A bivalve mollusc (*Nucula nitidosa*)

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

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Nucula nitidosa
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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	Marisa Sabatini & Susie Ballerstedt	**Refereed by**	This information is not refereed.
Authority	Winckworth, 1930		
Other common names	-	**Synonyms**	*Nucula turgida* Gould, 1846, *Nucula moorei* Winckworth, 1930

Summary

Description

The shell is subtriangular or oval, smooth, equivalve, inequilateral and 10-13 mm in length. The periostracum is a glossy olive or yellow-olive, whilst the shell is white/grey with bluish growth lines. The valves have bold concentric bands of grey/greenish yellow and fine radiating ribs. The anterior and posterior hinge lines are at right angles to each other. The margin of the shell is finely crenulate.

Recorded distribution in Britain and Ireland

Occurs on all British coasts where the substratum is suitable.

Global distribution

Distributed from Norway, south to the Mediterranean and West Africa.

Habitat

Found offshore on bottoms of fine sand, sandy mud and silt.

Depth range

180 m

Identifying features

- Shell is subtriangular or oval, and 10-13 mm in length.
- The periostracum is a distinctive glossy olive or yellow-olive in colour.
- Anterior and posterior hinge lines are at right angles to one another.
- Lunule poorly defined.
- 20-30 hinge teeth anteriorly, 10-14 teeth posteriorly.
- Shell margin finely crenulate.

Additional information

No text entered

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Further information sources

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Biology review

Taxonomy

Phylum	Mollusca	Snails, slugs, mussels, cockles, clams & squid
Class	Bivalvia	Clams, cockles, mussels, oysters, and scallops
Order	Nuculida	
Family	Nuculidae	
Genus	Nucula	
Authority	Winckworth, 1930	
Recent Synonyms	Nucula turgida Gould, 1846Nucula moorei Winckworth, 1930	

Biology

Typical abundance	High density
Male size range	12mm
Male size at maturity	3.5mm
Female size range	3.8mm
Female size at maturity	
Growth form	Bivalved
Growth rate	See additional information
Body flexibility	None (less than 10 degrees)
Mobility	
Characteristic feeding method	See additional information, Sub-surface deposit feeder
Diet/food source	See additional information
Typically feeds on	Microzooplankton, organic and inorganic particles and microbes.
Sociability	
Environmental position	Infaunal
Dependency	No information found.
Supports	No information
Is the species harmful?	No

Biology information

Protobranchs

Nucula nitidosa is a protobranch, a primitive form of bivalve that lacks the extensive gills typical of most bivalves and is, therefore, an obligate deposit feeder (Davis & Wilson, 1985).

Feeding

Nucula nitidosa is a selective deposit feeder that feeds on a variety of microzooplankton, organic and inorganic matter, and microbes including bacteria and fungi. Protobranchs maintain contact with the substratum by a pair of tentacles, elongations of the margins of the mouth. Each tentacle is associated with a large fold composed of two flaps, called a labial palp, one located to either side of the mouth (Ruppert & Barnes, 1994). During feeding, the palp probosci are extended between the ventral side immediately posterior to the head of the foot (Yonge, 1939). The probosci extend beyond the confines of the shell and actively search for food particles in the sediment. Material is collected by the tip and passes, by way of a ciliated groove, to the base of the proboscis. Here the food particles are transferred to the inner surface of the pouch which conveys them between the palp lamellae where food is sorted out by the action of complex series of ciliary tracts (Yonge, 1939).

It was reported that *Nucula nitidosa* was also able to feed from inhaled suspensions (Caspers, 1940; cited in Rachor, 1976). This filter feeding ability was demonstrated but shown to be of little importance for *Nucula nitidosa* (Trevallion, 1965; cited in Rachor, 1976). *Nucula nitidosa* may assist in the incorporation of organic material into the ecosystem in two ways. Firstly *Nucula nitidosa* may eat the organic matter present and convert it into flesh, providing food for predators such as flatfish (Blegvad, 1928; cited in Davis & Wilson, 1985). Secondly, *Nucula nitidosa* may alter the character of the organic matter, for example by producing faeces.

Growth

It has proved difficult to get a clear idea of the growth rate of *Nucula nitidosa* from shell ring analysis (Ford, 1925, Allen, 1953b). It has been suggested that this is due to great variability in reproductive behaviour and possibly growth (Rachor, 1976). In the German Bight, the annual growth rate of young *Nucula nitidosa* was at least 3.5 mm in the first year of life, while older *Nucula nitidosa* grew more slowly (1 mm and less during subsequent years) (Rachor & Salzwedel, 1976). Allen (1953b, 1954) calculated a maximum age of 12 years for individuals of *Nucula nitidosa* that were 12 mm long. This value was revised because Allen (1954) did not take the faster growth of juveniles into consideration (Rachor & Salzwedel, 1976). Rachor (1976) assumed that an individual of 3-4 mm in length was 1 year old with a further growth of 1 mm per year, and revised estimates showed that larger individuals around 12 mm in length were 9 years old rather than 12 years. It was also reported that weight increments decrease with age when *Nucula nitidosa* reach a length of 6.5 mm (Rachor, 1976).

