, 1995). *Obelia longissima* has been recorded from a wide variety of hard substrata including rocks, shells and artificial substrata (pilings, harbour installations, buoys, bridge supports), bivalve cultures (e.g. mussels and oysters), or floating debris, as epiphytes on kelp stipes or *Halidrys siliquosa*, and may occur in sandy areas where shells or other hard substrata provide attachment (Cornelius, 1992; Gili & Hughes, 1995; JNCC, 1999).

Distribution
Stepanjants (1998) reported that *Obelia longissima* was a cold water species, present in northern and southern hemispheres and the Black Sea but absent from tropical areas. Stepanjants (1998) therefore, regarded it as a bipolar species. However, Cornelius (1995b) suggested that numerous records from the Indo-Pacific probably referred to this species.

Obelia longissima occurs primarily in the subtidal but occurs occasionally in the littoral if washed up or in rockpools (Cornelius, 1995b). Zamponi *et al.* (1998) reported *Obelia longissima* in the sublittoral of Argentina between 36 and 70 m depth. Stepanjants (1998) noted that *Obelia* species were found in all oceans, preferentially no deeper than 200 m but cited a record of *Obelia longissima* between 300 and 510 m deep in Patagonian waters.

Habitat preferences

Water movement is important for hydroids to supply adequate food, gas exchange, remove waste products, prevent excessive siltation and provide suitable substratum. Hydroids tends to be abundant where water movement is sufficient to but not high enough to cause damage. Hydroids with long stems tend to occur in calmer waters (Riedl, 1971; Hiscock, 1983; Gili & Hughes, 1995). Hydroids tend to occur in low light conditions, possibly due reduced competition from algae and/or settlement preferences of their planulae larvae (Gili & Hughes, 1995). The majority of hydroid species are stenohaline, i.e. do not tolerate reduced salinities. However, *Obelia longissima* was reported from sites subject to reduced salinity such as the Taw and Fal estuaries (JNCC, 1999). Temperature is an important factor controlling growth and reproduction in hydroids, and many species have optimal temperature ranges for reproduction (Gili & Hughes, 1995). For example, Berrill (1949a) reported that growth in *Obelia longissima* ceased at 27 °C and that newly formed hydranths rapidly regressed at 25 °C.

Life history

Adult characteristics

Reproductive type	See additional information
Reproductive frequency	Annual episodic
Fecundity (number of eggs)	See additional information
Generation time	<1 year
Age at maturity	See additional information
Season	See additional information
Life span	See additional information

Larval characteristics

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

Life history information

Life history

Obelia longissima exhibits a typical leptolid life cycle consisting of a sessile colonial, vegetative hydroid stage, a free-living sexual medusoid stage, and a planula larval stage. Therefore, age at maturity, longevity, and reproductive type vary with the stage in the life cycle. For the sake of this review, the relatively long-lived and easily visible hydroid stage is regarded as the adult stage, while the hydromedusa stage is considered to be a dispersive larval stage and the planula another larval stage specialized for settlement. However, the definition of adult and larval stages in leptolids is a matter of debate (see Gili & Hughes, 1985).

Asexual reproduction

Hydroids may reproduce asexually by budding to form another colony. *Obelia longissima* develops a system of basal stolons, branching to form a network across the substratum, that gives rise to one or more upright colonies (Berrill, 1949; Kosevich & Marfenin, 1986; Marfenin, 1997). A common form of asexual reproduction in hydroids is the formation of vertical stolons, which then adhere to adjacent substratum, detach and form another colony (Gili & Hughes, 1995). Hydroids exhibit remarkable powers of regeneration and *Obelia longissima* (as *commissularis*) rapidly heals cut ends of stolons or branches within 1-2 min, and new growth can rapidly occur from the cut end or both ends of an excised piece of stolon (Berrill, 1949). Asexual reproduction by fission or mechanical fragmentation of the colony may be an important factor in dispersal (Gili & Hughes, 1995). Hydroids commonly form frustules or gemmules, which are thought to be resting stages, in response to stress (Gili & Hughes, 1995). In *Obelia longissima* short lengths of the hydrocladial coenosarc (the stems) are rounded off and detached from the colony (Billard, 1901a, b; Broch, 1927; Kosevich & Marfenin, 1986; Cornelius, 1992, 1995a). These frustules or gemmules are adhesive and stick to the substratum where they can form new colonies (Kosevich & Marfenin, 1986; Cornelius, 1995a). Frustule or gemmule production may be triggered by unfavourable conditions. For example, Cornelius (1992, 1995a) reported that placing a newly collected colony is sea water that was neither aerated or cooled prompted gemmule production. Kosevich & Marfenin (1986) reported that frustule formation was triggered by a acute temperature change of 4-6 °C or abundant food. Kosevich & Marfenin (1986) also noted that, in the laboratory, a frustule adhering to the substratum could develop its first hydranth within 24 hrs. Kosevich & Marfenin (1986) suggested that frustulation would enable the population to develop quickly in favourable conditions. However, most authors consider that frustules (gemmules) are probably resting stages formed to survive unfavourable conditions.

