MarLIN
Marine Information Network
Information on the species and habitats around the coasts and sea of the British Isles

Common periwinkle (*Littorina littorea*)

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.

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***Littorina littorea* in a rock crevice.**
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	Angus Jackson	**Refereed by**	Dr David Reid
Authority	(Linnaeus, 1758)		
Other common names	-	**Synonyms**	-

Summary

Description

This the largest British periwinkle, with the shell reaching a maximum height of 52 mm. The shell is sharply conical with a pointed apex and surface sculpturing. The spiral ridges which are marked in young animals tend to become obscured in older individuals, giving the shell a smooth appearance. The shell colour ranges from grey-black-brown-red but is generally black or dark grey-brown, often lighter towards the apex, and is usually patterned with spiral darker lines. The columella or central axis of the shell is typically white and the animal is recognizable in its juvenile stages by the transverse black barring of the tentacles which are rather flat and broad.

Recorded distribution in Britain and Ireland

Found on all British coasts, though rare or absent in the Isles of Scilly and Channel Isles.

Global distribution

Distributed from northern Spain to the White Sea (northern Russia).

Habitat

Littorina littorea is widely distributed on rocky coasts, in all except the most exposed areas, from the upper shore into the sublittoral. In sheltered conditions they can also be found in sandy or

muddy habitats such as estuaries and mud-flats. The species is fairly tolerant of brackish water.

Depth range

60m

Identifying features

- Shell solid, with 5 or 6 slightly tumid whorls; sutures shallow.
- Spire prominent, pointed up to maximum height of 52 mm.
- Shell smooth, especially in older specimens, but has prosocline growth lines and numerous, slight spiral ridges.
- Outer lip of aperture tangential to body whorl; inner lip thick, reflected over base of columella; no spout or canal interrupts the apertural edge.
- Generally black or dark grey-brown in colour, often lighter towards apex, with dark spiral lines.
- Columella white.
- Cephalic tentacles rather flat and broad, with many transverse black stripes.

Additional information

Also commonly known as the 'edible periwinkle'. Young animals with spiral ridges may be confused with *Littorina saxatilis*. During the breeding season males are easily distinguished by the presence of a penis on the right hand side of the body.
The taxonomy of the Gastropoda has been recently revised (see Ponder & Lindberg 1997, and Taylor 1996). Ponder & Lindberg (1997) suggest that Mesogastropoda should be included in a monophyletic clade, the Caenogastropoda. See Reid (1996) for a comprehensive review of the systematics and evolution of *Littorina littorea*.

Listed by

Further information sources

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Biology review

Taxonomy

Phylum	Mollusca	Snails, slugs, mussels, cockles, clams & squid
Class	Gastropoda	Snails, slugs & sea butterflies
Order	Littorinimorpha	
Family	Littorinidae	
Genus	Littorina	
Authority	(Linnaeus, 1758)	
Recent Synonyms	-	

Biology

Typical abundance	Moderate density
Male size range	<30mm
Male size at maturity	10-12mm
Female size range	10-12mm
Female size at maturity	
Growth form	Turbinate
Growth rate	0.065-0.097mm/day
Body flexibility	
Mobility	
Characteristic feeding method	Active suspension feeder
Diet/food source	
Typically feeds on	a range of fine green, brown and red algae, including *Ulva lactuca*, *Ulva* spp., *Cladophora* spp. and *Ectocarpus* spp.
Sociability	
Environmental position	Epifaunal
Dependency	Independent.
Supports	Host Trematodes such as *Cryptocotyle lingua*, *Himasthla leptosoma*, *Renicola roscovita* and *Ceracaria lebourae*.
Is the species harmful?	No

Biology information

Size and growth rate measurements apply to shell height. Most work suggests that maturity is reached at between 10-12mm shell height. *Littorina littorea* has various biochemical adaptations that allow the stressful intertidal habitat to be exploited. The species tends to aggregate and form clusters in areas that are more favourable for them, such as rock pools, rather than drier areas. Males are believed to mature earlier than females but females mature at a smaller size. Animals are more active when submerged due to the lower cost of moving on mucus when under water.