Abundance

Populations of *Nucula nitidosa* can increase markedly when the bottom sediments are suitable. Petersen (1977) reported that the density of *Nucula nitidosa* was highest at depths shallower than 50 m (Petersen, 1977). For example:

- In the German Bight between 1969 and 1974 the average density of *Nucula nitidosa* was 498 ind/m^2 (Rachor, 1976);
- in Aberdeen Bay the species makes up only 6% of the bivalve population on a bottom of coarse sand but 74% when the bottom consisted of fine sand (Tebble, 1976); and
- in Dublin Bay, a mean density of 350 ind/m^2 was reported for *Nucula nitidosa* (Wilson, 1983b).

Biomass and Production

According to Stripp (1969; cited in Rachor & Salzwedel, 1976), *Nucula nitidosa* is the dominant species of the *Abra alba* community in the German Bight and was found to contribute 23% to the mean macrobenthic biomass of this community. The production of *Nucula nitidosa* in the German Bight was estimated by Rachor (1976) from seasonal differences in body weights. Trevallion (1965 cited in Davis & Wilson, 1985) calculated some of the components of the energy budget for the closely related *Nucula sulcata* from British waters. Both studies suggested that about 50% of the total production was allocated to gonad output, a figure considerably in excess of that shown by other bivalves. In Dublin Bay, the production of *Nucula nitidosa* was 20 KJ m^2/yr, which accounted for about 23% of the total benthic productivity of the Bay (Davis & Wilson, 1985).

Mobility

Nucula nitidosa can be found beneath the surface of the sediments from a few millimetres to a few centimetres deep, where it can dig and creep amongst the sediments. It has been suggested that *Nucula nitidosa* can move a few to several centimetres per day (Rachor, 1976).

Respiration
Nucula nitidosa is a representative of the primitive bivalve condition (Purchon, 1968; cited in Holmes *et al*., 2002). *Nucula nitidosa* has a comparatively small underdeveloped gill functioning solely as a respiratory organ (Yonge, 1939).

Supports which species
Rachor (1976) reported that epizoic ciliates and hydroid polyps can sometimes be found on the ventral margins of the shells of *Nucula nitidosa*. Edwards (1965) also reported that the hydroid *Neoturris pileata* was found living commensally on *Nucula nitidosa*. *Neoturris pileata* may impair mobility and interfere with shell growth (Edwards, 1965).

Habitat preferences

Physiographic preferences	Open coast, Offshore seabed
Biological zone preferences	Lower circalittoral, Lower eulittoral, Lower infralittoral, Sublittoral fringe, Upper circalittoral, Upper infralittoral
Substratum / habitat preferences	Fine clean sand, Muddy sand, Sandy mud
Tidal strength preferences	Moderately Strong 1 to 3 knots (0.5-1.5 m/sec.), Weak < 1 knot (<0.5 m/sec.)
Wave exposure preferences	Exposed, Moderately exposed, Sheltered
Salinity preferences	Full (30-40 psu)
Depth range	180 m
Other preferences	No text entered
Migration Pattern	Non-migratory / resident

Habitat Information

-

Life history

Adult characteristics

Reproductive type	Gonochoristic (dioecious)
Reproductive frequency	Annual protracted
Fecundity (number of eggs)	No information
Generation time	Insufficient information
Age at maturity	2-3 years
Season	Autumn - Autumn
Life span	See additional information

Larval characteristics

Larval/propagule type	-
Larval/juvenile development	Lecithotrophic
Duration of larval stage	2-10 days
Larval dispersal potential	See additional information
Larval settlement period	Insufficient information

Life history information

Sexual maturity
In a population of *Nucula nitidosa* in Dublin Bay most individuals became sexually mature in their second year (Davis & Wilson, 1983b).

Reproduction
Trevallion (1965; cited in Rachor, 1976) reported that in UK waters, *Nucula nitidosa* matures from spring to summer and spawns in autumn. No winter spawning was observed. However, according to Allen (1953b, 1954) reproduction during winter is probable in British waters. In Dublin Bay, Davis & Wilson (1985) reported that the gametes of *Nucula nitidosa* were ripening during June and August. In mid September one single spawning event was reported when over 90% of the sexually mature population spawned (Wilson & Davis, 1938b). It was also suggested that low level spawning may commence in July (Davis & Wilson, 1983a). Davis & Wilson (1938a) suggest the reason for the differences in different populations of *Nucula nitidosa* is uncertain but may be due to intraspecific differences.