Reproductive structures, the gonothecae, develop in the older parts of the upright colony, at stem junctions (Berrill, 1949). Medusae develop within the gonotheca, budding from a central column of coenosarc, the blastostyle. As medusae develop distally within the gonothecae, they are liberated by the continued growth of the blastostyle through the opening at the top of the gonotheca, complete development from rudimentary bud to liberated medusa taking about 24 hrs at 18-20 °C (Berrill, 1949).

Sexual reproduction

Obelia longissima is dioecious, producing male and female medusae. The medusoid stage lasts between 7 -30 days (Stepanjants, 1998). At maturity the gonads migrate to the periphery of the radial canals. Fertilization is external with both eggs and sperm being released into the sea. Chemical attractants are believed to guide the sperm to the eggs (Cornelius, 1995a, b). Faulkner (1929) reported that *Obelia geniculata* had large eggs up to 200 µm in diameter. The eggs of other *Obelia* species may be similar. Fertilization results in an embryo that develops into a typical planula larva (Cornelius, 1995a, b; Gili & Hughes, 1995).

The planula larva is 1 -2 mm in size, ciliated and lecithotrophic. Longer-lived forms may contain a central cavity that may function in buoyancy (Cornelius, 1995a). Sommer (1992) suggested that the lifespan of planulae of *Obelia* species was 5 -21 days. The planula larva of some hydroids are released at dawn and are positively phototactic, becoming negatively phototactic prior to settlement and settle in shaded places, presumably to avoid adult competition with algae (Gili & Hughes, 1995). Stepanjants (1998) cites current evidence suggesting that the presence of microbial films may be important factors in the settlement of hydroid planulae.

Reproductive season

The medusae of *Obelia longissima* were reported from March to late April in southern England, May to June in southwest Norway and west Sweden and between the 28 March and 22 April in the Kiel Bight (Cornelius, 1995b). *Obelia* medusae were reported in the plankton in spring and summer in the Plymouth area (MBA, 1957) and from April to July around the Isle of Man (Bruce *et al.*, 1963).

Elmhirst (1925) reported that *Obelia* medusae were released over a 10 day period beginning on the last quarter of the moon in summer, suggesting a lunar periodicity. Hammett & Hammett (1945) reported that free-living medusae were present in the Massachusetts area in July. Hammett & Hammett (1945) and Hammett (1951a,b,c,d,e) concluded that while environmental factors influenced growth and differentiation of hydranths and gonangia, their development was primarily under endogenous control. However, Gili & Hughes (1995) noted that temperature was a critical factor controlling hydroid reproduction.

Fecundity

Fecundity will depend on the size of the colony and hence the number of gonothecae. Cornelius (1990b) suggested that an average colony of *Obelia* sp. might bear at least 100 gonotheca, each capable of releasing ca 20 medusae. Each female medusa could release about 20 eggs. Assuming that all the medusae survive to release gametes, Cornelius (1990b) estimated that an average colony could potentially produce about 20,000 planulae, although he also suggested that only one of these planulae was likely to survive to form a colony which itself might survive to reproduce.

Longevity

Unless destroyed by predators or physical damage, the colony may have a long lifespan (perhaps very long (Gili & Hughes, 1995)). No information concerning the lifespan of the resting stages (gemmules) was found. Gili & Hughes (1995) suggested that *in situ* studies indicated that hydroid colonies suffer significant mortality, leading to finite lifespans. However, the ability to reproduce asexually and regenerate from damaged sections means that although any individual colony may have a finite lifespan the genetic individual (genet) may be considerably longer lived (Gili & Hughes, 1995).

Dispersal

Rapid growth, budding and the formation of stolons allows hydroids to colonize space rapidly. Hydroids are often the first organisms to colonize available space in settlement experiments (Gili & Hughes, 1995). Fragmentation may also provide another route for short distance dispersal. However, it has been suggested that rafting on floating debris as dormant stages or reproductive adults (or attached to ships hulls or as medusae in ship ballast water), together with their potentially long lifespan, may have allowed hydroids to disperse over a wide area in the long-term and explain the near cosmopolitan distributions of many hydroid species (Gili & Hughes, 1995). For example, *Obelia longissima* has been reported to raft, and *Obelia* species were included in the 'species club' of rafting species that occur on remote islands and have wide distributions (Cornelius, 1992). *Obelia* species, with their planktonic medusoid stage of 7-30 days, and a long-lived pelagic planula larvae of up to 21 days duration, have significant dispersal potential by larval stages alone (see Sommer, 1992; Cornelius, 1992; Boero & Bouillon, 1993; Gili & Hughes, 1995; Stepanjants, 1998). Boero & Bouillon (1993) note that with the ability of hydroids to raft on floating objects as colonies or resting stages, possibly on shipping, dispersal is potentially unlimited. However, Boero & Bouillon (1993) stated that the distribution of hydroids was not dependent purely on they ability to disperse but by their limits of environmental tolerance.

