

Littorina plena

The checkered littorine or periwinkle

Phylum: Mollusca
Class: Gastropoda
Order: Littorinomorpha
Family: Littorinidae

Taxonomy: Although originally described as separate species by Gould in 1849, *Littorina scutulata* (see description in this guide) and *Littorina plena* were synonymized in 1864 and only became recognized as two separate species again in 1979 (Murray). Illustrations in this guide utilize the same figures for both, *L. plena* and *L. scutulata*. Readers should refer to supplemental materials on our website to differentiate the two species (e.g., photos of shell shading and penis shape).

Description

Size: *Littorina plena* is smaller than the morphologically similar congener, *L. scutulata*, and has an average height of ~9 mm and rarely exceeds 11 mm (Reid 1996); the illustrated specimen (from Coos Bay) is 9 mm in length (Fig. 1). At settlement, individuals are ~ 350 μm .

Color: Color and patterns can be variable but shell exterior is most commonly checkered, and can include a range of colors including dark brown, purple, green, black and white. Other possible patterns include splotches, zig-zags, fine vertical and/or horizontal etched banding, or various combinations of these. Shells are never with strong spiral shape and the exterior sculpture is often encrusted with algae depending on the local habitat (e.g., protected shore vs. wave-exposed shore). The interior of the shell is nearly always purple (Keep and Longstreth 1935).

General Morphology: Shelled gastropods can crawl and burrow using a muscular **foot** and have a head with **eyes** and **tentacles**, a mantle (which secretes the **shell**) and a **radula** that is composed of many teeth for tearing and rasping algae. Gastropods are characterized by torsion, where the body rotates early in development such that the

visceral mass (e.g. anus, mantle cavity) is directly above the foot (rather than posterior to) (McLean 2007). The Littorinidae are small-shelled snails with a rounded peristome (Plate 378, Reid 2007). Two local species in the family Littorinidae, *Littorina scutulata* and *L. plena*, are morphologically very similar and require examination of penis morphology for differentiation (Fig. B2, supplemental images on our website and **Possible Misidentifications** in this text).

Shell: The checkered shell pattern of *L. plena* is composed of smaller checks than *L. scutulata*. They are usually black/dark brown and white. Individuals exhibit a range of shell patterns and colors including a solid purple/black (Reid 1996). Other reported differences include the presence of a basal ridge and a distinct light-colored basal band in the body whorl of *L. scutulata* which is absent in *L. plena* (Rugh 1997; Hohenlohe and Boulding 2001). Shells should be wet to fully examine colors and patterns.

Shape: The overall shell shape is conical, with four whorls, and lacking a columellar groove (inner lip) or chink. Shell shape is known to vary depending on local conditions and snails on wave-exposed shores have shorter, thinner shells with a larger aperture (allows a larger foot to help prevent dislodgment) whereas snails on protected shores have larger, thicker shells with a smaller aperture, which may reduce predation by crabs (Rugh 1997)

Interior: *Littorina* spp. lack posterior or metapodial tentacles, having only cephalic tentacles (Carlton and Roth 1975) (see dissection, Fig. A3).

Exterior:

Aperture:

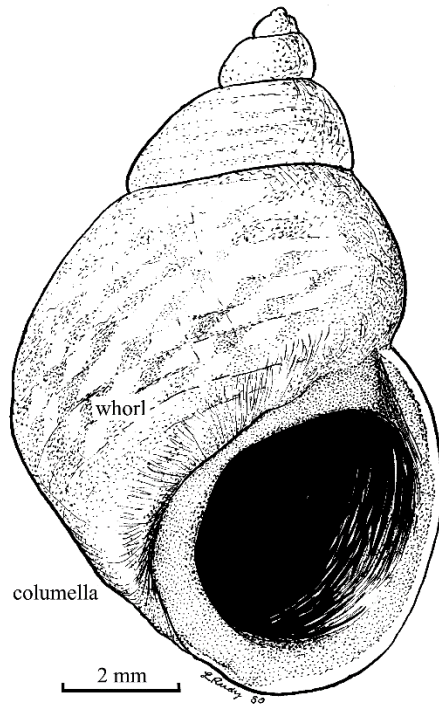
Inner (Columella) and Outer Lip:

