Spiny mudlark (*Brissopsis lyrifera*)

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

Georgina Budd

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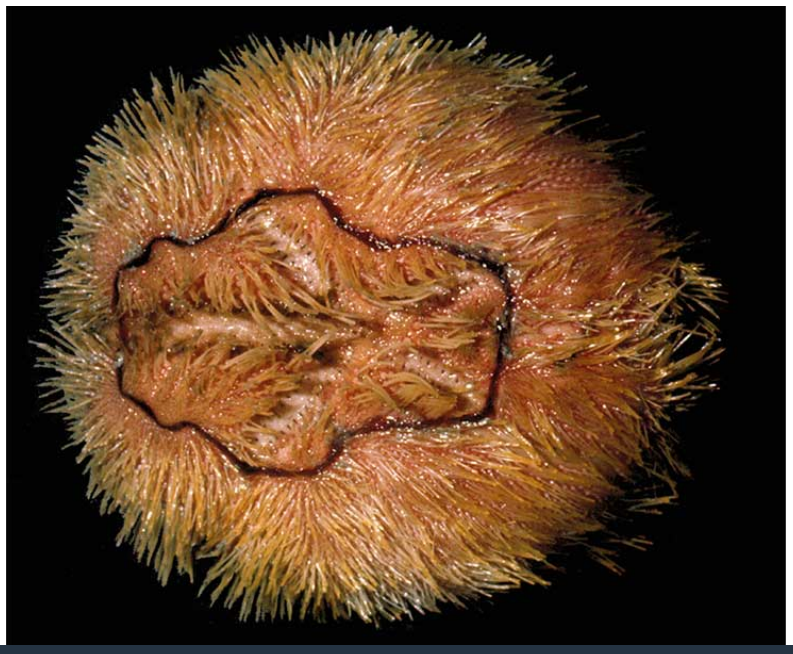

Brissopsis lyrifera
Photographer: Eve Southward
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See online review for distribution map

Distribution data supplied by the Ocean Biogeographic Information System (OBIS). To interrogate UK data visit the NBN Atlas.

Researched by	Georgina Budd	**Refereed by**	Dr Karin Hollertz
Authority	(Forbes, 1841)		
Other common names	-	**Synonyms**	-

Summary

Description

A reddish-brown coloured heart urchin that is longer (7 cm) than wide. The 'test' (calcareous skeletal plates, joined together to form a complete shell) is covered in mobile spines, which are coarser and sparser in comparison with *Echinocardium* species. Particularly characteristic of *Brissopsis lyrifera* is a narrow band of ciliated dark spines which rings all five ambulacra petals on the upper surface. It is the only heart urchin likely to be found in muddy sediments.

Recorded distribution in Britain and Ireland

Recorded off the west, north and east coasts of the British Isles, but not off the south coast. Common in deep water.

Global distribution

Brissopsis lyrifera may be found in offshore or inshore stable sediments from Norway and Iceland to South Africa and the Mediterranean. Also present on the east coast of North America but not Greenland.

Habitat

Brissopsis lyrifera lives buried in fine mud or muddy sands offshore and in shallower, stable near

shore environments.

Depth range
5-365 m

Identifying features

- A rather flattened, irregular shaped urchin with a bilateral symmetry superimposed on the basic radial plan of five skeletal plates that form the 'test'.
- The 'test' is generally slightly longer than wide and distinctly notched on its anterior margin.
- In profile, the highest point of the 'test' is towards the posterior.
- The ambulacra are deeply recessed and form distinctive petal shaped areas on the upper surface.
- A petalliferous fasicole (conspicuous petal-shaped ring) of ciliated spines encloses the ambulacral petals.
- The anus is outside the apical system on the posterior edge of the 'test' and is surrounded by ciliated spines, termed the 'sub-anal fasicole'.
- The mouth is found towards the front edge of the lower surface and lacks the complex dental apparatus found in some urchin groups.

