A razor shell (*Ensis ensis*)

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

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A report from:
The Marine Life Information Network, Marine Biological Association of the United Kingdom.

Please note. This MarESA report is a dated version of the online review. Please refer to the website for the most up-to-date version [https://www.marlin.ac.uk/species/detail/1419]. All terms and the MarESA methodology are outlined on the website (https://www.marlin.ac.uk)

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***Ensis ensis*, the razor shell.**
Photographer: Keith Hiscock
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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	Jacqueline Hill	**Refereed by**	This information is not refereed.
Authority	(Linnaeus, 1758)		
Other common names	-	**Synonyms**	-

Summary

Description

Razor shells have an elongate and fragile shell with valves gaping at both ends. The shell is smooth on the outside and whitish in colour with vertical and horizontal reddish-brown or purplish-brown markings separated by a diagonal line. The periostracum is olive-green. The inner surface is white with a purple tinge and the foot is pale red-brown. The presence of razor shells in sand is indicated by keyhole-shaped openings made by the short, united siphons which extend just above the sediment surface when the animal is suspension feeding.
There are three species of razor shell in Britain and Ireland: *Ensis ensis*, *Ensis siliqua* and *Ensis arcuatus*. *Ensis ensis* is slender, with a slightly curved elongate shell up to 130mm long. In *Ensis siliqua* both dorsal and ventral margins are straight and adults are up to 200mm long. *Ensis arcuatus* grows up to 150mm long and the dorsal margin is straight, the ventral margin is curved. It may be particularly difficult to distinguish between species in juvenile individuals.

Recorded distribution in Britain and Ireland

Common on all British coasts.

Global distribution

From Norway to the Atlantic coast of Spain. *Ensis ensis* and *Ensis siliqua* found in some parts of the Mediterranean.

Habitat

Razor shells live in deep, vertical, permanent burrows in fine, sometimes muddy, sand from extreme low water to the shallow sublittoral. *Ensis arcuatus* lives in coarser sediment than either *Ensis ensis* or *Ensis siliqua*.

Depth range

to a depth of 60m

Identifying features

- Anterior margin is rounded, the posterior obliquely truncate. Anterior and posterior ends gaping.
- Left valve with two, projecting peg-like cardinal teeth, and two elongate, posterior laterals, situated on above the other. Right valve with one short cardinal and a single, elongate posterior lateral.

Ensis ensis

- Dorsal and ventral margins evenly and equally curved.
- Up to 130mm long.
- Large foot pale red-brown in colour.

Ensis siliqua

- Dorsal and ventral margins of shell parallel, almost straight, anterior and posterior margins obliquely truncate, with rounded corners.
- Up to 200mm long.
- Foot creamy white with brown lines.

Ensis arcuatus

- Dorsal margin of shell almost straight, ventral margin curved, shell widest mid length.
- Length up to 150mm.
- Foot creamy white with brown lines

Additional information

- Many intertidal populations have been reduced by over fishing and the species is in decline in many areas.
- Razor fish are very sensitive to minor perturbations (for instance increased/decreased temperature and higher to lower salinity - salt is used as a method of dislodging them from their burrows).
- There are two other species of razor shell common to Britain, both larger than *Ensis ensis* and typically occupying different sediment types: *Ensis siliqua* which has straight margins and is up to 20 cm in length, is found in fine sand on moderately exposed shores and *Ensis arcuatus* which is curved and up to 15 cm in length is found in coarse sand and fine gravel.
- A non-native species *Ensis americanus* (synonym: *Ensis directus*) was found in 1989 on Holme beach, Norfolk (Howlett 1990). Currently it is found at sites along the British east coast south from the Humber and along the English Channel west as far as Rye Harbour,

East Sussex. (Howlett 1990; J. Light & I. Killeen pers. comm.). It is also common in the Wash (JNCC, 1999).
- *Ensis ensis*, (Linnaeus, 1758), MCS species index number W1999; *Ensis arcuatus* (Jeffreys, 1865), MCS species index number W1998
; *Ensis siliqua* (Linnaeus, 1758), MCS species index number W2001.

