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## *Leptochiton scabridus* (Jeffreys, 1880)

**Synonym:** *Lepidopleurus scabridus* (Jeffreys, 1880);

**GLOSSARY, BELOW**, uses the standardised terminology for chitons proposed by Schwabe (2010). Some Jones & Baxter (1987) terms are indicated in the glossary as a.k.a.

### Shell Description

Extreme maximum length 8mm, but usually smaller; **smallest chiton species in British waters**; unlikely to be found by casual observation. In dorsal view, when extended, width about 50% of length. Sides of shell, without girdle, almost parallel; forming oblong with rounded ends (fig. 1).

**figure 1.** <https://flic.kr/p/255RPLq> Length 4.1 mm. Head on right of frame.

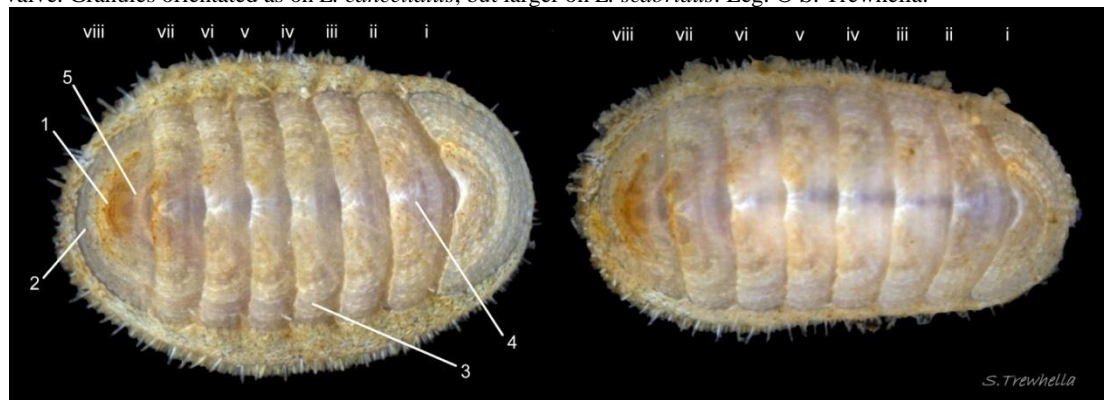
Varying extension of the peripheral girdle affects the animal's outline. In this case it is retracted at the head end, giving an apparent anterior taper to the outline.

The eight thin, fragile, whitish, slightly translucent valves have pinkish tint due to the red body showing through. Some of the valves are stained yellowish or light brown. Leg. S. Trewhella.



**Girdle** width variable on same individual; from 32% of chiton's total width when active and in good condition (fig. 2) to 15% when preserved or inactive/withdrawn, Kaas & Belle (1985) and Jones & Baxter (1987). Variation in girdle affects outline of entire animal; may differ from oblong formed by shell. Eight thin, fragile, whitish, slightly translucent **valves**, often stained yellowish or light brown and sometimes with pinkish tint due to red body showing through (fig. 1).

**figure 2.** <https://flic.kr/p/FurHFx>. Girdle 32% of active chiton's width (left); reduced to 15% when inactive (right). Head valve (i). Tail valve (viii) has central mucro (1). Granules vary from rounded bosses to angular; arranged radially on head valve, postmucronal area (2) of the tail valve and the lateral triangles (3) of intermediate valves. Arranged in longitudinal lines on central areas (4) of intermediate valves and the antimucronal area (5) of the tail valve. Granules orientated as on *L. cancellatus*, but larger on *L. scabridus*. Leg. © S. Trewhella.