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

<table>
<tr><th></th><th>Intolerance</th><th>Recoverability</th><th>Sensitivity</th><th>Confidence</th></tr>
<tr><td>Substratum Loss</td><td>High</td><td>Very high</td><td>Low</td><td>High</td></tr>
<tr><td colspan="5">Removal of the substratum would result in removal of the associated community and its component species, therefore an intolerance of high has been recorded. However, if suitable, the remaining substratum is likely to be recolonized and the population of <i>Obelia longissima</i> recover rapidly (see additional information below).</td></tr>
<tr><td>Smothering</td><td>Intermediate</td><td>Very high</td><td>Low</td><td>Low</td></tr>
<tr><td colspan="5">Hydroids usually colonize overhanging, vertical or steeply sloping surfaces presumably to avoid the possibility of siltation, smothering and/or competition from macroalgae. Smothering by 5cm of sediment (see benchmark) is likely to cover a large proportion of the colony, preventing feeding and hence reducing growth and reproduction. Although <i>Obelia longissima</i> forms long upright colonies up to 20 cm in length, the colonies are flexible so that smothering material is likely to bend the colony flat against the substratum. In addition, local hypoxic conditions are also likely to inhibit growth. Although, hydranths are likely to regress and portions of the colony or colonies are likely to die or be reabsorbed, parts of the colony is likely to become dormant, or otherwise survive for a period of at least a month, and recover rapidly once the sediment is removed. Therefore, an intolerance of intermediate has been recorded to represent loss of part of the colony or population. Recovery is likely to be rapid (see additional information below).</td></tr>
<tr><td>Increase in suspended sediment</td><td>Intermediate</td><td>Very high</td><td>Low</td><td>Low</td></tr>
<tr><td colspan="5">Hydroids are suspension feeders and their feeding apparatus, i.e. the hydranth tentacles, are susceptible to physical clogging by suspended particulates. Epifaunal communities, including hydroid turfs, tend to dominate on vertical or steeply sloping surfaces where siltation is reduced and/or in areas of sufficient water movement to prevent suspended sediment accumulating. The accumulation of sediment can be detrimental, e.g. Round <i>et al.</i> (1961) reported that the hydroid <i>Sertularia operculata</i> died when covered with a layer of silt after being transplanted to sheltered conditions. Boero (1984) suggested that deep water hydroid species develop upright, thin colonies that accumulate little sediment, while species in turbulent water movement were adequately cleaned of silt by water movement. <i>Obelia longissima</i> forms long upright but flexible thin colonies and has been recorded in a variety of water flow and wave exposure regimes. It has also been recorded in estuaries, which are naturally high in suspended sediment. Overall an increase in suspended sediment is likely to clog the colonies feeding apparatus to some degree, depending on local water movement, and at a minimum is likely to interfere with feeding, resulting in a decrease in growth rate, and potentially a reduction in the biomass and cover of the hydroid. Therefore, an intolerance of intermediate has been recorded. Recoverability is probably rapid.</td></tr>
<tr><td>Decrease in suspended sediment</td><td>Low</td><td>Immediate</td><td>Not sensitive</td><td>Low</td></tr>
</table>

Hydroids are passive suspension feeders dependent on water currents to bring food particles within reach of their stinging tentacles. A reduction in suspended particulates may result in a decrease in food availability. An adequate food supply is required for rapid, upright growth of colonies. A reduction in food supply may result in regression of older colonies in the long term. Therefore, a reduction in suspended sediment may result in a decrease in growth and an intolerance of low has been recorded. Recovery is likely to be immediate once ambient conditions return.

Dessication High Very high Low Moderate

Gili & Hughes (1995) note that few hydroids occur intertidally and fewer where they are exposed to the air. Cornelius (1995b) reported that *Obelia longissima* may occur in intertidal pools at extreme low water of spring tides or in pools in mussel beds, either washed up from deeper water of growing from settled planulae. Colonies growing in rockpools rarely reach the lengths of subtidal colonies (Cornelius, 1995b). Overall, *Obelia longissima* is likely to be highly intolerant of exposure to the air and hence desiccation. Therefore, an intolerance of high has been recorded. Recovery is likely to be rapid (see additional information below).