The sensitivity and recoverability information has been compiled primarily using information regarding the common razor shell *Ensis ensis*.

Listed by

Further information sources

Search on:

NBN WoRMS

Biology review

Taxonomy

Phylum	Mollusca	Snails, slugs, mussels, cockles, clams & squid
Order	Adapedonta	
Family	Pharidae	
Genus	Ensis	
Authority	(Linnaeus, 1758)	
Recent Synonyms	-	

Biology

Typical abundance	See additional information
Male size range	up to 13cm
Male size at maturity	>10cm
Female size range	>10cm
Female size at maturity	
Growth form	
Growth rate	2-4cm/year
Body flexibility	None (less than 10 degrees)
Mobility	
Characteristic feeding method	
Diet/food source	
Typically feeds on	Suspended organic detritus
Sociability	
Environmental position	Infaunal
Dependency	None.
Supports	Independent
Is the species harmful?	No *Ensis ensis* is an edible species and therefore non-toxic. However, *Ensis* species are thought to be especially at risk of Amnesic Shellfish Poisoning (ASP) (Edward Fahy pers. comm.).

Biology information

Typical abundance

Abundance of *Ensis* sp. varies from high to low density. In favourable conditions - such as the lee of rocks, rocks and islands for *Ensis arcuatus* on the western coast, individuals are found in high densities in 'beds' which interchange individuals with the surrounding areas where they occur in a more dispersed pattern (Fahy *et al.* in press).

Size ranges Size range given for *Ensis ensis*. *Ensis siliqua* males and females up to 20 cm and *Ensis arcuatus* males and females up to 15 cm.

Growth rates

Growth in the first winter is 2-4 cm. The three species have similar growth patterns but with different asymptotic lengths. In *Ensis siliqua* males grow faster than females. Growth rates are higher in the summer, when the food supply is abundant, than in the winter when the temperature and food supply are both reduced. *Ensis ensis* also show a neap-spring lunar growth pattern with smaller growth bands during spring tides when animals are emersed for longer (Henderson & Richardson, 1994). The growth rate given is the maximum rate in the first year or two of life. Thereafter growth falls to 2-3 cm/year (Robinson & Richardson, 1998).

Habitat preferences

Physiographic preferences	
Biological zone preferences	
Substratum / habitat preferences	
Tidal strength preferences	
Wave exposure preferences	
Salinity preferences	
Depth range	to a depth of 60m
Other preferences	No text entered
Migration Pattern	

Habitat Information

- **Habitat**
  Ensis spp. Occur virtually everywhere inshore but favourable conditions, such as the lee of reefs, rocks and islands make for high densities known as 'beds' which interchange individuals with the surrounding areas where they occur in a more dispersed pattern. *Ensis ensis* beds do occur at extreme low water of spring tides but the species is much more common in depths of about 10m (Holme, 1954). Single specimens have been collected from depths of 60m in the Plymouth area. *Ensis arcuatus* lives in coarser sediment than either *Ensis ensis* or *Ensis siliqua*.
- **Migration**
  Henderson & Richardson (1994) observed a distribution of razor clam size classes on a shore in north Wales which may indicate that there is a gradual down-shore migration of juveniles into the adult population. They suggest that juveniles become established further up the shore because the low water mark is exposed to the strongest tidal currents.
- **Wave exposure**
  In moderate wave exposure *Ensis ensis* may be replaced by the larger *Ensis siliqua* (Holme, 1954).

Life history

Adult characteristics

Reproductive type	
Reproductive frequency	Annual episodic
Fecundity (number of eggs)	

Generation time	Insufficient information
Age at maturity	3 years minimum
Season	Summer - Summer
Life span	11-20 years

Larval characteristics

Larval/propagule type	-
Larval/juvenile development	
Duration of larval stage	1-2 months
Larval dispersal potential	No information
Larval settlement period	

Life history information

Lifespan
The lifespan of *Ensis ensis* is likely to be in excess of 10 years. The other two British species *Ensis siliqua* and *Ensis arcuatus* are also very long-lived, with a lifespan up to 18 years (E. Fahy pers. Comm.).