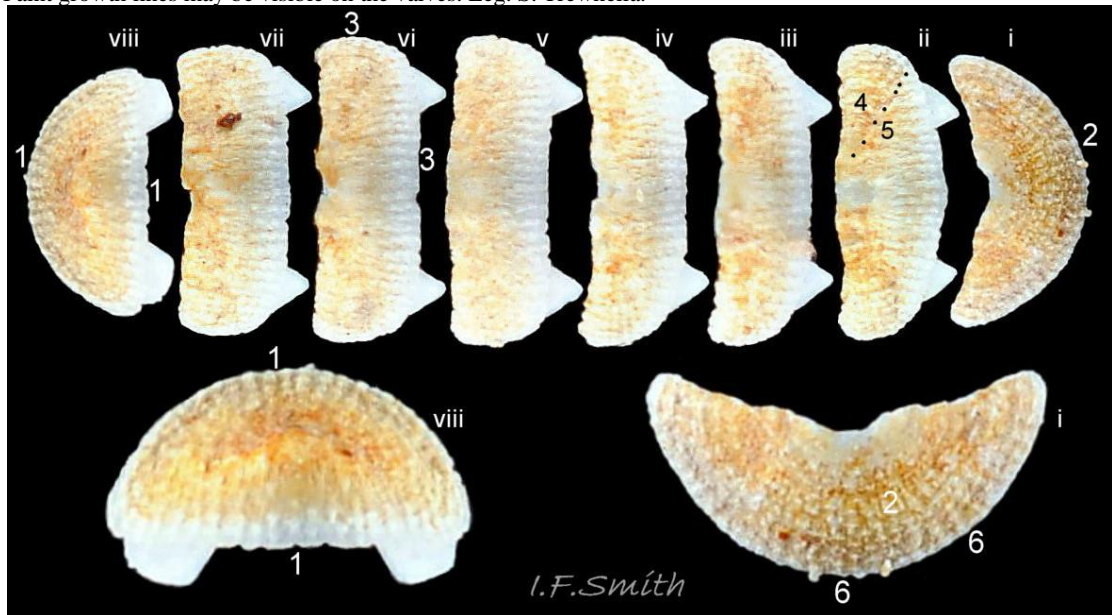


Valves principally made of

- 1) tegmentum: dorsal layer of aragonite permeated and weakened by canals, and
- 2) articulamentum: ventral layer of aragonite.

Head valve semicircular, posterior margin widely V-shaped (fig. 3); approximately crescentic on live animal (fig. 2). Intermediate valves (ii to vii) are all almost equal in length, so virtually no anterior or posterior taper on the complete shell, (omitting girdle). Individual valves ii to vii have straight or almost straight, parallel anterior and posterior edges and lack any sign of a beak (fig. 3).

**figure 3.** <https://flic.kr/p/244RWAY> Disarticulated valves, dorsal view. Length 3.5 mm. Tegmentum (outer shell-layer) has large granules that vary from rounded bosses (1) to rough angular sculpture (2). On intermediate valves (ii to vii), granules are largest near anterior and lateral edges (3). Lateral (4) and pleural (5) areas are differentiated by the slight elevation of the lateral triangle and the difference in orientation of granules. Head valve (i) has largest granules near its curved edge (6). Granules on the tail valve (viii) are largest near its entire periphery (1). Lines of granules may be indistinct if the shell is worn or has adhering secretions or deposits. Faint growth lines may be visible on the valves. Leg. S. Trehwella.

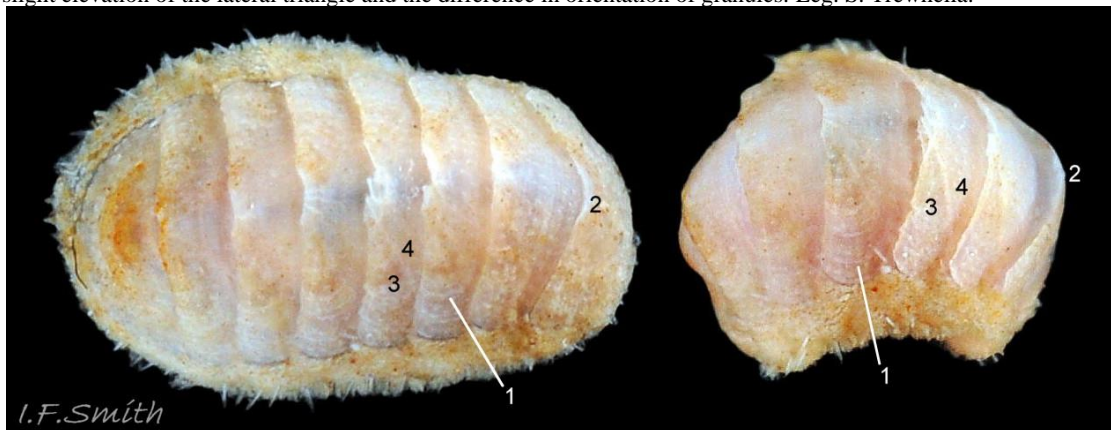


When an intermediate valve is viewed from the posterior, it has a low profile, H/W c. 30%, with a very slight keel (figs. 4 & 5).

**figure 4.** <https://flic.kr/p/FurFJM> Disarticulated valves, ventral view. Length 3.5 mm. Intermediate valves (ii to vii) lack lateral insertion plates/slits and obvious openings to aesthete canals. Each has two widely separated, small, triangular, translucent, white apophyses (1) on its anterior edge. Intermediate valve, viewed from posterior (2), has a low, smooth, gently curved profile with a slight keel. Leg. S. Trehwella.