Increase in emergence regime Intermediate Very high Low Low

Obelia longissima is a predominately subtidal species, intertidal representatives being restricted to low shore pools. However, an increase in emergence is likely to expose the most shallow proportion of the population to increased desiccation and extremes of temperature. Shallow water colonies may be lost and the upper extent of the resident population reduced, Therefore, an intolerance of intermediate has been recorded, although recovery is likely to be rapid.

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

A decrease in emergence and hence increased immersion is likely to allow the hydroid to colonize new substrata. Therefore, tolerant* has been recorded.

Increase in water flow rate Intermediate Very high Low Low

Water movement is essential for hydroids to supply adequate food, remove metabolic waste products, prevent accumulation of sediment and disperse larvae or medusae. Hydroids are expected to be abundant where water movement is sufficient to supply adequate food but not cause damage (Hiscock, 1983; Gili & Hughes, 1995). Flexibility of the otherwise rigid perisarc of hydroids is provided by annulations at the base of branches in many species including *Obelia* sp.

The biomass of *Obelia longissima* was reported to increase in direct proportion to mean free-stream water flow rate, in experiments in which the ambient water flow of between <2 and >50 cm/s were increased by 50% (Judge & Craig, 1997). They also noted that *Obelia longissima* colonies were bushier in increased flow. In experiments, Hunter (1989) exposed *Obelia longissima* colonies to oscillatory flow peaking at between 0.01 and 0.25 m/s, and unidirectional flow of 0.025, 0.05, and 0.1 m/s. He reported that feeding effectiveness varied with colony size and bushiness depending on the water flow regime. For example, increased colony bushiness decreased feeding effectiveness (the number of hydranths feeding) in unidirectional or low frequency oscillatory flow but increased feeding effectiveness in high frequency oscillatory flow (Hunter, 1989). Similarly, longer colonies had lower feeding effectiveness than short colonies, although the decreased feeding effectiveness was offset by the increased number of feeding hydranths in longer and bushier colonies. In unidirectional flow, the colony was orientated with the flow and hydranths at the base depleted food before it reach hydranths at the end of the colony (self-shading), while in oscillatory flow this effect was mitigated. Good mixing of the water in the vicinity of the colony increased feeding effectiveness by ensuring the water was replaced before the food was depleted (Hunter, 1989).

Obelia longissima has been recorded in a variety of water flow regimes, from very weak to strong tidal streams (JNCC, 1999), although in very weak tidal streams, wave action is probably a more important source of water movement. Kosevich & Marfenin (1986) suggested that the growth form of *Obelia longissima* was adapted to weak flow condition and susceptible to damage in strong flow. Hunter's study suggests that it can tolerant water flow of at least 0.1 m/s (Hunter, 1989). However, it is likely that an increase in water flow from moderately strong to very strong would be detrimental, due to the physical damage to large colonies. Therefore, the abundance or extent of the population may be decreased by an increase in water flow and an intolerance of intermediate has been recorded. Recovery is likely to be rapid (see additional information below)

Decrease in water flow rate	Intermediate	Very high	Low	Low

Water movement is essential for hydroids to supply adequate food, remove metabolic waste products, prevent accumulation of sediment and disperse larvae or medusae. Hydroids are expected to be abundant where water movement is sufficient to supply adequate food but not cause damage (Hiscock, 1983; Gili & Hughes, 1995). The biomass of *Obelia longissima* was reported to increase with increasing water flow (see above; Judge & Craig, 1997). *Obelia longissima* was recorded in a variety of water flow regimes (JNCC, 1999) including very weak tidal streams. In conditions of weak water flow, wave action may be a more important source of water movement. However, where water flow is the main source of water movement, a decrease in water flow may be detrimental due to increased siltation, and loss of available hard substratum. For example, the accumulation of sediment can be detrimental, e.g. Round *et al.* (1961) reported that the hydroid *Sertularia operculata* died when covered with a layer of silt after being transplanted to sheltered conditions. Boero (1984) suggested that deep water hydroid species develop upright, thin colonies that accumulate little sediment, while species in turbulent water movement were adequately cleaned of silt by water movement. Therefore an intolerance of intermediate has been recorded. Recovery is likely to be rapid (see additional information below)