Reproduction
Razor shells in Britain do not appear to breed before they are three years old (Henderson & Richardson, 1994). Breeding occurs during the summer but larval settlement is not successful every year, and recruitment of juveniles is irregular (Hayward *et al*., 1996). Breeding probably occurs during spring and the veliger larvae has a pelagic life of about a month (Fish & Fish, 1996). Studies on razor shells from North Wales showed that individuals of *Ensis ensis* were mature in July but were spent in August, indicating that spawning had occurred by the middle of the summer (Henderson & Richardson, 1994).

Sensitivity review

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

Physical Pressures

	Intolerance	Recoverability	Sensitivity	Confidence
Substratum Loss	High	High	Moderate	Moderate

Loss of the substratum will remove the resident population of the burrowing razor shell *Ensis ensis* and so intolerance is high. However, razor clams are very mobile bivalves and will rapidly migrate and recolonize favourable areas. In addition, razor shells have a pelagic larva, with annual spatfalls (E. Fahy pers. comm.) so it seems likely that populations could recover within a year. However, given the sporadic nature of the abundance of spatfalls, recovery may be more protracted and the age distribution of the population may be skewed towards younger individuals than before. In the Setubal region of Portugal, signs of recovery of *Ensis siliqua* populations was observed about 18 months after the cessation of fishing. However, yields were still low and it was recommended that the closure of fishing should remain for full recovery (Gaspar & Dias, 1999). However, it is likely that recovery should be complete within five years although beds of larger adults would probably take up to about 10 years.

Smothering	Tolerant	Not relevant	Not sensitive	High

Ensis ensis lives buried in sand, can extend its siphons and rise in its burrow and so is likely to tolerate smothering by 5 cm of sediment.

Increase in suspended sediment	Low	High	Low	High

Holme (1954) reports that *Ensis ensis* is the more silt tolerant of the British *Ensis* species and is generally found at sheltered localities or from offshore and in sediments with a silt percentage of up to 16%. A decrease in siltation may affect growth and fecundity if the supply of organic particulate matter declines.

Decrease in suspended sediment

Dessication	High	High	Moderate	Moderate

Ensis ensis is found in the intertidal at extreme low water so will be subject to desiccation only rarely. The shell gapes at both ends so that water loss cannot be prevented and the animal is therefore, likely to be highly intolerant of an increase in desiccation. If the animal is not surrounded by a burrow the shells open and the mantle splits. However, the species may burrow further into the sand during low tide to avoid desiccation although on a number of occasions *Ensis ensis* have been seen to come right out of the sand at low tide, and lie on the surface when a heavy mortality is likely to result (Holme, 1954). *Ensis* spp. may be held for some time out of water, provided the shells are kept closed (by being restrained by an elastic band for example) although periods are likely to be damaging. In years of good recruitment recolonization may occur within a year. However, recruitment is sporadic (see reproduction) and recovery may take longer but should be complete within five years.

Increase in emergence regime	High	High	Moderate	High

Ensis ensis is found in the intertidal at extreme low water being exposed briefly once or twice a month and is therefore likely to be highly intolerant of an increase in emergence. On a number of occasions *Ensis ensis* have been seen to come right out of the sand at low tide, and lie on the surface when a heavy mortality is likely to result. While some probably survive the exposure and burrow in again when the tide returns, many must be eaten by gulls (Holme, 1954). The species will probably tolerate a decrease in emergence which will probably allow the population to extend up the shore. In years of good recruitment recovery may occur within a year. However, recruitment is sporadic (see reproduction) and recovery may take longer but should be complete within five years.