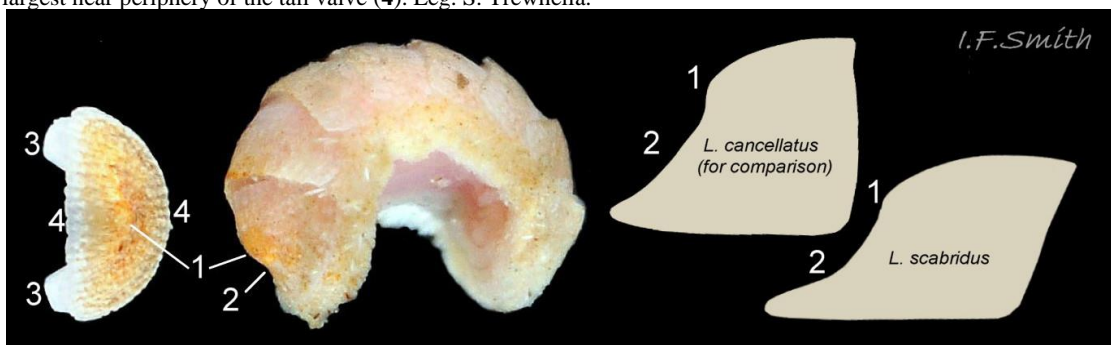
figure 5. <https://flic.kr/p/H1XySJ> Length 4.1 mm. Growth lines faint (1). Intermediate valve, in posterior view (2), has low, smooth, curved profile with a slight keel. Lateral (3) and pleural areas (4) are slightly differentiated by the slight elevation of the lateral triangle and the difference in orientation of granules. Leg. S. Trehwella.



The tail valve viii (fig. 6) is large and semicircular with a swollen, central mucro and a concave postmucronal slope that terminates in a low flare.

**Canals** permeate the tegmentum and terminate on its dorsal surface in large granules. Intermediate valves ii to vii each have two widely separated, small, triangular, translucent, white **apophyses** on their anterior edge that extend under the next valve forwards (fig. 3) & (fig. 4). Tail valve viii has a rounded trapezoidal apophyses (fig. 6). *L. scabridus*, like others in family Leptochitonidae, lacks **insertion plates** that most chitons have at the ends of intermediate valves, at the anterior of the head valve and posterior of the tail valve.

figure 6. <https://flic.kr/p/FurFzP> Length 4.1 mm. Large tail valve has a swollen, central mucro (1) and concave postmucronal slope (2) that ends in a low flare. It has rounded-trapezoidal apophyses (3). Valve granules are largest near periphery of the tail valve (4). Leg. S. Trehwella.



The **dorsal surface** of the tegmentum (figs. 2 & 3) has **large granules** that vary from rounded bosses to rough angular sculpture. They are arranged (fig. 2) radially on the head valve i, postmucronal area of tail valve viii and the lateral triangles of intermediate valve ii to vii. They are arranged in longitudinal lines on the central areas (= jugal and pleural areas) and antimucronal area of tail valve viii. On intermediate valves ii to vii, the granules are largest (fig. 3) near the anterior and lateral edges of each valve. They are largest near the entire periphery of tail valve viii (fig. 6), and largest near the curved edge of head valve i (fig. 3). Lines of granules may be indistinct if the shell is worn or has adhering secretions or deposits. Lateral and pleural areas are slightly differentiated by the slight elevation of the lateral triangle (figs. 3 & 5) and the difference in orientation of granules. Faint growth lines may be visible on the valves (fig. 5).

### **Body Description**

The head and foot rarely, if ever, protrude into view naturally on a live animal (fig. 2), and can only be examined if the animal is removed from substrate or placed on glass. The **head** consists of a mouth surrounded by a large pinkish-white hood with a red-pink longitudinal band at each side (fig. 7); it has no eyes or sensory tentacles.

**figure 7** (left). <https://flic.kr/p/244RWqy> Expanded foot is an elongate ellipse, broadest at the front. When live and in good condition, sole is carmine red. Leg. © S. Trewhella.



**figure 8** (right). <https://flic.kr/p/FurF9P> Ventral surface of the girdle has about five distinct rows running around it of white, imbricated, elongate, obtusely pointed scales. Leg. S. Trewhella.