Nucula nitidosa produces unusually large eggs with a high lipid content for a bivalve, which helps to sustain the leicthotrophic development of the larvae (Wilson, 1992). Lebour (1938) reported that the length of *Nucula nitidosa* eggs was about 90 µm. Whereas Rachor (1976) and Davis & Wilson (1983a) reported that the size of *Nucula nitidosa* eggs ranged from 100-150 µm

Survival of larvae
Wilson (1992) estimated that for a population of *Nucula nitidosa* spawning, effort would be around 1.1 million potential recruits annually and that survivorship from a juvenile state to appearance in the adult population would be just 1 in 10,000.

Longevity
Nucula nitidosa were thought to have a lifespan of over 20 years (Allen, 1953b). But subsequent studies on population structure and productivity in the German Bight suggested a life -span of 12 years (Rachor, 1976), and in Dublin Bay, a lifespan of 5-7 years was reported (Davis & Wilson, 1983b, 1985), which suggested a more normal lifespan of some 7-10 years (Wilson, 1992).

Mortality rates
Rachor (1976) reported that the mortality rate of *Nucula nitidosa* was very uncertain. A population of *Nucula nitidosa* was studied in Dublin Bay. Low larval and adult mortality rates were reported for several years, which was followed by high mortality when adults reached old age (Davis & Wilson, 1983b).

Sensitivity review

This MarLIN sensitivity assessment has been superseded by the MarESA approach to sensitivity assessment. MarLIN assessments used an approach that has now been modified to reflect the most recent conservation imperatives and terminology and are due to be updated by 2016/17.

Physical Pressures

	Intolerance	Recoverability	Sensitivity	Confidence
Substratum Loss	High	Moderate	Moderate	Moderate

Nucula nitidosa lives infaunally in muddy /sandy sediments. Removal of the substratum would also remove the entire population of this species so intolerance has been assessed to be high with a high recoverability. See additional information for recoverability.

Smothering	Low	Very high	Very Low	Low

Nucula nitidosa can tolerate anaerobic conditions for several days and is able to thrive in poorly aerated sediments. Ranchor (1976) suggested that their ability to tolerant anaerobic conditions and their mobility, allowed them to survive when covered by sediments during stormy weather. Ranchor (1976) also reported that *Nucula nitidosa* was abundant in an area subject to sewage sludge dumping. Therefore, an intolerance of low has been recorded at the benchmark level. Intolerance to other factors such as oil may be higher.

Increase in suspended sediment	Tolerant*	Not relevant	Not sensitive*	Low

Nucula nitidosa is a deposit feeder and therefore is not directly reliant on suspended matter as a food resource. Davis & Wilson (1983b) reported that the high levels of particulate matter in the water column suggested that turbidity was unlikely to be a factor that limited the distribution of *Nucula nitidosa* (Davis & Wilson, 1983b). However, an increase in suspended sediment will increase the rate of siltation at the sediment surface which may enhance the food supply for *Nucula nitidosa* . Therefore *Nucula nitidosa* is tolerant* of increases in suspended sediment at the benchmark level.

Decrease in suspended sediment	Low	Very high	Very Low	Low

Nucula nitidosa is a deposit feeder and is therefore not directly reliant on suspended matter to be able to feed. However a decrease in siltation may result in a decreased rate of deposition on the substratum surface and therefore a reduction in food availability. The benchmark states that this change would occur for one month and therefore would be unlikely to cause mortality. Intolerance has been assessed as low and as feeding activity should return to normal as soon as the suspended sediment levels increase recoverability has been assessed as very high.

Dessication	Low	High	Low	Low

The effect of desiccation stress on *Nucula nitidosa* is likely to be minimal as it lives infaunally in muddy sand and is able to burrow into the sediments in order to avoid or reduce the effects of desiccation. Bivalves are also able to respond to desiccation stress by valve adduction i.e. during periods of emersion. Therefore an intolerance of low has been given with a high recoverability.

Increase in emergence regime	Intermediate	High	Low	Low

An increase in emergence may expose *Nucula nitidosa* to thermal stress and increase the risk of predation and dislodgement from the sediments. *Nucula nitidosa* is a burrowing bivalve that lives infaunally in the muddy sands and can be found at depths of 180 m. It is therefore unlikely that the benchmark level would cause mass mortalities. However, those clams further up the shoreline would be more at risk to desiccation stress and mortalities may occur. Therefore, an intolerance of intermediate is given with a high recoverability.

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

A decrease in emergence, is unlikely to stress *Nucula nitidosa* and may benefit the species, allowing it to colonize further up the shore and increase its habitat range. Periods of thermal stress, risk of predation and dislodgement would be reduced. Therefore, as decreased emergence may benefit this tolerant* is recorded for this species.