Habitat preferences

Physiographic preferences	Open coast, Estuary
Biological zone preferences	Lower eulittoral, Mid eulittoral, Sublittoral fringe, Upper eulittoral
Substratum / habitat preferences	Bedrock, Cobbles, Gravel / shingle, Large to very large boulders, Mud, Muddy gravel, Muddy sand, Pebbles, Saltmarsh, Sandy mud, Small boulders
Tidal strength preferences	Moderately Strong 1 to 3 knots (0.5-1.5 m/sec.), Strong 3 to 6 knots (1.5-3 m/sec.), Very Weak (negligible), Weak < 1 knot (<0.5 m/sec.)
Wave exposure preferences	Extremely sheltered, Moderately exposed, Sheltered, Ultra sheltered, Very sheltered
Salinity preferences	Full (30-40 psu), Reduced (18-30 psu), Variable (18-40 psu)
Depth range	60m
Other preferences	No text entered
Migration Pattern	Seasonal (environment)

Habitat Information

- The species is found most commonly on the lower shore and shallow subtidal but in ideal conditions may be found up to the high tide line. However, the lower limit is poorly defined and will depend on factors such as predation, latitude etc. Therefore, the species may be found in the infra- and circalittoral zones. However, in deeper water the species is only found as isolated individuals in very low densities.
- At least in northern Britain *Littorina littorea* migrates down shore as temperatures fall in autumn (to reduce exposure to sub-zero temperatures) and up shore as temperatures rise in spring; migration depends on local winter temperatures. When exposed to the air, the species usually remains inactive unless conditions are very moist.

Life history

Adult characteristics

Reproductive type	Gonochoristic (dioecious)
Reproductive frequency	Annual episodic
Fecundity (number of eggs)	10,000-100,000
Generation time	2-5 years
Age at maturity	2-3 years.
Season	February - June
Life span	5-10 years

Larval characteristics

Larval/propagule type	-
Larval/juvenile development	Planktotrophic
Duration of larval stage	11-30 days

Larval dispersal potential	Greater than 10 km
Larval settlement period	Insufficient information

Life history information

This species can breed throughout the year but the length and timing of the breeding period are extremely dependent on climatic conditions. Also, estuaries provide a more nutritious environment than the open coast (Fish, 1972). Sexes are separate, and fertilisation is internal. *Littorina littorea* sheds egg capsules directly into the sea. Egg capsules are about 1mm across and each biconvex capsule can contain up to nine eggs but normally there are only two or three eggs per capsule. Egg release is synchronized with spring tides. In estuaries the population matures earlier in the year and maximum spawning occurs in January. Fecundity value is up to 100,000 for a large female (27mm shell height) per year. Eggs are released on several separate occasions. Female fecundity increases with size. Larval settling time or pelagic phase can be up to six weeks. Males prefer to breed with larger, more fecund females. Parasitism by trematodes may cause sterility.

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	Low

The species is epifaunal so loss of the substratum would also result in loss of the population. The species is widespread and often common or abundant. Adults are slow crawlers so active immigration of snails is unlikely. Recolonization may occur through rafting of adults on floating wood or weed. The eggs and larvae form the main mode of dispersal. *Littorina littorea* is an iteroparous breeder with high fecundity that lives for several (at least 4) years. Breeding can occur throughout the year. The planktonic larval stage is long (up to 6 weeks) although larvae do tend to remain in waters close to the shore. Recolonization, recruitment and recovery rates should be high.