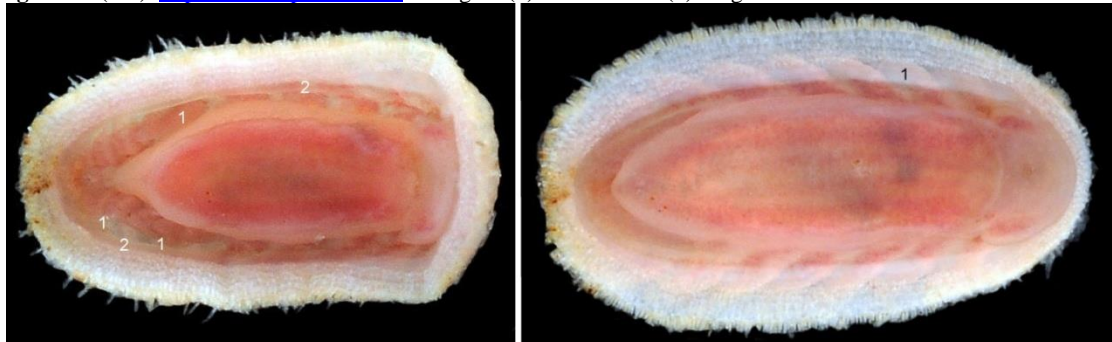
**Aesthetes** (sensory tissue) fill canals that permeate the tegmentum and parts of articulation. They terminate in granules as sense organs on the dorsal surface of valves, but are not visible without high magnification. The dorsal surface of the **girdle** is yellowish-white. Sometimes it is stained brown, but there is no recognisable colour-pattern. It has densely packed, squarish scales with rounded corners (fig. 9). The ventral surface of the girdle has about five distinct rows running around it of white, imbricated, elongate, obtusely pointed scales (fig. 8). The peripheral margin of the girdle has a dense fringe of yellowish spicules, and a row of more widely spaced, longer white spicules (fig. 9).

**figure 9**. <https://flic.kr/p/244RVN1> Dorsal surface of the girdle stained brown, but no recognisable colour-pattern. Densely packed, squarish scales (1) with rounded corners. Dense peripheral fringe of yellowish spicules (2) and row of more widely spaced, longer, white spicules (3). Leg. © S. Trewhella.



An open, narrow **mantle cavity** runs around the whole animal. It contains about six red **gills** on either side close to the posterior (merobranch arrangement) (fig. 10). Between the foot and girdle, the unobtrusive mantle fold helps the foot seal the mantle cavity into a closed tube containing the gills (figs. 10 & 11).

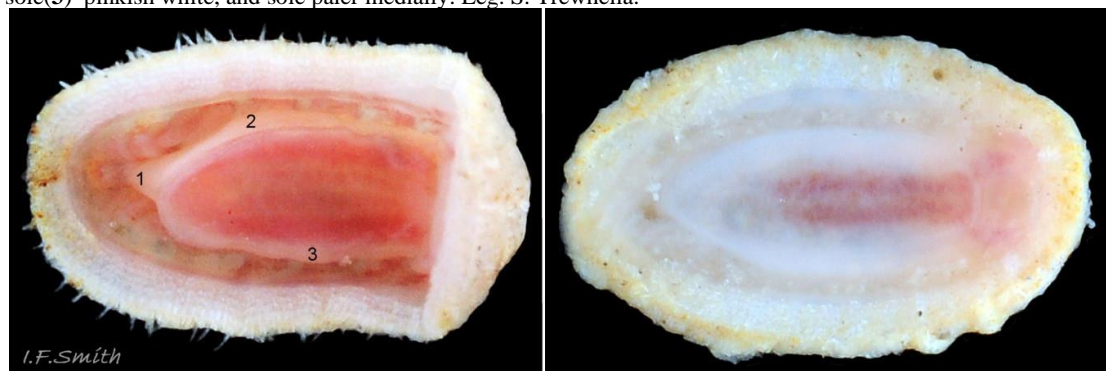
**figure 10** (left). <https://flic.kr/p/H1XxUG> Red gills (1). Mantle fold (2). Leg. S. Trewhella.



**figure 11** (right). <https://flic.kr/p/244RVzW> Sole expanded so red less intense. Mantle fold (1). Leg. S. Trewhella.

The **anus** is on a large whitish papilla (fig. 12) that opens into the mantle cavity at the posterior where the girdle deflects dorsally for expulsion of faeces. The nephridiopores and gonopores open laterally into the posterior quarter of the cavity. Chitons have no **penis** as fertilization is external. The expanded **foot** is an elongate ellipse, broader at the front than at the posterior (fig. 11). When live and in good condition, the sole is a striking carmine red (fig. 7), but paler when fully expanded (fig. 11). The foot fades on death (fig. 13) or when it is in poor condition. The sides of the foot and periphery of the sole are usually pinkish white, and the sole may be paler medially.

**figure 12** (left). <https://flic.kr/p/H1XxQU> Anus on whitish papilla (1). Sides of the foot (2) and periphery of the sole(3) pinkish white, and sole paler medially. Leg. S. Trewhella.



**figure 13** (right). <https://flic.kr/p/H1XxL5> Faded foot on dead specimen. Leg. S. Trewhella.

### **Key identification features**

\* indicates principal distinguishing features.

#### ***Leptochiton scabridus***.

**1\***: Small; often 4 or 5mm, extreme maximum length 8mm. Valves whitish, sometimes tinted pink and/or with yellowish or light brown staining. **No lateral insertion plates** or slit (fig. 4).  
**2\***: Only at LWS and sublittorally. Brittany, Channel Islands, south coast England & west coast Ireland. Probably overlooked because small; watch for it in S.W.Wales & W. Scotland.  
**3**: Girdle yellowish-white sometimes with light brown staining, but no recognisable colour-pattern (fig. 9) .