Increase in water flow rate	Intermediate	High	Low	Low

Nucula nitidosa lives in a mixture of fine muddy sand sediments. Increased water flow may cause the substrata to be disturbed and the sediment on the seabed to erode. This scouring of sand and gravel causes coarse sediments to become unstable and difficult to burrow. This may lead to dislodgement and abrasion of *Nucula nitidosa*. The sediments and the species within such as *Nucula nitidosa* may then be transported to another area (bedload transport) by increased water flow. It may also damage or prevent settlement of larvae that can lower recruitment levels and lower the population present (Hiscock, 1983). Therefore, an intolerance of intermediate has been assessed with high recoverability.

Decrease in water flow rate	Intermediate	High	Low	Low

In areas exposed to less water flow, the sediments will be more stable (Hiscock, 1983) and particles may become finer and the substrata may become more muddy. However, a decrease in water flow over the benchmark level of 1 year may also cause the substrata to build up and become too muddy for *Nucula nitidosa*, which prefers muddy sand sediments. Therefore, intolerance has been assessed as intermediate with a high recoverability level.

Increase in temperature	Tolerant	Not relevant	Not sensitive	Low

Nucula nitidosa is distributed to the south of the British Isles and so is likely to be tolerant of warmer water temperatures than those it experiences round the British Isles.

Decrease in temperature	Low	Very high	Very Low	Moderate

Short term acute periods of extreme cold and icing conditions are likely to cause stress and some mortality in bivalve populations (Dame, 1996). During the extreme cold winter of 1962/1963 sea water temperatures near Helgoland (North Sea) fell to an abnormal low of -1.5 °C. Most invertebrates present suffered high mortalities except for *Nucula nitidosa*. A decrease in temperature may slow down the growth of *Nucula nitidosa*. Therefore it is likely that *Nucula nitidosa* would survive a decrease in temperature, but the viability of the population may be reduced. Hence, intolerance has been assessed as low with a very high recoverability.

Increase in turbidity	Not relevant	Not relevant	Not relevant	Moderate

The light attenuating effects on primary productivity resulting from an increase in turbidity are unlikely to directly affect *Nucula nitidosa* which is dependent on organic matter for its productivity. Davis & Wilson (1983b) reported that the high levels of particulate matter in the water column suggested that turbidity was unlikely to be a factor that limited the distribution of *Nucula nitidosa* (Davis & Wilson, 1983b). In addition, *Nucula nitidosa* lives within the sediment. Therefore, this factor is not relevant.

Decrease in turbidity	Not relevant	Not relevant	Not relevant	Moderate

This factor is considered not relevant (see above).

Increase in wave exposure Intermediate Moderate Moderate Low

Nucula nitidosa prefers depths less than 50 m in areas of wave action ranging from sheltered to very sheltered. Increased wave exposure will cause the sediment on the seabed to erode. The sediments and the species within, such as *Nucula nitidosa*, may then be transported to another area (bedload transport) reducing numbers of the population of present in an area. The dispersion and settlement of juvenile *Nucula nitidosa* may also be disrupted. Therefore, intolerance has been assessed as intermediate with a high recoverability.

Decrease in wave exposure Intermediate High Low Low

Changes in wave exposure are likely to have marked effects on the sediment dynamics. If the wave exposure is decreased, sediments that are deposited will slowly consolidate becoming more fine and muddy. Decreased exposure could also increase siltation and the risk of smothering. *Nucula nitidosa* is specialised for its preferred habitat of muddy and fine sand, however a decrease in wave exposure over the benchmark period of 1 year may cause the substrata to become too muddy for *Nucula nitidosa*. Therefore, intolerance has been assessed as intermediate with a high recoverability.

Noise Not relevant Not relevant

No information was found concerning the intolerance levels of *Nucula nitidosa* to noise. This species is not expected to be sensitive at the level of the benchmark.

Visual Presence Not relevant Not relevant

Nucula nitidosa probable has little visual acuity and was recorded to be not sensitive to this factor.

Abrasion & physical disturbance Intermediate High Low Low

Fishing for demersal species will disturb the surface layer of sediment and any protruding or shallow burrowing species. Even though *Nucula nitidosa* has a small thick shell, it is probably vulnerable to physical damage from e.g. otter boards (Rumohr & Krost, 1991) but its small size relative to the meshes of commercial trawls may ensure survival of at least a moderate proportion of disturbed individuals that pass through the nets. The effects of trawl disturbance on a benthic community was investigated with a manipulative field experiment in a fine muddy habitat that had been closed to fishing for twenty five years (Tuck *et al*., 1998). A decline in the population density of *Nucula nitidosa* was reported after 5 months of trawling disturbance, which remained significantly lower than the reference control area after 10 months (Tuck *et al*., 1998). Therefore intolerance has been assessed as intermediate as mortality may occur, and recoverability has been assessed as high.