Additional information
-none-

Listed by

Further information sources

Search on:

Biology review

Taxonomy

Phylum	Echinodermata Starfish, brittlestars, sea urchins & sea cucumbers
Order	Spatangoida
Family	Brissidae
Genus	Brissopsis
Authority	(Forbes, 1841)
Recent Synonyms	-

Biology

Typical abundance	
Male size range	<70mm
Male size at maturity	30-60mm
Female size range	30-60mm
Female size at maturity	
Growth form	Globose
Growth rate	10-15mm/year
Body flexibility	None (less than 10 degrees)
Mobility	
Characteristic feeding method	No information, Sub-surface deposit feeder
Diet/food source	
Typically feeds on	Organic detritus, foraminifers and other small organisms within sediment.
Sociability	
Environmental position	Infaunal
Dependency	No text entered.
Supports	Host *Ulophysema öresundense* (Brattström), an ascothoracidan parasite living in irregular sea urchins.
Is the species harmful?	No

Biology information

Size

Ferrand *et al.* (1988), studied *Brissopsis lyrifera* in the Gulf of Lions, Mediterranean Sea and found the 'test' length to be unrelated to the sex of the animal.

Feeding

Brissopsis lyrifera are capable of both deposit feeding and filter feeding although ventilation rates are not high enough to sustain the animal on filter feeding alone (Hollertz, 2002). *Brissopsis lyrifera* is reported to feed selectively on carbon- and nitrogen-rich particles (Hollertz, 2002). Mucus trapping of fine-organic rich particles and selective collection by the sticky tube feet around the mouth are thought to be the mechanisms underlying this selectivity (Hollertz, 2002).

Characteristically, *Brissopsis lyrifera* is a sub-surface deposit feeder, but Hollertz (1998) observed *Brissopsis lyrifera* to emerge from the sediment and feed close to the surface in response to the addition of organic matter. When buried in the sediment, *Brissopsis lyrifera* maintain contact with the surface through a funnel. The funnel is kept clear of sediment by tube feet that also line the funnel with mucus (Hollertz, 2002).
In the spatangoids, to which *Brissopsis lyrifera* belongs, the tube foot pattern typical of the urchins is drastically altered, owing to its highly developed burrowing habit. In addition, the suckered tube-feet are no longer required and they are functionally replaced (in appropriate positions) by burrow-building, sensory or feeding tube-feet. Feeding is achieved by a combination of ciliary action and the action of these sticky, feeding tube-feet. The feeding tube-feet pass material from the substratum into the mouth where organic matter adhering to it are digested and the particular matter voided via the anus (Nichols, 1969).

Population densities
Brissopsis lyrifera is a gregarious species. Tunberg (1991), found densities of *Brissopsis lyrifera* to be up to 30 individuals per m at various locations along the Swedish coast. However, in the North Sea densities of up to 60 individuals per m have been reported (Ursin, 1960).

Mobility and burrowing
Despite being a conspicuous and large animal, very little is known about the natural burrowing behaviour of *Brissopsis lyrifera*, e.g. how much time it spends on the surface and how fast it moves. It is known to burrow about 20 mm below the surface of the substratum and, due to the fact that it moves with a rocking motion through the sediment, is capable of reworking relatively large volumes of sediment (Hollertz & Duchêne, 2001). In laboratory conditions, Hollertz (1998) calculated the locomotion rate of *Brissopsis lyrifera* to be 11 mm/h, and, using a formula given by Schinner (1993), estimated the turnover rate of sediment by *Brissopsis lyrifera* to be 8.0 cm per hour. Further research by Hollertz & Duchêne, (2001) found that *Brissopsis lyrifera* reworked between 14-22 ml of sediment per hour depending on temperature. Temperature was found to significantly affect burrowing activity that was almost doubled when temperature was raised from 7 to 14 °C. The burrowing activity has a pronounced effect on the surrounding sediment by increases the oxygen concentration in the sediment and thus stimulating the growth of microorganisms and decomposition of organic material (Hollertz & Duchêne, 2001).

Habitat preferences

Physiographic preferences	Open coast, Offshore seabed, Sea loch / Sea lough
Biological zone preferences	Bathybenthic (Bathyal), Circalittoral offshore, Lower circalittoral
Substratum / habitat preferences	Mud, Muddy sand
Tidal strength preferences	Very Weak (negligible), Weak < 1 knot (<0.5 m/sec.)
Wave exposure preferences	Not relevant
Salinity preferences	Full (30-40 psu), Variable (18-40 psu)
Depth range	5-365 m
Other preferences	No text entered
Migration Pattern	Non-migratory / resident

Habitat Information

Brissopsis lyrifera typically co-occurs with the brittle star, *Amphiura chiajei*, on muddy, soft bottom areas of the North Sea, the Skagerrak and the Kattegat (Hollertz *et al.*, 1998).