Smothering	High	High	Moderate	High

Smothering by 5 cm of sediment is highly likely to cause death. On smothering, if the snails cannot regain the surface then death normally occurs within 24 hours (Chandrasekara & Frid, 1998). If the sediment is well oxygenated and fluid (as with high water, high silt content) snails may be able to move back up through the sediment. *Littorina littorea* is much more intolerant of smothering than *Hydrobia ulvae* (Chandrasekara & Frid, 1998). The species is widespread and often common or abundant. Adults are slow crawlers so active immigration of snails is unlikely. Recolonization may occur through rafting of adults on floating wood or weed. The eggs and larvae form the main mode of dispersal. *Littorina littorea* is an iteroparous breeder with high fecundity that lives for several (at least 4) years. Breeding can occur throughout the year. The planktonic larval stage is long (up to 6 weeks) although larvae do tend to remain in waters close to the shore. Recolonization, recruitment and recovery rates should be high.

Increase in suspended sediment	Intermediate	High	Low	Low

Increases in siltation for a year may have some influence in changing substratum type and removing available habitat such as nooks and crevices. If habitat type is no longer optimal then the snail population may decrease. Adults are slow crawlers so active immigration of snails is unlikely. The eggs and larvae form the main mode of dispersal. *Littorina littorea* is an iteroparous breeder with high fecundity that lives for several (at least 4) years. Breeding can occur throughout the year. The planktonic larval stage is long (up to 6 weeks) although larvae do tend to remain in waters close to the shore. Recruitment and recovery rates should be high.

Decrease in suspended sediment

Dessication	Low	Immediate	Not sensitive	High

The species is typically intertidal and in ideal conditions may be found up to the high tide level. During exposure to the air, feeding and locomotion are halted unless conditions are very damp. The species is tolerant of long periods (several hours) of exposure to the air. For longer periods of exposure to desiccating influences, a dried mucus seal forms around the shell aperture reducing evaporation. *Littorina littorea* has the ability to determine its position on the

shore relative to the preferred zone, can orient itself in this direction and move into more suitable conditions. It demonstrates behavioural adaptations to desiccation, seeking out damp crevices and forming gregarious aggregations to reduce evaporative loss.

Increase in emergence regime Low Immediate Not sensitive High

The species has the ability to determine its position on the shore relative to the preferred zone, can orient itself in this direction, is mobile, and demonstrates behavioural adaptations to avoid the increased risk of desiccation resulting from increased emergence. Conversely decreased emergence will extend the species range further up the shore. Changes in emergence regime may affect the extent and abundance of the macroalgae on which *Littorina littorea* feeds. However, this species can consume a wide variety of algal species and it unlikely to be adversely affected by changes in emergence at the benchmark level.

Decrease in emergence regime

Increase in water flow rate Intermediate High Low Low

The species is found in areas with water flow rates from negligible to strong. Increases in water flow rates above 6 knots may cause snails in less protected locations (e.g. not in crevices etc) to be continually displaced into unsuitable habitat. Decreases in flow rate are not likely to have any effect. Adults are slow crawlers so active immigration of snails is unlikely. The eggs and larvae form the main mode of dispersal. *Littorina littorea* is an iteroparous breeder with high fecundity that lives for several (at least 4) years. Breeding can occur throughout the year. The planktonic larval stage is long (up to 6 weeks) although larvae do tend to remain in waters close to the shore. Recruitment and recovery rates should be high.

Decrease in water flow rate

Increase in temperature Low Immediate Not sensitive Moderate

Littorina littorea is a hardy intertidal species and can tolerate long periods of exposure to the air and consequently wide variations in temperature. Adult snails can easily tolerate sub-zero temperatures and the freezing of over 50 % of their extracellular body fluids. In colder conditions an active migration may occur down the shore to a zone where exposure time to the air (and hence time in freezing temperatures) is less. The snails are able to tolerate these low temperatures by drastically reducing their metabolic rate (down to 20 % of normal). Long term chronic temperature decreases may slow down growth. In restricted laboratory conditions, high temperatures have been observed to cause death. The species survives in upper shore rockpools where temperature may exceed 30 °C. At water temperatures above about 20 °C growth rate is reduced. In the British Isles sea water temperatures do not get this high. The species distribution extends south from the British Isles where temperatures are higher. Normal metabolic rate can be re-established rapidly on return to better conditions.