Displacement Low High Low Low

Nucula nitidosa has a small solid shell. Fishing for demersal species will disturb the surface layer of sediment and any protruding or shallow burrowing species. *Nucula nitidosa* has the ability to reburrow back down into the sediment when it is displaced to the surface therefore, it is probably relatively tolerant of displacement. However, when displaced the risk of predation by predators is increased which may lead to some mortalities of *Nucula nitidosa*. Storms or increased wave action may cause whole populations to be lifted along with the substrata and transported to a different area where they will settle. Sediment bed load transport can occur when wave action is increased causing large coarse muddy / sandy grains to roll, hop or saltate along the bottom as bedload (Snelgrove *et al*., 1994). Therefore, an intolerance of low has been recorded with a high recoverability assessment.

Chemical Pressures

	Intolerance	Recoverability	Sensitivity	Confidence
Synthetic compound contamination		Not relevant		Low

Synthetic chemicals, including tributyl-tin (TBT) have been shown to have detrimental effects in a variety of bivalve species (for examples see reviews of *Abra alba*, *Limecola balthica*, *Mytilus edulis*, *Cerastoderma edule*, *Ostrea edulis* and *Mya arenaria*. However, no specific information was found concerning the effect of synthetic chemicals on *Nucula nitidosa*, therefore intolerance and recoverability assessments could not be given.

	Intolerance	Recoverability	Sensitivity	Confidence
Heavy metal contamination		Not relevant		Low

The capacity of bivalves to accumulate heavy metals in their tissues, far in excess of environmental levels, is well known. For example:

- Bryan (1984) states that Hg is the most toxic metal to bivalve molluscs while Cu, Cd and Zn seem to be most 'problematic' in the field; and
- reactions to sub-lethal levels of heavy metals include siphon retraction, valve closure, inhibition of byssal thread production, disruption of burrowing behaviour, inhibition of respiration, inhibition of filtration rate, inhibition of protein synthesis and suppressed growth (see review by Aberkali & Trueman, 1985).

However, no information specifically concerning the effects of heavy metal contamination on *Nucula nitidosa* was found therefore intolerance and recoverability could not be assessed.

	Intolerance	Recoverability	Sensitivity	Confidence
Hydrocarbon contamination		Not relevant		Low

Nucula nitidosa may not come into direct contact with spilt oil but may be exposed to the water soluble components of oils, and oils adsorbed onto particulates. Suchanek (1993) reviewed the effects of oil on invertebrates. Information on the effects of oils and hydrocarbons on bivalves is included in reviews of *Abra alba*, *Limecola balthica*, *Mytilus edulis*, *Cerastoderma edule*, *Ostrea edulis* and *Mya arenaria*. However, no information concerning the effects of hydrocarbons specifically on *Nucula nitidosa* was found. Therefore intolerance cannot be assessed.

	Intolerance	Recoverability	Sensitivity	Confidence
Radionuclide contamination		Not relevant		Not relevant

No specific information was found concerning the effects of radionuclides on *Nucula nitidosa*.

	Intolerance	Recoverability	Sensitivity	Confidence
Changes in nutrient levels	Tolerant*	Not relevant	Not sensitive*	Moderate

Nucula nitidosa are considered to be indicators of organic enrichment (Walker & Rees, 1980). *Nucula nitidosa* was abundant in an area north of the Elbe estuary where colonization by other macrofauna was impaired due to the sewage sludge from Hamburg being regularly deposited in the estuary (Rachor, 1976). High densities of *Nucula nitidosa* were also recorded in Howth Harbour (Ireland) in an area that was subject to sewage sludge dumping (Davis & Wilson, 1983b). Therefore *Nucula nitidosa* has been assessed as tolerant*.

	Intolerance	Recoverability	Sensitivity	Confidence
Increase in salinity		Not relevant		Not relevant

Nucula nitidosa is found in waters at full salinity. Therefore this factor is not relevant. However, no information concerning the effects of hypersaline conditions was found.

	Intolerance	Recoverability	Sensitivity	Confidence
Decrease in salinity	Intermediate	High	Low	Low

Nucula nitidosa is found in waters at full salinity. Ranchor (1976) successfully reared specimens in the laboratory at a salinity of 27 to 32 ppt. However, very little information on salinity tolerance was found. It is possible that a decrease in salinity may cause mortalities. Therefore, intolerance has been assessed as intermediate with a high recoverability at the benchmark level.

	Intolerance	Recoverability	Sensitivity	Confidence
Changes in oxygenation	Intermediate	High	Low	High

Wilson & Davis (1984) suggested that *Nucula nitidosa* showed the greatest limitation in the protobranch gill and in its inability to regulate oxygen to any great extent in response to hypoxic conditions. Holmes *et al.* (2002) stated that all the literature with regards to the susceptibility of *Nucula nitidosa* to hypoxia are anecdotal in nature. For example:

- Trevallion (1965: cited in Wilson & Davis, 1984) showed that *Nucula nitidosa* has the ability to survive up to 72 hours under anoxic conditions, and
- Ranchor (1976) reported that *Nucula nitidosa* will withstand oxygen deficiency and reducing conditions in the sediment and will survive 7 days of anaerobic conditions (Ranchor, 1976), whereas
- Holmes *et al.*(2002) reported that *Nucula nitidosa* had a mean survival time of 3.53 days and suffered 100% mortality after 10 days under hypoxic conditions at 1.38 ml O_2/l (1.93 mg O_2/l).