Life history

Adult characteristics

Reproductive type	Gonochoristic (dioecious)
Reproductive frequency	Semelparous / monotely
Fecundity (number of eggs)	>1,000,000
Generation time	See additional information
Age at maturity	4 years
Season	Summer - Autumn
Life span	See additional information

Larval characteristics

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

Life history information

Reproduction and generation time
Echinoids have separate sexes. Fertilization is external and the majority have a free swimming pelagic larva (Fish & Fish, 1996).
From observations made along the Northumbrian coast, Buchanan (1967), described *Brissopsis lyrifera* as a highly productive, short lived but fast growing species. The population he studied showed clear evidence of successful and consecutive annual recruitment. Specimens became sexually mature when 'test' length was >60 mm, they spawned in the summer towards the end of their 4th year and died shortly afterwards. No individuals were observed to survive to breed for a second time.
Larval settling time
Adults of *Brissopsis lyrifera* are burrowers, so the larval phase is the main dispersive mechanism of the urchin. Echinoderm larvae undergo a complicated and protracted metamorphosis. For instance, the larvae of other echinoderms, *Echinocardium cordatum* and *Echinus esculentus* remain in the plankton for 40 and 46-60 days respectively (Kashenko, 1994; MacBride, 1914). Thus the larvae of *Brissopsis lyrifera* probably remain in the plankton for a sufficient length of time to be swept away from the location of spawning to new areas, or to restock existing areas (Nichols, 1969).

Sensitivity review

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

Physical Pressures

	Intolerance	Recoverability	Sensitivity	Confidence
Substratum Loss	High	High	Moderate	High

Brissopsis lyrifera is an infaunal species burrowing to a depth of up to 10 cm. It is not sufficiently mobile to avoid substratum removal. Thus removal of the substratum would also remove the resident population of *Brissopsis lyrifera* and intolerance has been assessed to be high. However, *Brissopsis lyrifera* is likely to repopulate rapidly, see additional information below.

Smothering	Low	Immediate	Not sensitive	Moderate

Brissopsis lyrifera lives buried in muddy sediments up to 2-5 cm deep. As an urchin adapted for burrowing it is unlikely that it will be intolerant of additional sediment at the benchmark level and intolerance has been assessed to be low. However, it should be remembered that smothering by impermeable or viscous materials are likely to have some effect upon the animal, e.g. by causing deoxygenation.

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

Brissopsis lyrifera is a non-selective deposit feeder and therefore does not rely on suspended food. However, for most benthic deposit feeders, food is suggested to be a limiting factor for body and gonad growth, at least between events of sedimentation of fresh organic matter (Hargrave, 1980; Tenore, 1988). Consequently, an increase in the suspended matter settling out from the water column to the substratum will be utilizable by *Brissopsis lyrifera* as a food resource. Although characteristically a sub-surface deposit feeder, *Brissopsis lyrifera* has been observed to increase its surface feeding (apical tuft becomes visible) activity after addition of organic matter to the sediment surface and utilized the material for growth (Hollertz *et al.*, 1998; Hollertz, 1998). This suggests that an increase in siltation may be beneficial to the population and the species has been assesses as tolerant.

Decrease in suspended sediment	Low	Very high	Very Low	Moderate

Brissopsis lyrifera is a non-selective deposit feeder and therefore does not rely on suspended food. However, for most benthic deposit feeders, food is suggested to be a limiting factor for body and gonad growth, at least between events of sedimentation of fresh organic matter (Hargrave, 1980; Tenore, 1988). A decrease in siltation will increase competition for food resources and consequently impair growth. Intolerance has been assessed to be low. Recovery is likely to be rapid once food availability increases.

Dessication	Not relevant	Not relevant	Not relevant	Moderate

Populations of *Brissopsis lyrifera* are subtidal and are not likely to be affected by desiccation. Where *Brissopsis lyrifera* occurs in coastal marine inlets and sealochs it is protected from desiccation because it inhabits a burrow in sediments to a depth of up to 10 cm. However, *Brissopsis lyrifera* is likely to be intolerant of continuous exposure to air and sunshine for one hour, e.g. as a result of by-catch and surface exposure.

Increase in emergence regime Not relevant Not relevant Not relevant Moderate

An assessment of this factor is not relevant for *Brissopsis lyrifera* as the species lives subtidally.