Decrease in emergence regime

Increase in water flow rate Intermediate High Low Moderate

In an investigation of an intertidal population of *Ensis ensis* in north Wales Henderson & Richardson (1994) found that the largest razor clams were found only at extreme low water, whilst smaller clams (<100mm) were collected further up the shore. The authors suggest that the area on the lower shore may be unsuitable for juveniles because they are exposed to the greatest tidal currents and may get washed away. Increased water flow is likely to make the sediment more mobile and individuals of *Ensis ensis* may be washed away. However, since the species is able to burrow deeper into the sediment during unsuitable conditions water flow rates would have to increase substantially to remove individuals and so intolerance is assessed as intermediate.

Decrease in water flow rate

Increase in temperature Intermediate High Low Moderate

Populations of the razor shell *Ensis siliqua* in the warmer waters of Portugal spawn several months earlier in the year than UK populations and are sexually mature at only one year old (Gaspar & Monteiro, 1998; Henderson & Richardson, 1994) compared to three in the UK. Therefore, it is likely that temperature is important for growth and fecundity of *Ensis ensis*. However, the species extends north and south of British populations and so is likely to be tolerant of a long term change in temperature of 2°C. The species is likely to be more intolerant of a rapid change in temperature of 5°C outside its normal temperature range. During the cold winter of 1962-63 when air temperatures fell below freezing for several weeks Crisp (1964) recorded very high levels of mortality of *Ensis ensis* and suggests that the razor shells lost the ability to burrow at lowered temperatures, and so were left exposed at the surface. At some sites live individuals were later found by digging so some protection is afforded by burrowing position. *Ensis* spp. are known to emerge from the sediment when shallow inshore waters become warm as happened in Torbay in 1999 (K. Hiscock pers. comm.). In years of good recruitment recolonization may occur within a year, however, recruitment is sporadic and may take several years when recruitment is poor.

Decrease in temperature

Increase in turbidity Low High Low Moderate

Changes in light attenuation resulting from turbidity changes are not likely to affect the suspension feeding *Ensis ensis*. However, if increased turbidity is caused by silt particles additional feeding costs may be imposed and phytoplankton production may decline reducing food supplies. The species may benefit from increased nutritional value if turbidity is caused by organic particles.

Decrease in turbidity

Increase in wave exposure	Intermediate	High	Low	Moderate

On exposed beaches where the sand is continually churned by waves, razor shells are absent. Wave scour caused by winter gales along the North Wales coast washed out some individuals of *Ensis ensis* although numbers were much lower than for some other fauna (Rees *et al.*, 1976). Therefore, significant increases in wave exposure may cause the death of some individuals in a population and may limit individuals to below the low-water mark. On moderately wave exposed beaches *Ensis ensis* may be replaced by the larger *Ensis siliqua* (Holme, 1954). In years of good recruitment recolonization may occur within a year, however, recruitment is sporadic and may take several years when recruitment is poor.

Decrease in wave exposure

Noise	Tolerant	Not relevant	Not sensitive	Moderate

Ensis ensis can probably detect the vibration caused by predators and will withdraw its siphons. No information was found concerning the effect of noise or vibration on razor shell populations although the species is unlikely to be sensitive to noise or vibration.

Visual Presence	Tolerant	Not relevant	Not sensitive	Moderate

Razor shells are unlikely to be sensitive to visual disturbance.

Abrasion & physical disturbance	High	High	Moderate	High

Ensis ensis has a thin brittle shell and so is highly intolerant of abrasion and physical disturbance. Eleftheriou & Robertson (1992) observed large numbers of *Ensis ensis* killed or damaged by dredging operations and Gaspar (1998) reports high levels of damage in *Ensis siliqua* from fishing. Therefore, an intolerance of high has been recorded. In years of good recruitment recolonization may occur within a year. However, given the sporadic nature of the abundance of spatfalls, recovery may be more protracted and the age distribution of the population may be skewed towards younger individuals than before. In the Setubal region of Portugal, signs of recovery of *Ensis siliqua* populations was observed about 18 months after the cessation of fishing. However, yields were still low and it was recommended that the closure of fishing should remain for full recovery (Gaspar & Dias, 1999). However, it is likely that recovery should be complete within five years although beds of larger adults would probably take up to about 10 years.