A long term decline of populations of *Nucula nitidosa* in the German Bight was attributed to an increased frequency of hypoxic events (Diaz & Rosenberg, 1995; Holmes *et al.*, 2002). Therefore, a decrease in oxygen concentration at the benchmark level is likely to result in some mortality, and an intolerance of intermediate has been recorded. Recoverability is likely to be high.

Biological Pressures

	Intolerance	Recoverability	Sensitivity	Confidence
Introduction of microbial pathogens/parasites	Intermediate	High	Low	Moderate

A number of parasites have been found in *Nucula nitidosa*.

- *Nucula nitidosa* is the sole intermediate host for the trematode *Steringotrema pagelli*. About 2% of *Nucula nitidosa* from western Kattegat were found to be infected (Køie, 1980). The gonad of the infected host is completely destroyed. Trematodes can reduce growth and fecundity within bivalves and in some instances may cause death (Dame, 1996).
- *Monascus* (Haplocladus) *filiformis* has its larval stage in *Nucula nitidosa*. The furcocercous cercariae, which occur in thick walled red brown sporocysts in the digestive gland and gonads, are unusually large measuring on average 970 X 340 µm. Køie, (1979) recorded these cercariae in 30% of about 200 *Nucula nitidosa* also from Kattegat.

Parasitic infections are likely to result in sub lethal effects but an intolerance of intermediate has been recorded to reflect the castrations in some individuals. Recoverability has been assessed as high.

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

No information regarding the effects of non- native species on *Nucula nitidosa* could be found therefore an intolerance assessment could not be made.

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

Nucula nitidosa are not targeted for extraction. Therefore, an intolerance assessment is not relevant.

Extraction of other species	Intermediate	High	Low	Moderate

The effects of trawl disturbance on a benthic community was investigated with a manipulative field experiment in a fine muddy habitat that had been closed to fishing for twenty five years (Tuck *et al.*, 1998). A decline in the population density of *Nucula nitidosa* was reported after 5 months of trawling disturbance and remained significantly lower than the reference control areas after 10 months (Tuck *et al.*, 1998).
In areas of high population density it appears that trawling would be unlikely to remove a whole population, therefore intolerance has been assessed as intermediate with a high recovery level.

Additional information

Recoverability

The life-span of *Nucula nitidosa* ranges from 7-10 years (Wilson, 1992). It takes 2-3 years for *Nucula nitidosa* to reach sexual maturity (Davis & Wilson, 1983b). *Nucula nitidosa* reproduce in high numbers. Once hatched *Nucula nitidosa* larvae spend a short time in the water column (a few days), which reduces the risk of predation. However, juveniles do not have a high dispersal potential as they settle in the vicinity of the adults (Thorson, 1946).

Populations of *Nucula nitidosa* appear stable and were reported to fluctuate little from year to year (Thorson, 1946). Rachor (1976) reported that the mortality rate of *Nucula nitidosa* was very uncertain. Populations of *Nucula nitidosa* can increase markedly when the bottom sediments are suitable and decrease when the older age classes die. For instance, in Dublin Bay, low larval and adult mortality rates of *Nucula nitidosa* were reported for several years, which was followed by high mortality when adults reached old age (Davis & Wilson, 1983b). *Nucula nitidosa* is also known to inhabit unstable substrates and populations can reach high densities (Creutzberg, 1986).

Overall, *Nucula nitidosa* is likely to exhibit good local, within population recruitment. Therefore, if the extent of abundance of a population is reduced, recovery is likely to be rapid. However, long-distance dispersal is potentially poor. If a population is removed from an area, it may take a long time for the area to be recoonized, depending on the local hydrography.

Importance review

Policy/legislation

- no data -

Status

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

Non-native

Native	-		
Origin	-	Date Arrived	-

Importance information

Food source

Specimens of *Nucula* were classified as a second class food for plaice (*Pleuronectes platessa*) (Blegvad, 1928; cited in Rachor, 1976). *Nucula nitidosa* was found in the stomach contents of dab *Limanda limanda* (K&#252hl, 1963; cited in Rachor, 1976).

Bibliography

Aberkali, H.B. & Trueman, E.R., 1985. Effects of environmental stress on marine bivalve molluscs. *Advances in Marine Biology*, **22**, 101-198.