Decrease in temperature

Increase in turbidity Low Very high Very Low Low

Changes in turbidity will probably have little direct effect on the snails. Some populations live in estuaries where turbidity tends to be high. *Littorina littorea* feeds mainly on algae and increased turbidity may reduce the photosynthetic capability of this algae and decrease food availability. Reduced food availability may reduce growth rates and reproductive capacity. Decreases in turbidity are unlikely to have any effect. Once feeding resumes individuals can return to normal.

Decrease in turbidity

Increase in wave exposure	Intermediate	High	Low	Moderate

On exposed shores individuals may be dislodged or damaged. *Littorina littorea* regularly have to abandon optimal feeding sites in order to avoid wave-induced dislodgement. This will result in a decreased growth rate (Mouritsen *et al*., 1999). Increases in wave exposure will probably cause a decrease in population size. Decreases in wave exposure are unlikely to have any effect. Adults are slow crawlers so active immigration of snails is unlikely. The eggs and larvae form the main mode of dispersal. *Littorina littorea* is an iteroparous breeder with high fecundity that lives for several (at least 4) years. Breeding can occur throughout the year. The planktonic larval stage is long (up to 6 weeks) although larvae do tend to remain in waters close to the shore. Recruitment and recovery rates should be high.

Decrease in wave exposure

Noise	Tolerant	Not relevant	Not sensitive	Low

This species probably has limited facility for noise vibration detection and as such is unlikely to be sensitive to noise.

Visual Presence	Tolerant	Not relevant	Not sensitive	Low

Although the species has eyes, visual perception is probably quite limited and as such the species is unlikely to be sensitive to visual presence.

Abrasion & physical disturbance	Intermediate	High	Low	Low

The species is small and the shell is quite thick, particularly in older individuals. Abrasion may cause damage to the shell. Damaged shells may make the snail more prone to desiccation. The snail is able to repair damage to the lip of the shell. The annual life cycle, high fecundity and long planktonic larval stage means that successful recruitment from other populations is quite likely.

Displacement	Tolerant	Not relevant	Not sensitive	High

The species is mobile, moving around on the shore to feed. Displacement will have no effect.

Chemical Pressures

	Intolerance	Recoverability	Sensitivity	Confidence
Synthetic compound contamination	Low	Very high	Very Low	Moderate

Littorina littorea is tolerant of high TBT levels (Oehlmann *et al*., 1998) and has been found to be well suited for TBT effect monitoring because the species exists in sufficient numbers for sampling even in regions where a relatively high level of contamination exists. It is often present in areas where the very TBT sensitive dogwhelk *Nucella lapillus* has disappeared. Although imposex is rare in *Littorina littorea* strong TBT-toxication may affect a population significantly by reducing reproductive ability (Deutsch & Fioroni, 1996) through the development of intersex. Intersex is defined as a change in the female pallial oviduct towards a male morphological structure (Bauer *et al*., 1995). However, only sexually immature and juvenile individuals of *Littorina littorea* are able to develop intersex. Also, owing to the reproductive strategy of *Littorina littorea*, which reproduces by means of pelagic larvae, populations do not necessarily become extinct as a result of intersex (Casey *et al*, 1998) and so recoverability is good. It may take some time for the toxicant to be eliminated from the system and conditions to return to normal.