**4\***: Arch of valves has a low profile, H/W c.31% and a **slight keel**.

**5**: No posterior beak on intermediate valves.

**6**: Valves have large, raised granules (fig. 2) in rows running radially on valves i & viii and on lateral areas of valves ii to vii. Rows longitudinal on central areas of valves ii to vii. (Orientated as on *L. cancellatus*, but coarser.)

**7\***: **Sole** strikingly **bright carmine red** (fig. 7), but fades when dead (fig. 13) or in poor condition and may then resemble sole of *L. cancellatus*.

**8**: About six gills each side, close to anus at posterior (merobranch) (fig. 10).

### **Similar species**

***Leptochiton cancellatus*** (G. B. Sowerby II, 1840).

**1**: Small; maximum length 9mm. Valves whitish or cream, often stained with black manganese and/or rust coloured ferrous deposits. No lateral insertion plates or slits (fig. 15).

**2**: Only at LWS and sublittorally. All round Britain.

**3**: Narrow whitish girdle has no pattern, may be stained with rust coloured ferrous, and/or blackish manganese, deposits. Dorsal girdle scales squarish with rolled tip.

**4\***: Arch of valves is moderately high **smooth curve with no sign of a keel**. Elevation of arch of valves iv & v; H/W c.46% (fig. 14).

**5**: No posterior beak on intermediate valves.

**6\***: Cancellated by closely packed, almost touching, small, uniformly sized, oval granules in chainlike lines (orientated as on *L. scabridus*) (fig. 16).

**7\***: Sole whitish pink centrally, becoming reddish pink towards periphery. (fig. 17).

**8**: Gills close to anus at posterior (merobranch) (fig. 17).

figure 14. <https://flic.kr/p/244RVsG> 1: Keel on high arch of *L. cinerea*. 2: Smoothly rounded, high arch of *L. cancellatus*. H/W 46%. 3: Slight keel on low arch of *L. scabridus*. H/W c.31%.



figure 15. <https://flic.kr/p/H1XxEJ> *L. cancellatus* comparison. 1: No lateral insertion plates or slits. 2: Head valve eroded. Apophyses triangular on intermediate valves (3), but rounded trapezoidal on tail valve viii (4).

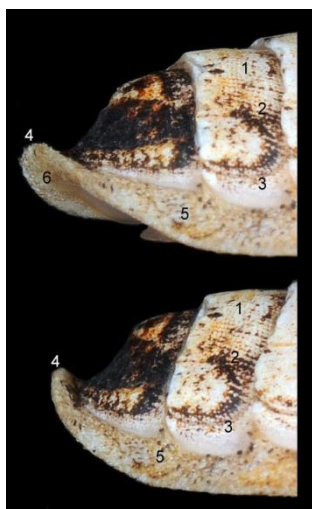
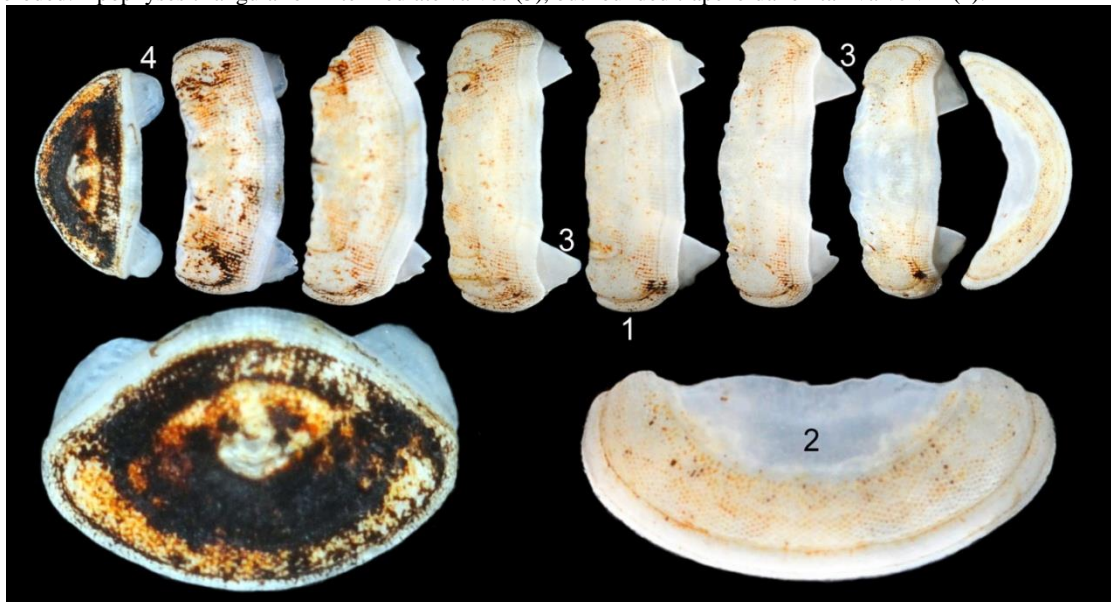
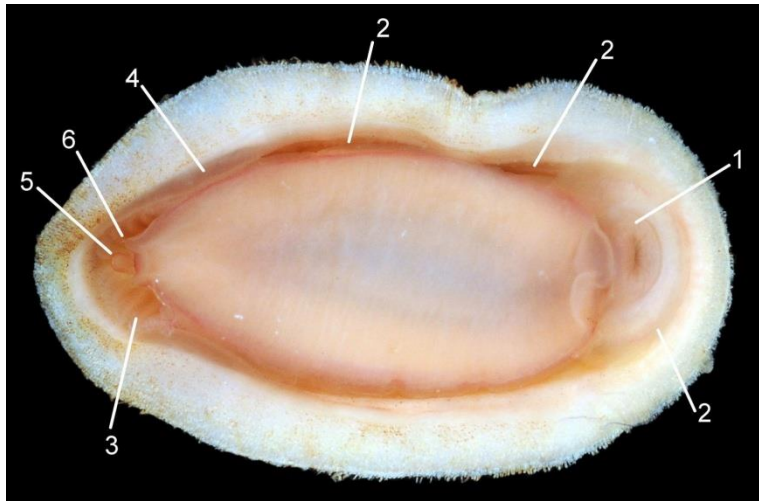