Decrease in emergence regime Not relevant Not relevant Not relevant Moderate

An assessment of this factor is not relevant for *Brissopsis lyrifera* as the species lives subtidally.

Increase in water flow rate Intermediate High Low Low

Brissopsis lyrifera is characteristic of offshore muddy sedimentary habitats exposed to only weak or very weak currents. The species is likely to be intolerant of the benchmark increase in water flow rate. Increased currents may wash out some of the sediments in which it burrows and decrease siltation of suspended organic matter to the sediment surface. The combination of a reduction in habitat and reduced food supply is likely to affect the viability of the population for a period of a year, so intolerance has been assessed to be intermediate. *Brissopsis lyrifera* is likely to recover rapidly, see additional information below.

Decrease in water flow rate Tolerant Not relevant Not sensitive Low

Brissopsis lyrifera is characteristic of offshore and shallower, stable muddy habitats exposed to only weak or very weak currents. Sediments may become muddier due to increased settlement of silt if current strength declines. However, at the level of the benchmark it is not expected that populations will be affected. Thus *Brissopsis lyrifera* was assessed to be tolerant of a decrease in water flow rate.

Increase in temperature Intermediate High Low Very low

No information specifically concerning the temperature tolerances of *Brissopsis lyrifera* was found. The geographic range of the species suggests that *Brissopsis lyrifera* is tolerant to a range of temperatures and a long term chronic increase of 2°C is unlikely to have adverse effects on populations around Britain and Ireland. *Brissopsis lyrifera* is an infaunal species that burrows up to 10 cm in depth, thus the burrow may offer some initial protection to an acute increase in water temperature. Furthermore, burrowing itself has been found to be significantly affected by temperature. Hollertz & Duchêne, (2001) found that *Brissopsis lyrifera* reworked almost double the amount of sediment per hour at 14 °C compared to activity at 7 °C (see adult general biology). However, *Brissopsis lyrifera* maintains a continuous contact with the overlying water column through the funnel (Hollertz, 2002). Increased water temperature may enhance microbial decomposition within the muddy sediments and promote deoxygenation to which *Brissopsis lyrifera* is intolerant. It is likely that *Brissopsis lyrifera* would be intolerant of an acute short term temperature increase and intolerance is assessed as intermediate. *Brissopsis lyrifera* has a high capacity for recovery, please see additional information below.

Decrease in temperature Intermediate High Low

No information specifically concerning the temperature tolerances of *Brissopsis lyrifera* was found. The geographic range of the species suggests that *Brissopsis lyrifera* is tolerant to a range of temperatures and a long term chronic decrease is unlikely to have adverse effects on populations around Britain and Ireland. *Brissopsis lyrifera* is an infaunal species that burrows up to 10 cm in depth, thus the burrow may offer some protection to acute decreases in temperature. Furthermore, *Brissopsis lyrifera* populations live in deep water so that events such as a very cold winter is unlikely to affect the temperature of these deeper waters. However, burrowing itself has been found to be significantly affected by temperature. Hollertz & Duchêne, (2001) found that *Brissopsis lyrifera* reworked almost half the amount of sediment per hour at 7 °C compared to activity at 14 °C (see adult general biology).

Furthermore, *Brissopsis lyrifera* maintains a continuous contact with the overlying water column through the funnel (Hollertz, 2002). Very low water temperatures have caused mass mortalities of other similar echinoderms, such as *Echinocardium cordatum*. In the severe winter of 1962-63 masses of dead *Echinocardium cordatum* were observed in regions of the North Sea and English Channel (Crisp (ed.), 1964), although it was reported that living specimens were obtained easily enough by digging (Moyse & Nelson-Smith, 1964 in Crisp (ed.), 1964). Intolerance of *Brissopsis lyrifera* to acute decreases in temperature has been assessed to be intermediate. *Brissopsis lyrifera* has a high capacity for recovery, see additional information below.

Increase in turbidity Tolerant* Not relevant Not sensitive* Moderate

Brissopsis lyrifera is likely to have a poor facility for perception of irradiance and consequently is likely to be tolerant of an increase in turbidity. However, an increase in turbidity may be indicative of a potential increase in the supply of organic matter that may settle upon the sediment surface and be utilized as a food resource by *Brissopsis lyrifera* (Hollertz, 1998).