Increase in temperature	High	Very high	Low	Moderate

Stepanjants (1998) regarded *Obelia longissima* as a cold water species, with a bipolar distribution, while other authors regarded this species as probably cosmopolitan in distribution (Boero & Bouillon, 1993; Cornelius, 1995b). Cornelius (1995b) suggested that numerous records in the Indo-Pacific were probably attributable to *Obelia longissima*. Given, this species wide distribution it is unlikely to be adversely affected by chronic temperature change at the benchmark level within the British Isles.
Berrill (1949) reported that growth in *Obelia commissularis* (syn. *longissima*) was temperature dependant but ceased at 27 °C. Hydranths did not start to develop unless the temperature was less than 20 °C and any hydranths under development would complete their development and rapidly regress at ca 25 °C. Berrill (1948) reported that *Obelia* species were absent from a buoy in July and August during excessively high summer temperatures in Booth Bay Harbour, Maine, USA. Berrill (1948) reported that the abundance *Obelia* species and other hydroids fluctuated greatly, disappearing and reappearing as temperatures rose and fell markedly above and below 20 °C during this period. The upwelling of cold water (8-10 °C colder than surface water) allowed colonies of *Obelia* sp. to form in large numbers. Berrill (1948) suggested that *Obelia longissima* grew vigorously in warm weather, although at temperatures above 20 °C, growth of terminal stolons and branches was promoted but the formation of hydranths inhibited. Therefore, it would appear that *Obelia longissima* is intolerant of acute temperature

change above 20 °C.

Deep water colonies are probably buffered against the extremes of temperature potentially experienced by shallow or surface water colonies. However, thermal effluents may result in acute temperature change equivalent to the benchmark level. Therefore, an intolerance of high has been recorded, although recoverability is probably very high (see additional information below).

Decrease in temperature Low Immediate Not sensitive Low

Little information on the lower temperature limits of *Obelia longissima* was found. However, Kosevich & Marfenin (1986) reported that *Obelia longissima* was active all year round in the White Sea. Similarly, its northern limit lies in the Arctic Circle (Cornelius, 1995b; Stepanjants, 1998) suggesting that it probably tolerant of the lowest temperatures it is likely to encounter in Britain and Ireland. However, growth rates are reduced at low temperatures, and an intolerance of low has been recorded.

Increase in turbidity Low Immediate Not sensitive Low

Hydroids tend to shun well lit conditions, planulae becoming negatively phototactic prior to settlement, presumably to avoid competition with macroalgae (Gili & Hughes, 1995). Therefore, a decrease in light penetration may decrease competition for space with macroalgae. Bourget *et al.* (in press) noted that for any given water temperature on buoys in the Gulf of St Lawrence, water transparency and primary production influenced the biomass of fouling organisms, including *Obelia longissima*, most in many sample sites. Biomass was reported to increase with increasing transparency up to a transparency of 15 m after which it decreased again (see Figure 2, Bourget *et al.*, in press). Increased transparency was presumably correlated with increased primary production and hence food availability.
An increase in turbidity (decreased turbidity) may reduce primary productivity and hence food availability in shallow water populations. Therefore, growth may be reduced and an intolerance of low has been recorded.

Decrease in turbidity Low Immediate Not sensitive Low

Bourget *et al.* (in press) noted that for any given water temperature on buoys in the Gulf of St Lawrence, water transparency and primary production influenced the biomass of fouling organisms, including *Obelia longissima*, most in many sample sites. Biomass was reported to increase with increasing transparency up to a transparency of 15 m after which it decreased again (see Figure 2, Bourget *et al.*, in press). Increased transparency was presumably correlated with increased primary production and hence food availability. Therefore, a decrease in turbidity may be beneficial and tolerant* has been recorded.

Increase in wave exposure Low Immediate Not sensitive Low

Water movement is essential for hydroids to supply adequate food, remove metabolic waste products, prevent accumulation of sediment and disperse larvae or medusae. Hydroids are expected to be abundant where water movement is sufficient to supply adequate food but not cause damage (Hiscock, 1983; Gili & Hughes, 1995). *Obelia longissima* was recorded from sites varying in wave exposure from very sheltered to extremely exposed (JNCC, 1999). The branches and stems are flexible and probably able to withstand oscillatory flow (see Hunter, 1989). This species probably occurs at greater depths in more wave exposed conditions, and probably does not reach the same lengths in wave exposed areas as in more sheltered areas. Therefore, an increase in wave exposure from e.g. exposed to extremely exposed is likely to physically damage long colonies. However, hydroids demonstrate a degree of phenotypic plasticity, so that the colonies would probably redistribute resources to form shorter colonies over a wider area. Therefore, an intolerance of low has been recorded.

Decrease in wave exposure	Intermediate	Very high	Low	Low

Water movement is essential for hydroids to supply adequate food, remove metabolic waste products, prevent accumulation of sediment and disperse larvae or medusae. Hydroids are expected to be abundant where water movement is sufficient to supply adequate food but not cause damage (Hiscock, 1983; Gili & Hughes, 1995). A decrease in wave action may allow the colonies to grow longer and more luxuriant. However, in areas of weak tidal streams, a decrease in wave action may significantly decrease net water movement, to the detriment of the colonies (see water flow above). Therefore, an intolerance of intermediate has been recorded. Recovery is probably rapid.