figure 16. <https://flic.kr/p/244RVbj> *L. cancellatus* comparison. Closely packed, oval granules in chainlike lines running: longitudinally in jugal (1) and pleural (2) areas, and radially on lateral area (3) of valve vii. 4: Raised girdle. 5: Stained whitish girdle. 6: Ventral surface of girdle has imbricated, bluntly pointed, flat scales.



**figure 17.**

<https://flic.kr/p/22oDHW>

*L. cancellatus* comparison. Head (1) has large transverse slit-mouth with wrinkled lips, surrounded by white hood. Mantle cavity (2) contains pink gills (3) at posterior (merobranch arrangement). The mantle fold (4) is unobtrusive. Anus(5) on papilla opens into mantle cavity at posterior. The foot has a small projection (6) either side of the anal papilla. The sole is whitish pink centrally, becoming reddish pink towards the periphery

***Lepidochitona cinerea*** (Linnaeus, 1767)

*L. scabridus* might be mistaken for a juvenile, pale *L. cinerea*.

1\*: Maximum length 28mm. Valves diversely coloured, including whitish (fig. 18). **Lateral insertion plates** separated by single slit on each end of valves ii to vii.

2\*: Midshore level and below. All round Britain. Commonest littoral chiton.

3\*: Girdle has a unique (in N.W. Europe) **lozenge pattern** (fig. 19), sometimes indistinct on whitish specimens, juveniles of which might be confused with *Leptochiton scabridus*.

4\*: Arch of valves is **keeled** (fig. 14).

5\*: Distinct posterior beak on intermediate valves.

6: Dorsal surface of valves has densely packed rounded granules, not in straight lines.

7: Sole pinkish white to orange pink, often with grey viscera showing centrally (fig. 20).

8\*: Usually 16 to 19 gills each side for whole length of foot (holobranch) (fig. 20).

**figure 18** (left). <https://flic.kr/p/244RV8y> Comparison *L. cinerea*. Whitish specimens with a very faint trace (1) of diagnostic lozenge pattern on the girdle. Intermediate valves each have a projecting posterior beak (2).

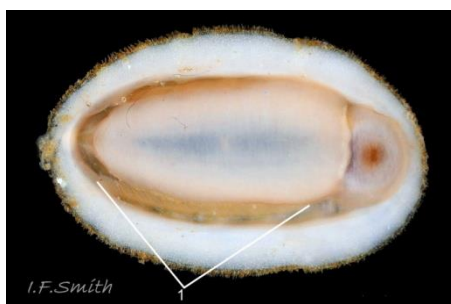


**figure 19** (right). <https://flic.kr/p/23MwvvgF> Comparison. Girdle of *Lepidochiton cinerea* has alternating dark and light transverse lozenge-like bands of approximately equal size.

1: narrow waist of dark band interlocking with bulging waist of pale band (sometimes colours interchanged).

2: central dark spot on pale band, and white spot somewhere on dark band (in this case, near margin).