Decrease in turbidity Low Very high Very Low Moderate

Brissopsis lyrifera is likely to have a poor facility for perception of irradiance and consequently is probably tolerant of a decrease in turbidity. A decrease in turbidity may be indicative of a reduced supply of organic matter eventually falling to the sediment surface which the species can utilize as a food resource (see changes in siltation). Reduced growth and fecundity may result.

Increase in wave exposure Low High Low Low

Brissopsis lyrifera is characteristic of offshore and stable muddy nearshore habitats, where wave exposure is negligible. Populations of *Brissopsis lyrifera* occurring offshore at depths greater than 60 m would not be subjected to exposure from wave action, as the effects are attenuated with increasing depth. Populations situated in normally sheltered stable habitats at shallower depths may experience some disturbance to the sediment surface. However, as *Brissopsis lyrifera* burrows in the sediment to a depth of 10 cm, it is unlikely that turnover and displacement would occur to an extent where the population is significantly reduced. Intolerance has been assessed to be low.

Decrease in wave exposure Not relevant Not relevant Not relevant Low

Brissopsis lyrifera is characteristic of offshore and stable muddy nearshore habitats where wave exposure is negligible. Thus an assessment for decreased wave exposure was not considered relevant.

Noise Not relevant Not relevant

No information concerning sound or vibration reception in echinoids was found.

Visual Presence Not relevant Not relevant

Some response to visual disturbance has been detected in echinoderms. However, *Brissopsis lyrifera* lives buried in muddy substrates up to 10 cm deep thus visual disturbance was not considered relevant to this species.

Abrasion & physical disturbance Intermediate High Low High

Brissopsis lyrifera has a fragile test that is likely to be damaged by an abrasive force, such as movement of trawling gear. In areas of the North Sea where heavy demersal fishing for *Nephrops norvegicus* occurs, populations of *Brissopsis lyrifera* may be reduced owing to damage inflicted to the 'test' by the fishing gear. Broken tests may be seen on the seabed (E.I.S. Rees,

M. Costello, pers comm. to Connor *et al.*, 1997). Intolerance has been assessed to be intermediate as some individuals of the species may be destroyed by the abrasive factor. Populations of *Brissopsis lyrifera* are likely to recover from effects of physical disturbance rapidly as the species is fecund and recruits annually with pelagic larva.

Displacement Low Immediate Not sensitive Low

If displaced to the substratum surface *Brissopsis lyrifera* is potentially exposed to an increased risk of predation, but is capable of re-burrowing into the sediment. In the laboratory, animals left on the sediment surface were all observed to have buried themselves within a few hours (Hollertz, 2002). Intolerance is assessed to be low. *Echinocardium cordatum* can re-burrow into the sediment within 20 minutes, and as a similar specialized burrower it is also likely that *Brissopsis lyrifera* will submerge as rapidly, thus recovery has been assessed to be immediate.

Chemical Pressures

	Intolerance	Recoverability	Sensitivity	Confidence
Synthetic compound contamination	High	High	Moderate	Low

Dahllöf *et al.*, (1999) studied the long term effects of tri-n-butyl-tin (TBT) on the function of a marine sediment system. TBT spiked sediment was added to a sediment that already had a TBT background level of approximately 27 ng g^{-1} and contained the following fauna: *Amphiura* spp., *Brissopsis lyrifera* and several species of polychaete. Within two days of treatment with a TBT concentration above 13.7 µmol /m all species except the polychaetes had crept up to the surface and after six weeks these fauna had started to decay. Thus contamination from TBT is likely to result cause death of this species. Detergents used to disperse oil from the Torrey Canyon oil spill caused mass mortalities of a similar species, *Echinocardium cordatum* (Smith, 1968). Sea-urchins, especially the eggs and larvae are used for toxicity testing and environmental monitoring (reviewed by Dinnel *et al.*, 1998). It is likely therefore, that *Brissopsis lyrifera* and its larvae are highly intolerant of organic compounds. *Brissopsis lyrifera* populations would probably recover rapidly assuming deterioration of contaminants, see additional information below.

Heavy metal contamination Not relevant

Information concerning the effects of heavy metals on echinoderms is limited and no information specific to *Brissopsis lyrifera* was found.