Noise	Tolerant	Not relevant	Not sensitive	High

Hydroids are unlikely to be sensitive to noise or vibration at the benchmark level.

Visual Presence	Tolerant	Not relevant	Not sensitive	High

Hydroid polyps may retract when shaded by potential predators, however hydroids are unlikely to be affected by visual presence as defined in the benchmark.

Abrasion & physical disturbance	Intermediate	Very high	Low	Low

Abrasion by an anchor or fishing gear is likely to remove relatively delicate upright parts of the colony. However, the surface covering of hydrorhizae may remain largely intact, from which new uprights are likely to grow. In addition, the resultant fragments of colonies may be able to develop into new colonies (see displacement). Populations on small hard substrata (e.g. cobbles, pebbles or stones) may be removed by fishing gear, constituting substratum loss (see above). Overall, a proportion of the colonies are likely to be destroyed and an intolerance of intermediate has been recorded. However, recovery from surviving hydrorhizae and occasional fragments is likely to be rapid (see additional information below).

Displacement	Intermediate	Very high	Low	Low

Fragmentation is thought to be a possible mode of asexual reproduction in hydroids (Gili & Hughes, 1995). Therefore, it is possible that a proportion of displaced colonies (or fragments thereof) may attach to new substrata and survive. Cornelius (1995b) noted that detached specimens of *Obelia longissima* sometimes continue to grow if entangled in the intertidal. Therefore an intolerance of intermediate has been recorded. Recovery is likely to be rapid (see additional information below).

Chemical Pressures

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

The species richness of hydroid communities decreases with increasing pollution but hydroid species adapted to a wide variation in environmental factors and with cosmopolitan distributions tend to be more tolerant of polluted waters (Boero, 1984; Gili & Hughes, 1995). Stebbing (1981) reported that Cu, Cd, and tributyl tin fluoride affected growth regulators in *Laomedea* (as *Campanularia*) *flexuosa* resulting in increased growth. Stebbing (1981a) cited reports of growth stimulation in *Obelia geniculata* caused by methyl cholanthrene and dibenzanthrene. Bryan & Gibbs (1991) reported that virtually no hydroids were present on hard bottom communities in TBT contaminated sites and suggested that some hydroids were intolerant of TBT levels between 100 and 500 ng/l.
No information concerning the intolerance of *Obelia longissima* was found. However, the above

evidence suggests that several species of hydroid exhibit sublethal effects due to synthetic chemical contamination and lethal effects due to TBT contamination. Therefore, an intolerance of intermediate has been suggested, albeit with very low confidence. Recoverability is likely to be very high.

Heavy metal contamination	Intermediate	Very high	Low	Very low

Various heavy metals have been shown to have sublethal effects on growth in the few hydroids studied experimentally (Bryan, 1984). Stebbing (1981) reported that Cu, Cd, and tributyl tin fluoride affected growth regulators in *Laomedea* (as *Campanularia*) *flexuosa* resulting in increased growth. Stebbing (1976) reported that 1 µg/l Hg^{2+} was stimulatory, although the effect was transitory, exposure resulting in reduced growth towards the end of his 11 day experiments. Cadmium (Cd) was reported to cause irreversible retraction of 50% of hydranths in *Laomedea loveni* after 7 days exposure at concentrations between 3 µg/l (at 17.5 °C and 10 ppt salinity) and 80 µg/l (at 7.5 °C and 25 ppt salinity) (Theede *et al.*, 1979). *Laomedea loveni* was more tolerant of Cd exposure at low temperatures and low salinities. Karbe (1972, summary only) examined the effects of heavy metals on the hydroid *Eirene viridula* (Campanulidae). He noted that Cd and Hg caused cumulative effects, and morphological changes. Mercury (Hg) caused irreversible damage at concentrations as low as 0.02 ppm. He reported threshold levels of heavy metals for acute effects in *Eirene viridula* of 1.5-3 ppm Zn, 1-3 ppm Pb, 0.1-0.3 ppm Cd, 0.03-0.06 ppm Cu and 0.001-0.003 ppm Hg. Karbe (1972, summary only) suggested that *Eirene viridula* was a sensitive test organism when compared to other organisms.
Although no information on the effects of heavy metals on *Obelia* species was found, the above evidence suggests that hydroids may suffer at least sub-lethal effects and possibly morphological changes and reduced growth due to heavy metal contamination. Therefore, an intolerance of intermediate has been suggested, albeit with very low confidence. Recoverability will probably be very high (see additional information below).