3: pale grey (or whitish or pale brown) longitudinal line often runs across, or near to, the waists of bands.



**figure 20.** <https://flic.kr/p/244RTF5>

Comparison. *Lepidochiton cinerea* has a pinkish white to orange pink sole, often with grey viscera showing centrally. Usually 16 to 19 gills each side for whole length of foot (holobranch) (1).

*Leptochiton asellus* (Gmelin, 1791)

1\*: Maximum size 18mm X 10mm. Valves whitish, often with distinct black longitudinal lines (fig. 21) or general staining by black or rust coloured mineral deposits (fig. 22). **No lateral insertion plates or slits.**

2: Only at LWS and sublittorally. All round Britain; probably commonest sublittoral chiton.

3: Whitish girdle has no pattern, may be stained with rusty ferrous, and/or blackish manganese, deposits. Dorsal girdle scales elongate, bluntly pointed (fig. 23).

4\*: Arch of valves is quite high with **distinct keel** and straight side slopes (fig. 23). (Elevation of arch valves iv & v; height/width 36%)

5: Often a slight beak on intermediate valves, especially valves ii & iii.

6: Roughly oval granules on valves in slightly disjointed lines, orientated as on *L. scabridus*.

7: Sole whitish pink centrally, becoming reddish pink towards periphery (fig. 22).

8: Eight to thirteen gills in posterior half of pallial groove (merobranch).

**figure 21.** <https://flic.kr/p/255RDKd> Dorsal and ventral views. Comparison image; *Leptochiton asellus* has whitish valves, often with distinct black or dark brown longitudinal streaks. No lateral insertion plates or slits.



**figure 22 (left).** <https://flic.kr/p/H1XuoU> Comparison. *Leptochiton asellus* has whitish valves, often with general staining by rust coloured mineral deposits. Sole whitish pink centrally, becoming reddish pink towards periphery.



**figure 23 (right).** <https://flic.kr/p/FurCkn> Comparison *Leptochiton asellus*. Arch of valves has distinct keel (1) and straight side slopes (2). Elevation of arch valves iv & v; height/width 36%, (Kaas & Belle). Dorsal girdle scales elongate, bluntly pointed (3).



### **Habits and ecology**

*L. scabridus* lives on stones resting on sand or gravel at LWS and sublittorally. On shores, many finds are under large rocks embedded up to 20cm into clean sand or gravel, sometimes in pools. If displaced from the substrate, it can roll up. **Respiration:** cilia on its gills and mantle create an inhalent water-current entering the pallial cavity wherever the girdle is raised at the anterior. The water current passes through the gills and then along the cavity as an exhalent current to exit at the posterior under the raised girdle.

In the absence of eyes or sensory tentacles on its head, it **senses** the environment through aesthetes exposed on the surface of the valves.

It **feeds** by scraping micro algae and associated organisms from the rock surface using its hard radula of chitin mineralized with magnetite. The water current in the pallial cavity carries excreta from the lateral nephridiopores to the posterior where faecal pellets from the anus join the flow; all are expelled at the posterior under the raised girdle. It **travels** by monotaxic retrograde compression waves on the sole of the foot.

**Breeding** is dioecious. The water current in the mantle cavity carries sperm or ova from lateral gonopores to the posterior and out under the deflected girdle. As fertilization is external, synchronised emission of sperm and ova is needed to ensure success; the trigger in many chiton species is moon-phase/ state of tides. Planktonic trochophore larvae hatch and metamorphose into small adult-form young without an intervening veliger stage.

### **Distribution and status**

Canary Islands, Mediterranean, Iberia, Brittany, south coast England and west Ireland. GBIF map <https://www.gbif.org/species/5193784> Reportedly rare in Britain, but probably overlooked because of small size and living under large rocks embedded into sand or gravel.

NBN distribution map:

[https://species.nbnatlas.org/species/NBNSYS0000183422#tab\\_mapView](https://species.nbnatlas.org/species/NBNSYS0000183422#tab_mapView)

### **Acknowledgements**

I am most grateful to Steve Trehwella for images, a specimen and information. Without his help the account would have not been possible.

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**Current taxonomy:** World Register of Marine Species (WoRMS)  
<http://www.marinespecies.org/aphia.php?p=taxdetails&id=140211>

### **Glossary**

aesthete (in chitons) = one of complex of canals filled with sensory tissue that permeate tegmentum and parts of articulamentum. Occur in bundles of a large megal aesthete surrounded by several smaller radiating micraesthetes that open as sensory macropores and micropores on dorsal surface of valves. Some are photoreceptors; other function(s) uncertain, may include chemoreception, mechanoreception, properiostracum replenishment and/or secretion of protective substances.

a.k.a. = also known as.

antemucronal area = area situated to anterior of mucro.