Heavy metal contamination	Intermediate	High	Low	High

Most of the information available suggests that adult gastropod molluscs are rather tolerant of heavy-metal toxicity (Bryan, 1984). Winkles may absorb metals from the surrounding water by absorption across the gills or from the diet, and evidence from experimental studies on *Littorina littorea* suggest that the diet is the most important source (Bryan*et al.*, 1983). The species has been suggested as a suitable bioindicator species for some heavy metals in the marine environment. Bryan *et al.* (1983) suggests that the species is a reasonable indicator for Ag, Cd, Pb and perhaps As. It is not found to be a reliable indicator for other metals because of some interactions between metals and regulation of some, such as Cu and Zn (Langston & Zhou Mingjiang, 1986). The lethal dose of mercury (as mercury chloride) is between 1 and 10 ppm of seawater (Staines Web page). This stems mainly from its ability to accumulate trace elements and compounds and consequential behavioural changes. The eggs and larvae form the main mode of dispersal. *Littorina littorea* is an iteroparous breeder with high fecundity that lives for several (at least 4) years. Breeding can occur throughout the year. The planktonic larval stage is long (up to 6 weeks) although larvae do tend to remain in waters close to the shore. Recruitment and recovery rates should be high. Adults are slow crawlers so active immigration of snails is unlikely.

Hydrocarbon contamination High High Moderate Moderate

Experience of and observations from oil spills such as the *Sea Empress* and *Amoco Cadiz* suggest that gastropod molluscs are highly intolerant of hydrocarbon pollution. Recovery though is usually rapid. The species is widespread and often common or abundant. Adults are slow crawlers so active immigration of snails is unlikely. Recolonization may occur through rafting of adults on floating wood or weed. The larvae form the main mode of dispersal. *Littorina littorea* is an iteroparous breeder with high fecundity that lives for several (at least 4) years. Breeding can occur throughout the year. The planktonic larval stage is long (up to 6 weeks) although larvae do tend to remain in waters close to the shore. Recolonization, recruitment and recovery rates should be high.

Radionuclide contamination Not relevant

Insufficient information.

Changes in nutrient levels Tolerant Not relevant Not sensitive Low

The species occurs on all British and Irish coasts, including lower salinity areas such as estuaries where nutrient loading is likely to be higher than elsewhere. Higher nutrient levels may benefit the algal substrata and food used by the snail.

Increase in salinity Tolerant Not relevant Not sensitive Low

This species is found in waters of full, variable and reduced salinities. It is also an intertidal species where precipitation can cause exposure to low salinity water. Changes in salinity are unlikely to have an effect.

Decrease in salinity

Changes in oxygenation Low Very high Very Low Moderate

Littorina littorea can endure long periods of oxygen deprivation. The snails can tolerate anoxia by drastically reducing their metabolic rate (down to 20 percent of normal).(MacDonald & Storey, 1999). However, this reduces feeding rate and thus the viability of a population may be reduced. Normal metabolic rate and feeding can be re-established rapidly on return to better conditions.

Biological Pressures

	Intolerance	Recoverability	Sensitivity	Confidence
Introduction of microbial pathogens/parasites				Not relevant
Insufficient information				
Introduction of non-native species				Not relevant
Insufficient information				
Extraction of this species	Intermediate	High	Low	Moderate
This species is harvested by hand, without regulation, for human consumption. In some areas, notably Ireland, collectors have noted a reduction in the number of large snails available. Adults are slow crawlers so active immigration of snails is unlikely. The larvae form the main mode of dispersal. *Littorina littorea* is an iteroparous breeder with high fecundity that lives for several (at least 4) years. Breeding can occur throughout the year. The planktonic larval stage is long (up to 6 weeks) although larvae do tend to remain in waters close to the shore. Recruitment and recovery rates should be high.				
Extraction of other species	Tolerant	Not relevant	Not sensitive	Low
Adult *Littorina littorea* have no known obligate relationships.				

Additional information

Importance review

Policy/legislation

- no data -

Status

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

Non-native

Native	-		
Origin	-	**Date Arrived**	-

Importance information

- *Littorina littorea* is often the dominant grazing gastropod on the lower shore. The species has some commercial value and is gathered by hand at a number of localities, particularly in Scotland and in Ireland where the industry is valued at around £5 million per year. Demand increases considerably over Christmas from the French market (CRC Web site).
- The species has been suggested as a highly suitable bioindicator species for contamination of the marine environment. This stems mainly from its ability to accumulate trace elements and compounds and consequential behavioural changes.

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