Hydrocarbon contamination		Not relevant		Not relevant

Little information of the effects of hydrocarbons on hydroids was found. Hydroid species adapted to a wide variation in environmental factors and with cosmopolitan distributions tend to be more tolerant of polluted waters (Boero, 1984; Gili & Hughes, 1995). The water soluble fractions of Monterey crude oil and drilling muds were reported to cause polyp shedding and other sublethal effects in the athecate *Tubularia crocea* in laboratory tests (Michel & Case, 1984; Michel *et al.*, 1986; Holt *et al.*, 1995). However, no information concerning the effects of hydrocarbons or oil spills on *Obelia* species was found, and no assessment of intolerance has been made.

Radionuclide contamination		Not relevant		Not relevant

No information found.

Changes in nutrient levels	Tolerant*	Not relevant	Not sensitive*	Not relevant

A moderate increase in nutrients may increase food availability for suspension feeders, in the form of organic particulates. Marfenin (1997) noted that growth form and growth rates are dependant on food availability. Eutrophication may result in local hypoxic conditions (see below) and /or blooms of ephemeral algae. However, *Obelia longissima* was recorded from estuarine habitats (JNCC, 1999). Estuarine habitats are generally higher in nutrient levels than coastal waters. Therefore, *Obelia longissima* may benefit from an increase in nutrients at the benchmark level, and tolerant* has been recorded.

Increase in salinity		Not relevant		Not relevant

Little information concerning salinity tolerance in *Obelia longissima* was found. It has been recorded from estuarine sites in variable and reduced salinities (18-40 and 18-30 psu) (JNCC, 1999). It is a predominately subtidal species, unlikely to experience exposure to salinities greater than full seawater (ca 35 psu). However, the effects of exposure to hypersaline effluents are unknown and no assessment of intolerance has been made.

Decrease in salinity	Intermediate	Very high	Low	Low

Little information concerning salinity tolerance in *Obelia longissima* was found. It has been recorded from estuarine sites in variable and reduced salinities (18-40 and 18-30 psu) (JNCC, 1999). Therefore, it would probably survive a reduction in salinity from full to reduced. However, in estuarine areas a reduction in salinity from reduced to low may be detrimental. Therefore, an intolerance of intermediate has been recorded. Recovery is likely to be rapid (see additional information below).

Changes in oxygenation	Low	Immediate	Not sensitive	Very low

Hydroids mainly inhabit environments in which the oxygen concentration exceeded 5 ml/l (Gili & Hughes, 1995). Temperature, salinity, food digestion and reproductive state have been shown to affect oxygen consumption rates in hydroids (Gili & Hughes, 1995). No specific data on oxygen consumption in *Obelia longissima* was found. Hydroids are dependant on water movement to provide oxygenated water. Cornelius (1995a) noted that placing a colony in still, unaerated water stimulated the production of resting stages (frustules), generally thought to be a response to unfavourable conditions (see reproduction). Sagasti *et al.* (2000) reported that epifaunal species (including several hydroids and *Obelia bicuspidata*) in the York River, Chesapeake Bay, tolerated summer hypoxic episodes of between 0.5 and 2 mg O_2/l (0.36 and 1.4 ml/l) for 5-7 days at a time, with few changes in abundance or species composition. Overall, an intolerance of low has been recorded to represent sublethal effects, albeit with a very low confidence.

Biological Pressures

	Intolerance	Recoverability	Sensitivity	Confidence
Introduction of microbial pathogens/parasites	Low	Immediate	Not sensitive	Low

The medusae of *Obelia* species were reported to be parasitised by the flagellate *Protoodinium chattoni* in the Black /Sea and Mediterranean. *Obelia* sp. medusae can also act as secondary hosts for trematode parasites. For example, the metacercaria of *Opechona bacillaris* were reported to infest *Obelia* sp. medusae in summer in the Plymouth area (Lauckner, 1980). The larval stages of the pycnogonid (sea spider) *Anoplodactylus pygmaeus* parasitises the hydroid stage of *Obelia* species, occupying the gastric cavity, while the larvae of *Anoplodactylus petiolatus* parasitises the medusoid stage (King, 1974; Lauckner, 1980). Although no detrimental effects were reported, any parasite burden is likely to have subvital effects. Therefore, an intolerance of low has been recorded.

Introduction of non-native species		Not relevant		Not relevant

No information found

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

Hydroids are not known to be subject to extraction.

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

Obelia longissima is not known to be closely associated with species subject to extraction.

Additional information

Hydroids have the ability to produce dormant resting stages (menonts or gemmules) that are far more resistant to environmental change than the colony itself. Therefore, although colonies may be removed or destroyed, the resting stages may survive attached to the substratum. For the sake of assessment, the intolerance of the branched colonies themselves (the clearly visible component) has been recorded. The resting stages provide a mechanism for rapid recovery.