Allen, J.A. 1953b. Observations on *Nucula yurgida* Marshall and *Nucula moorei* Winckworth. *Journal of the Marine Biological Association of the United Kingdom*, **31**, 515-527.

Allen, J.A. 1954. A comparative study of British species of *Nucula* and *Nuculana*. *Journal of the Marine Biological Association of the United Kingdom*, **33**, 457-472.

Beaumont, A.R., Newman, P.B., Mills, D.K., Waldock, M.J., Miller, D. & Waite, M.E., 1989. Sandy-substrate microcosm studies on tributyl tin (TBT) toxicity to marine organisms. *Scientia Marina*, **53**, 737-743.

Bryan, G.W., 1984. Pollution due to heavy metals and their compounds. In *Marine Ecology: A Comprehensive, Integrated Treatise on Life in the Oceans and Coastal Waters*, vol. 5. *Ocean Management*, part 3, (ed. O. Kinne), pp.1289-1431. New York: John Wiley & Sons.

Creutzberg, F., 1986. The distribution patterns of two bivalve species (*Nucula turgida*, *Tellina fabula*) along a frontal system in the southern North Sea. *Netherlands Journal of Sea Research*, **20**, 305-311.

Dame, R.F.D., 1996. *Ecology of Marine Bivalves: an Ecosystem Approach.* New York: CRC Press Inc. [Marine Science Series.]

Davis, J.P. & Wilson, J.G., 1983a. Seasonal changes in the tissue weight and biochemical composition of the bivalve *Nucula turgida* in Dublin Bay with reference to gametogenesis. *Netherlands Journal of Sea Research*, **17**, 84-95.

Davis, J.P. & Wilson, J.G., 1983b. The population structure and ecology of *Nucula turgida* (Leckenby & Marshall) in Dublin Bay. *Progress in Underwater Science*, **8**, 53-60.

Davis, J.P. & Wilson, J.G., 1985. The energy budget and population structure of *Nucula turgida* in Dublin Bay. *Journal of Animal Ecology*, **54**, 557-571.

Diaz, R.J. & Rosenberg, R., 1995. Marine benthic hypoxia: a review of its ecological effects and the behavioural responses of benthic macrofauna. *Oceanography and Marine Biology: an Annual Review*, **33**, 245-303.

Edwards, C., 1965. The hydroid and the medusa of *Neoturris pileata*. *Journal of the Marine Biological Association of the United Kingdom*, **45**, 443-468.

Ford, E,. 1925. On the growth of some lamellibranchs in relation to the food supply of fishes. *Journal of the Marine Biological Association of the United Kingdom*, **13**, 531-559.

Hayward, P.J. & Ryland, J.S. (ed.) 1995b. *Handbook of the marine fauna of North-West Europe.* Oxford: Oxford University Press.

Hiscock, K., 1983. Water movement. In *Sublittoral ecology. The ecology of shallow sublittoral benthos* (ed. R. Earll & D.G. Erwin), pp. 58-96. Oxford: Clarendon Press.

Holmes, S.P., Miller, N. & Weber, A., 2002. The respiration and hypoxic tolerance of *Nucula nitidosa* and *Nucula nucleus*: factors responsible for determining their distribution? *Journal of the Marine Biological Association of the United Kingdom*, **82**, 971-981.

Howson, C.M. & Picton, B.E., 1997. *The species directory of the marine fauna and flora of the British Isles and surrounding seas.* Belfast: Ulster Museum. [Ulster Museum publication, no. 276.]

Køie, M., 1979. On the morphology and life history of *Monascus* (=*Haplocladus*) *filiformis* (Rudolphi, 1819) Looss, 1907, and *Steringophorus furciger* (Olsson, 1868) Odhner, 1905 (Trematoda, Fellodistomidae). *Ophelia*, **18**, 113-132.

Køie, M., 1980. On the morphology and life history of *Steringotrema pagelli* (van Beneden, 1871) Odhner, 1911 and *Fellodistomum fellis* (Olsson, 1868), Nicoll, 1909 [syn. *S.ovacutum* (Lebour, 1908) Yamaguti, 1953] (Trematoda, Fellodistomidae). *Ophelia*, **19**, 215-236.

Lebour, M.V., 1938. Notes on the breeding of some lamellibranchs from Plymouth and their larvae. *Journal of the Marine Biological Association of the United Kingdom*, **23**, 119-144.

Møhlenberg, F. & Kiørboe, T., 1983. Burrowing and avoidance behaviour in marine organisms exposed to pesticide-contaminated sediment. *Marine Pollution Bulletin*, **14** (2), 57-60.

Pechenik, J. A., 1991. The Molluscs. In *Biology of the invertebrates* (2nd edn) pp. 269-34. United States: W. C. Brown.

Petersen, G.H., 1977. The density, biomass and origin of the bivalves of the central North Sea. *Meddeleser fra Danmarks Fiskeri - Og Havundersøgelser*, **7**, 221-273.