Displacement	Intermediate	High	Low	High

Razor shells displaced from their burrow onto the surface of the sediment, as may be caused by a storm, can rapidly reburrow on return to a suitable substratum and so can survive. However, if the method of removal is stressful the species ability to reburrow on return to a suitable substratum may be impaired. For example, live specimens removed by dredging and then replaced on the substratum took a long time to reburrow and many were consumed by predatory crabs (Robinson & Richardson, 1998). Therefore, intolerance has been assessed as intermediate.

Chemical Pressures

	Intolerance	Recoverability	Sensitivity	Confidence
Synthetic compound contamination	High	High	Moderate	Moderate

High levels of mortality of *Ensis* spp. were found at places distant from shores treated with dispersants following the *Torrey Canyon* oil spill (Smith, 1968). Almost complete mortality of razor shells was found at stations more than a kilometre from the shore at a depth of about

20m. Experiments have shown that *Ensis* species are intolerant of only 0.5 ppm of detergent with high intolerance to the solvent rather than the surfactant element (Smith, 1968). On return to normal conditions recovery may occur within a year if recruitment is good. However, recruitment is sporadic (see reproduction) and recolonization may take longer but should be complete within five years.

Heavy metal contamination Intermediate High Low Low

No specific information on the effect of heavy metals to razor shells could be found. However, in investigations of faunal distribution in the metal contaminated Restronguet Creek in the Fal estuary bivalve molluscs appear to be the most vulnerable (Bryan, 1984). The bivalve *Scrobicularia plana*, for example, is absent from large areas of the intertidal muds where, under normal conditions, it would account for a large amount of the biomass (Bryan & Gibbs, 1983). Bryan (1984) also reports that metal-contaminated sediments can exert a toxic effect on burrowing bivalves and so intolerance has been assessed as intermediate. Embryonic and larval stages of bivalve molluscs are the most vulnerable to heavy metals (Bryan, 1984). On return to normal conditions recovery may occur within a year if recruitment is good. However, recruitment is sporadic (see reproduction) and recovery may take longer but should be complete within five years.

Hydrocarbon contamination High High Moderate Moderate

Ensis ensis is reported to bioconcentrate aromatics and is highly intolerant of hydrocarbons. Four days after the *Sea Empress* oil spill moribund razor shells (mostly *Ensis siliqua*) were the first organisms observed to have been affected (SEEEC, 1998). Hundreds of razor shells were protruding from the sand and most died in that position over the next few days. Glegg & Rowland (1996) observed dead razor shells washed up on the shore a few days after the final break-up of the *Braer* wreck and about a million razor shells were seen after the *Amoco Cadiz* oil spill in Brittany (Southward, 1978). On return to normal conditions recolonization should be high. Although recruitment of *Ensis ensis* is sporadic recovery should be complete within five years. However, the age distribution of the population may be skewed towards younger individuals than before.

Radionuclide contamination Not relevant

Insufficient information.

Changes in nutrient levels Intermediate High Low Low

Although no specific information regarding the response of *Ensis ensis* to changes in nutrient levels the species is not characteristic of habitats at the upper end of the organic gradient and so is assessed as having intermediate intolerance.

Increase in salinity Intermediate High Low Moderate

Ensis ensis does not occur in water of reduced salinity, although its absence from estuaries may sometimes be due to the lack of deposits of suitable grade (Holme, 1954). The species concentrates K and Ca (Kinne, 1971) and can probably tolerate a degree of salinity reduction because it will be subject to periodic precipitation in the intertidal. Intolerance has therefore, been assessed as intermediate. One means of collecting *Ensis* spp. is to sprinkle salt on their burrows causing them to rise to the surface.