Recoverability

The medusoid and planula larval stages of *Obelia longissima* potentially result in significant powers of dispersal (see reproduction). In addition, few species of hydroids have specific substrata requirements, many are generalists, and *Obelia longissima* has been reported from a variety of hard substrata, together with sandy habitats (Cornelius, 1992; Cornelius, 1995b). Hydroids are also capable of asexual reproduction and many species produce dormant, resting stages, that are very resistant of environmental perturbation (Gili & Hughes, 1995). Rapid growth, budding and the formation of stolons allows hydroids to colonize space rapidly. Fragmentation may also provide another route for short distance dispersal. However, it has been suggested that rafting on floating debris as dormant stages or reproductive adults (or on ships hulls or in ship ballast water) , together with their potentially long life span, may have allowed hydroids to disperse over a wide area in the long term and explain the near cosmopolitan distributions of many hydroid species (Cornelius, 1992; Boero & Bouillon, 1993; Gili & Hughes, 1995). Therefore, recruitment potential is high.

Hydroids are often the first organisms to colonize available space in settlement experiments (Gili & Hughes, 1995). For example, hydroids were reported to colonize an experimental artificial reef within less than 6 months becoming abundant in the following year (Jensen, *et al*., 1994). In similar studies, *Obelia* species recruited to the bases of reef slabs within 3 months and the slab surfaces within 6 months of the slabs being placed in the marine environment in summer (Hatcher, 1998). Sebens (1986) reported that hydroids, together with spirorbid worms, bryozoans, red crustose alga, amphipods and polychaetes, colonized cleared areas in the subtidal within 1 -4 months in spring, summer and autumn. In Bodega Harbour, California, *Obelia dichotoma* recruited to, and covered all available space on settlement plates within a month (Standing, 1976). In the St Lawrence Estuary, Canada, settlement plates immersed in June were colonized by *Obelia longissima* within a few months, and *Obelia longissima* was a dominant member of the epifauna until the following July (Brault & Bourget, 1985). On their settlement plates, *Obelia longissima* suffered high mortality, probably due to predation, in July only to recover by October to December that year. However, Brault & Bourget (1985) reported that *Obelia longissima* demonstrated annual variation in recruitment, with a very successful recruitment in 1978 but poor recruitment in 1979 and 1980.

Overall, *Obelia longissima* is likely to recover from damage very quickly. Even where the colonies are destroyed and/or removed, remaining resting stages or colony fragments, together with rapid growth and potentially good recruitment should result in rapid recovery.

Importance review

Policy/legislation

- no data -

Status

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

Non-native

Native	-		
Origin	-	**Date Arrived**	-

Importance information

Obelia longissima and other *Obelia* species are common members of fouling communities on buoys, shipping and bivalve mollusc culture (Gili & Hughes, 1995; Stepanjants, 1998). *Obelia* species are an important member of epifaunal communities, which they may dominate (Stepanjants, 1998). For example, Stepanjants (1998) reported that *Obelia longissima* reached a biomass of ca 700 g/m▯ in *Saccharina latissima* (studied as *Laminaria saccharina*) communities in the White Sea, a biomass of 40 g/m▯ on navigation buoys in the Barents Sea, up to 5 g/m▯ on mussel cultures in the White Sea and more than 2 kg/m▯ in the near shore area off Kamchatka. Similarly, in settlement experiments, Brault & Bourget (1985) reported that *Obelia longissima* and *Balanus crenatus* were the dominant species, providing additional substratum for other species settlement, providing niches for mobile epifauna, and increased species richness. Loss of the dominant species resulted in impoverishment of the assemblage.

Bault & Bourget (1985) reported that the upright branches of *Obelia longissima* were used as substratum by *Mytilus edulis*, algae, and the polychaetes *Autolytus* sp. and *Spirorbis* sp. Standing (1976) noted that *Obelia dichotoma* interfered with the settlement of barnacle cyprids on settlement plates but enhanced settlement by the ascidian *Ascidia*. Gili & Hughes (1995) cited data suggesting that *Obelia* species were important regulators of local populations of the copepod *Acartia hudsonia*.

Obelia species are probably an important food source for epifaunal grazers such as some turbellarians, aplacophorans, gastropods including nudibranchs, polychaetes, pycnogonids, sea urchins, and fish (Salvini-Plawen, 1972; Sebens, 1985; Picton & Morrow, 1994; Gili & Hughes, 1995). Gili & Hughes (1995) suggested that hydroids probably play an important role in the marine food webs between the plankton and the benthos.

Stepanjants (1998) also suggested that the presence of *Obelia* medusae in the plankton may have a detrimental effect on herring larvae, so that artificial herring breeding grounds should avoid areas used for mussel culture, since mussel culture attracts abundant settlements of *Obelia* species.

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