Picton, B.E. & Costello, M.J., 1998. *BioMar* biotope viewer: a guide to marine habitats, fauna and flora of Britain and Ireland. [CD-ROM] *Environmental Sciences Unit, Trinity College, Dublin.*

Rachor, E. & Salzwedel, H. 1976. Studies on population dynamics and productivity of some bivalves in the German Bight. In *Proceedings of the 10th European Symposium on Marine Biology, Volume 2: Population Dynamics* (ed. G. Persoone & E. Jaspers), pp. 575-588. Wettern, Belgium: Universa Press

Rachor, E., 1976. Structure, dynamics and productivity of a population of *Nucula nitidosa* (Bivalvia, Protobranchiata) in the German Bight. *Berichte der Deutschen Wissenschaftlichen Kommission fur Meeresforschung*, **24**, 296-331.

Rumohr, H. & Krost, P., 1991. Experimental evidence of damage to benthos by bottom trawling with special reference to *Arctica islandica*. *Meeresforschung*, **33** (4), 340-345.

Ruppert, E.E. & Barnes, R.D., 1994. *Invertebrate zoology* (6th ed.). Fort Worth, USA: Saunders College Publishing.

Seaward, D.R., 1982. *Sea area atlas of the marine molluscs of Britain and Ireland*. Peterborough: Nature Conservancy Council.

Snelgrove, P.V.R. & Butman, C.A., 1994. Animal-sediment relationships revisited: cause versus effect. *Oceanography and Marine Biology: an Annual Review*, **32**, 111-177.

Stachowitsch, M., 1992. *The invertebrates: an illustrated glossary.* USA: Wiley-Liss.

Suchanek, T.H., 1993. Oil impacts on marine invertebrate populations and communities. *American Zoologist*, **33**, 510-523.

Tebble, N., 1976. *British Bivalve Seashells. A Handbook for Identification*, 2nd ed. Edinburgh: British Museum (Natural History), Her Majesty's Stationary Office.

Thorson, G., 1946. Reproduction and larval development of Danish marine bottom invertebrates, with special reference to the planktonic larvae in the Sound (Øresund). *Meddelelser fra Kommissionen for Danmarks Fiskeri- Og Havundersögelser, Serie: Plankton*, **4**, 1-523.

Tuck, I.D., Hall, S.J., Robertson, M.R., Armstrong, E. & Basford, D.J., 1998. Effects of physical trawling disturbance in a previously unfished sheltered Scottish sea loch. *Marine Ecology Progress Series*, **162**, 227-242.

Walker, A.J.M. & Rees, E.I.S., 1980. Benthic ecology of Dublin Bay in relation to sludge dumping: fauna. *Irish Fisheries Investigation Series B (Marine)*, **22**, 1-59.

Webb, C.M., 1987. Post-larval development of the bivalves *Nucula turgida*, *Venus striatula*, *Spisula subtruncata* and *Spisula elliptica* (Mollusca: Bivalvia), with reference to the late larvae. *Journal of the Marine Biological Association of the United Kingdom*, **67**, 441-459.

Wilson, J.G. & Davis, J.P., 1984. The effect of environmental variables on the oxygen consumption of the protobranch bivalve *Nucula turgida* (Leckenby & Marshall). *Journal of Molluscan Studies*, **50**, 73-77.

Wilson, J.G., 1992. Age specific energetics of reproduction in *Nucula turgida* (Leckenby & Marshall) a bivalve with lecithotrophic larval development. *Invertebrate Reproduction and Development*, **22**, 275-280.

Yonge, C.M., 1939. The protobranchiata mollusca: a functional interpretation of their structure and evolution. *Philosophical Transactions of the Royal Society of London, Series B*, **230**, 79-147.

Datasets

Bristol Regional Environmental Records Centre, 2017. BRERC species records recorded over 15 years ago. Occurrence dataset: https://doi.org/10.15468/h1ln5p accessed via GBIF.org on 2018-09-25.

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

Conchological Society of Great Britain & Ireland, 2018. Mollusc (marine) data for Great Britain and Ireland - restricted access. Occurrence dataset: https://doi.org/10.15468/4bsawx accessed via GBIF.org on 2018-09-25.

Conchological Society of Great Britain & Ireland, 2018. Mollusc (marine) data for Great Britain and Ireland. Occurrence dataset: https://doi.org/10.15468/aurwcz accessed via GBIF.org on 2018-09-25.

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

Merseyside BioBank., 2018. Merseyside BioBank (unverified). Occurrence dataset: https://doi.org/10.15468/iou2ld accessed via GBIF.org on 2018-10-01.

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

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

South East Wales Biodiversity Records Centre, 2018. SEWBReC Molluscs (South East Wales). Occurrence dataset: https://doi.org/10.15468/jos5ga accessed via GBIF.org on 2018-10-02.