Hydrocarbon contamination Intermediate High Low Moderate

No information directly concerning the intolerance of *Brissopsis lyrifera* to hydrocarbons was found. Suchanek (1993), proposed that echinoderms would be especially sensitive to the toxic effects of oil, owing to the exposure of the epidermis. However, as *Brissopsis lyrifera* burrows in muddy sediments to a depth of up to 10 cm, the likely route of exposure to the animal will arise from its feeding method. As a non-selective deposit feeder *Brissopsis lyrifera* is likely to ingest contaminated sediments. Intolerance has been assessed to be intermediate owing to a range of effects reported in other echinoderms (mortalities, feeding and growth inhibition, embryological abnormalities) reviewed by Suchanek (1993). *Brissopsis lyrifera* is likely to recover from this factor, see additional information below.

Radionuclide contamination Not relevant Not relevant

Insufficient information.

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

Brissopsis lyrifera is characteristic of muddy sediments with significant organic matter content

and is a non-selective deposit feeder. For most benthic deposit feeders, food is suggested to be a limiting factor for body and gonad growth, at least between events of sedimentation of fresh organic matter (Hargrave, 1980; Tenore, 1988). An increase in nutrient availability is likely to promote pelagic productivity and increase the amount of organic matter reaching the sea bed. Hollertz (1998) demonstrated that such organic matter is utilizable by *Brissopsis lyrifera* as a food resource for gonad growth. Thus *Brissopsis lyrifera* may benefit from some nutrient enrichment. However, an excess of nutrients (eutrophication) facilitating a high pelagic production, in combination with thermal stratification of the water column in summer is likely to cause mortality of *Brissopsis lyrifera* indirectly, owing to the effects of hypoxia. Refer to 'changes in oxygenation' for a separate assessment of intolerance.

Increase in salinity Not relevant Not relevant Not relevant Low

Echinoderms are stenohaline owing to the lack of an excretory organ and a poor ability to osmo- and ion-regulate (Stickle & Diehl, 1987). The inability of echinoderms to osmoregulate extracellularly causes body fluid volume to increase or decrease when individuals are exposed to higher salinity. No information concerning the specific tolerance of *Brissopsis lyrifera* to changes in salinity was found. However, the preferred habitat of *Brissopsis lyrifera* is found in waters of full salinity where an increase of salinity is not likely to occur.

Decrease in salinity Low High Low

Echinoderms are stenohaline owing to the lack of an excretory organ and a poor ability to osmo- and ion-regulate (Stickle & Diehl, 1987). The inability of echinoderms to osmoregulate extracellularly causes body fluid volume to or decrease when individuals are exposed to lower salinities. However, no information concerning the specific tolerance of *Brissopsis lyrifera* to a decrease in salinity was found. Populations that occur in sheltered nearshore situations, such as sealochs, which periodically receive inputs of freshwater are unlikely to experience the reduced salinities recorded at the surface. Furthermore, the muddy sediment in which *Brissopsis lyrifera* burrows may offer some protection. However, as a species with an apparent preference for fully saline conditions it is likely to be intolerant of a decrease in salinity.

Changes in oxygenation High Moderate Moderate High

Brissopsis lyrifera is reported as a species sensitive to hypoxia (Diaz & Rosenberg, 1995). Demersal trawling in hypoxic areas has shown that large numbers of infaunal species in areas of high abundance and biomass leave their positions in the sediment and lie exposed on the bottom. At a bottom water oxygen concentration of ca. 1 ml/l (15% saturation) in the Kattegat, Baden *et al.*, (1990) caught no fishes, but 200-400 kg per hour of benthic invertebrates that included the echinoderms *Brissopsis lyrifera* and *Echinocardium cordatum*. Similar mass migration of benthic infauna (including *Brissopsis lyrifera*) to the sediment surface was recorded during trawling in the North Sea with low values of oxygen (ca 2 ml/l) recorded (Dyer *et al.*, 1983). Hollertz (2002) reported that *Brissopsis lyrifera* could tolerate ca 4 ml/l (ca 5.6 mg/l) for at least 15 hours in the laboratory and that the animals recovered quickly. However, this is a much higher oxygen concentration than that in the benchmark. Recovery of *Brissopsis lyrifera* has been assessed to be moderate. Recovery of 'mature' equilibrium dominants eliminated by hypoxia appears to be a process requiring more than two years (Diaz & Rosenberg, 1995). In the Gullmarsfjord (where *Brissopsis lyrifera* is reported; Brattström, 1946; Vasseur & Carlsen, 1949), the 1980/1981 hypoxia, ca 0.2 ml/l, eliminated all the macrobenthic fauna below 115 m depth. The recovery sequence was slow and communities were not re-established eighteen months after the collapse (Josefson & Widbom, 1988).