apophysis (pl. apophyses) = natural protruberance within a shell for attachment of muscles. On chitons, anterior extension of articulamentum which underlies preceding valve; on all valves except head valve.

aragonite = orthorhombic crystalline mineral form of calcium carbonate  
<http://www.minerals.net/mineral/aragonite.aspx> . Less common on land than calcite, but, currently, the more frequent mineral-form in oceans and living mollusc shells.

articulamentum = ventral shell-layer of chiton valves, usually hard, white, porcelaneous aragonite and often differently coloured in central part. (Partially overlain ventrally by inconspicuous myostracum layer.)

cancellated = lattice like pattern.

chemoreception = sensing of chemicals; “smell / taste”.

chitin = semitransparent flexible horny protein.

chitinous = (adj.) made of chitin.

dioecious = having separate male and female individuals, not hermaphrodite.

ELWS = extreme low water spring tide (usually near March and September equinoxes).

girdle = peripheral band of thickened, reflexed mantle that encloses ends of valves.

gonopore = opening through which eggs or sperm are released.

haemoglobin = oxygen-carrying substance in blood; scarlet when oxygenated.

holobranch = arrangement of gills in pallial groove that extends full length of foot.

hyponotum = ventral surface of chiton’s girdle.

imbricated = (of scales, plates, etc.) arranged to overlap and alternate like roof tiles.

insertion plate = (on most chitons) extension of articulamentum on lateral margin of intermediate valves, anterior margin of head valve and posterior margin of tail valve. Inserts into, and anchors valve to, the girdle muscle block.

intermediate valve = any valve (ii to vii), except head valve (i) and tail valve (viii).

jugal area = on dorsal surface, triangular middle section of intermediate valves, with apex pointing to posterior; discernible when defined by differences of colour and/or sculpture.

jugal tract = on ventral surface, triangular middle of intermediate valves, with apex pointing to posterior; discernible when defined by densely arranged aesthete pores.

jugum = triangular middle section of intermediate valves. (See jugal area and jugal tract.)

lateral area = on dorsal surface of intermediate valve, triangular area with its base along lateral edge of valve and its apex near the centre of the posterior edge. a.k.a. lateral triangle.

LWS = low water spring tide, two periods of a few days each month when tide falls lowest.  
magnetite = mineral of iron oxide, hardest material made by any living organism.

mantle = sheet of tissue covering visceral mass which secretes shell. On chitons, forms mantle/pallial cavity and is toughened to form the girdle surrounding the shell valves.

megalaesthete = (see aesthete).

merobranch = gills in pallial groove only in posterior two-thirds of animal.

micraesthete = (see aesthete).

monotaxic = (of locomotion waves) single series of waves across complete width of foot.

mucro = projection on tail valve (viii) demarking posterior from rest of valve. Varies in prominence and position.

myoglobin = red oxygen-binding protein in muscle tissue; often in buccal-mass muscles of gastropods. Similar to red haemoglobin in vertebrate blood, but green haemocyanin is usual oxygen-carrier in mollusc blood.

myostracum = microscopically thin discontinuous innermost layer of chiton valve.

nephridium (pl. nephridia) = cilia-lined excretory/osmoregulatory tubule (kidney).

nephridiopore = opening of nephridium for excretion. a.k.a. nephropore, or renal pore.

odontophore = firm, approximately ellipsoid, structure of cartilage supporting radula. Protruded like a tongue to operate radula. Often reddish from myoglobin, and medially grooved.

papilla (pl. papillae) = small nipplelike protuberance.

plankton = animals and plants that drift in pelagic zone (main body of water).

pleural area (on intermediate valve of chiton) = triangular area with its base along anterior edge of valve and its apex near the centre of the posterior edge. a.k.a. median triangle.

postmucronal = situated to posterior of mucro on tail valve.

periostracum (on chitons) = proteinaceous material covering the shell. Different composition from periostracum of most other molluscs.

radula = ribbon of chitin bearing chitinous teeth that is extruded on a tongue-like odontophore of cartilage to rasp food. On chitons and limpets, teeth are usually impregnated with magnetite, a hard magnetic mineral of iron.

<https://en.wikipedia.org/wiki/Radula>

retrograde (of locomotion waves on foot) = waves travel from anterior to posterior.

sublittoral = below level of low water spring tide

trochophore = spherical or pear-shaped larvae that move with aid of girdle of cilia. Stage preceding veliger, passed within gastropod egg in most spp. but free in plankton for limpets, Trochidae and, with no veligers, chitons.

tegmentum = outer shell-layer of chiton valves, usually porous and relatively soft. (Covered by periostracum when live.)

valves = the eight dorsal, articulated shell plates.

veliger = shelled larva of marine gastropod or bivalve mollusc which swims by beating cilia of a velum (bilobed flap). Veliger stage is absent from chitons.