Decrease in salinity

Changes in oxygenation Intermediate High Low Moderate

Ensis species typically occur in sands which are not black below the surface i.e. where conditions are oxygenated and not reducing. Where seaweed or other organic matter gets buried in and incorporated in the sand, resulting in a black layer containing ferrous sulphide, *Ensis* is absent. However, the species can tolerate sands which are slightly reducing, in which there is a grey layer below the surface, such as occurs on beaches of firm fine sand in which the organic content is not high, but there is little circulation of water (Holme, 1954), and so intolerance is assessed as intermediate.

Biological Pressures

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

No information on diseases of *Ensis* spp. was found. However, mortalities of the Pacific razor clam *Siliqua patula*, explained by infection with *Rickettsia*-like organisms, have been reported in several locations in the US (Elston, 1986).

	Intolerance	Recoverability	Sensitivity	Confidence
Introduction of non-native species	Intermediate	High	Low	Moderate

The American razor shell *Ensis americanus* (synonym: *Ensis directus*) has spread from its point of introduction in the German Bight in 1978 into southern North Sea countries. The species, which is native to the Atlantic coast of North America was found in Britain in 1989 on Holme beach, Norfolk. The long-lasting pelagic larval stage is assumed to be transported with water currents and has spread rapidly in southern North Sea countries and is now found at sites along the British east coast south from the Humber and along the English Channel west as far as East Sussex (Eno *et al*., 1997). The species lives in brackish as well as marine conditions so may be filling a niche in estuaries not already occupied (Urk van, 1987). *Ensis americanus* is also found in much finer and unstable sand than *Ensis ensis* and so the two species may not be in direct competition. Armonies & Reise (1999) report that there were no significant interactions between *Ensis americanus* and resident species.

	Intolerance	Recoverability	Sensitivity	Confidence
Extraction of this species	Intermediate	High	Low	High

Traditionally *Ensis ensis* has been hand collected for food, bait and personal use. In Scotland, some subtidal razor clam beds are dense enough to be exploited commercially and recently the species has been harvested by suction dredger (Fowler, 1999; Robinson & Richardson, 1998). *Ensis ensis* has a pelagic larva so it seems likely that the population could recolonize within a year. However, given the sporadic nature of recruitment in *Ensis ensis*, recovery may be more protracted but should be complete within five years. However, the age distribution of the population may be skewed towards younger individuals than before. In the Orkneys for example, where *Ensis arcuatus* beds are subject to repeated dredging, populations have a significantly smaller average length than those at an un-fished site (Robinson & Richardson, 1998).

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

Ensis ensis has no known obligate relationships with other species.

Additional information

The intolerance and recoverability information has been compiled primarily using information regarding the common razor shell *Ensis ensis*.

Occasional mass mortalities of razor clams have occurred being attributable to several causes, among them storms (Tebble, 1966) and "adverse environmental conditions" (Howard, 1998). In western Ireland in the spring of 2001 there were mass mortalities of razor clams (Fahy, in press) over too wide an area to be explained by local environmental conditions. Histological and bacterial examinations were carried out but no pathological cause was identified. It is suggested that mortality is explained as a natural post-spawning phenomenon, which in 2001 was unusually severe, possibly exacerbated by an environmental factor.

Importance review

Policy/legislation

- no data -

Status

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

Non-native

Native	-		
Origin	-	**Date Arrived**	-

Importance information

Traditionally *Ensis ensis* has been hand collected for food, bait and personal use. Boats with hydraulic dredges and SCUBA diving have also been employed to collect up to a tonne of live razor clams each week (Allen, 1990) although it is unclear which species are being collected or how often they are fished commercially. More recently, in Scotland and Ireland, dense subtidal razor clam beds have been exploited commercially and the species is now harvested by hydraulic dredger (Fowler, 1999; Fahy, 1999). However, the vulnerability of the species to overfishing has been recognised with visible declines in stocks in some areas and absence of larger animals (Henderson & Richardson, 1994; Gaspar & Monteiro, 1998).

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