Biological Pressures

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

The occurrence of the ascothoracidan parasite *Ulophysema öresundense* (Brattström) has been observed in the body cavity of *Brissopsis lyrifera* (Brattström, 1946). This parasite may cause sexual castration but no further information concerning the effect of this parasite on the population was found.

Introduction of non-native species		Not relevant		Not relevant

No alien or non-native species are known to compete with *Brissopsis lyrifera*.

Extraction of this species	Not relevant	Not relevant	Not relevant	Low

Brissopsis lyrifera is not a targeted species for harvest, but it may be affected by the extraction of other species, please refer to 'Extraction of other species'.

Extraction of other species	Intermediate	High	Low	Moderate

Mud in deep offshore waters may be characterized by urchin *Brissopsis lyrifera* and brittle star *Amphiura chiajei*, communities. In certain sea areas around the British Isles, e.g. northern Irish Sea, this community may also contain the Norway lobster, *Nephrops norvegicus*. *Nephrops norvegicus* is one of the most important fisheries in Scotland and the community can consequently become the focus for fishing activity (Mackie, Oliver & Rees, 1995). Where heavy demersal fishing occurs populations of *Brissopsis lyrifera* may be reduced owing to damage inflicted to the 'test' by the fishing gear. Broken tests may be seen on the sea bed (E.I.S. Rees, M. Costello pers. Comm. In Connor *et al.*, 1997). The impact of pots/creels on the sea bed and non-target species is considered to be slight. *Brissopsis lyrifera* is likely to recover from fishing impacts as the species is fecund and recruits annually with pelagic larva.

Additional information

Recoverability

Brissopsis lyrifera is likely to have a high capacity for recovery. The species is fecund and has shown clear evidence of successful and consecutive annual recruitment (Buchanan, 1967). The adults are burrowers, so the larval phase is the main dispersive mechanism of the urchin. Echinoderm larvae undergo a complicated and protracted metamorphosis in the plankton. For instance, the larvae of other echinoderms, *%Echinocardium cordatum%* and *%Echinus esculentus%* remain in the plankton for 40 and 46-60 days respectively (Kashenko, 1994; MacBride, 1914). Thus the larvae of *Brissopsis lyrifera* probably remain in the plankton for sufficient time to be swept away from their spawning ground to new areas or to re-populate disturbed areas. Whilst, recolonization is likely to occur rapidly, the new population will not reach reproductive maturity for about four years (Buchanan, 1967).

Importance review

Policy/legislation

- no data -

Status

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

Non-native

Native	-		
Origin	-	**Date Arrived**	-

Importance information

Species heterogeneity

Brissopsis lyrifera burrows down to ca. 2-5 cm in the sediment, where it ingests sediment in bulk and feeds on the associated organic matter. *Brissopsis lyrifera* is therefore an active 'bioturbator'. Bioturbation is particularly important in controlling chemical, physical and biological processes in marine sediments, especially when the influences of physical disturbances such as wave action or strong currents are minimized (Widdicombe & Austen, 1999).

Evidence, (Widdicombe *et al.*, 2000; Widdicombe & Austen, 1999, 1998; Austen, Widdicombe & Villano-Pitacco, 1998; Austen & Widdicombe, 1998) suggests that *Brissopsis lyrifera* plays a role in the enhancement of regional species heterogeneity in an otherwise largely homogenous environment. When burrowing, *Brissopsis lyrifera* disturbs the sediment in a way that may result in lowered sediment stability (De Ridder & Lawrence, 1982). This disturbance combined with its respiratory activity alters the sediment chemistry, probably increasing oxygenation of the sediment at deeper levels. Consequently, the effects of *Brissopsis lyrifera* on the associated meiofauna will arise through both its non-selective feeding habit and its alteration of the physical and chemical environment of the sediment in which the meiofauna live.

Widdicombe & Austen (1998) found that the presence of *Brissopsis lyrifera* had significant effects on the fluxes of two nutrients. Burrowing promoted oxygen penetration in to the sediment and led to a decrease in nitrate reduction, suggesting that bioturbating macrofauna, such as *Brissopsis lyrifera*, can regulate denitrification.

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