Umbilicus:

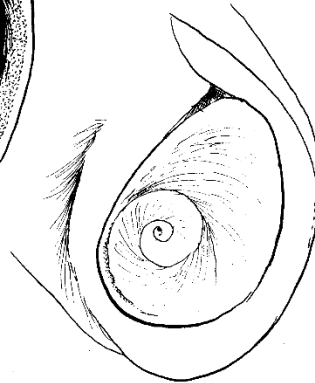
Tentacles: *Littorina plena* tentacles typically have a mostly-unbroken longitudinal stripe

Figure A

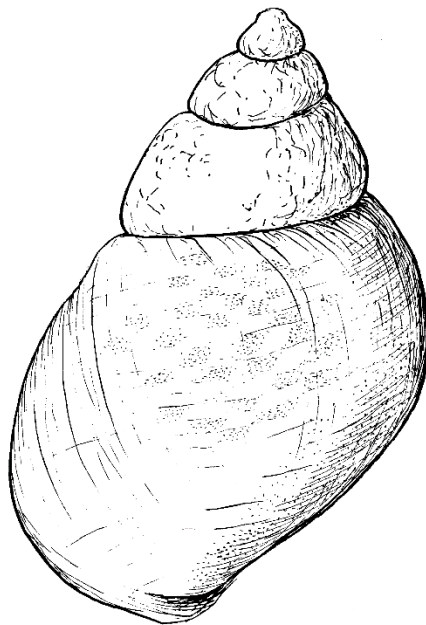
Littorina scutulata and *plena*



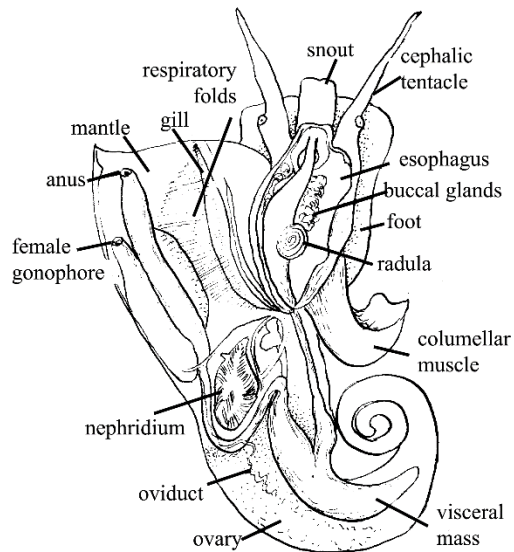
1. *Littorina scutulata* and *plena* (anterior view, H: 9mm) x12: conical, four whorls; no columellar groove; surface checkered, interior purple.



1a. Operculum.



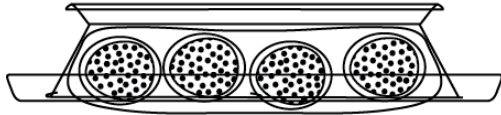
2. (Posterior view) x12.



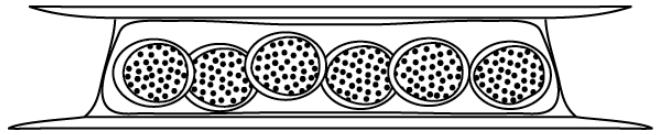
3. Dissection of female *Littorina* sp.: mantle cut, turned over (Hyman, 1967; Souleyet, 1852).

Figure B

Littorina scutulata and *plena*



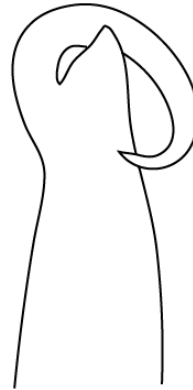
1a. *L. scutulata* egg case.



1b. *L. plena* egg case.



2a. *L. scutulata* penis.



2b. *L. plena* penis.



3a. *L. scutulata* tentacle.



3b. *L. plena* tentacle.

Illustration by Jenna Valley

with or without transverse bands, but they can also be all-dark (Fig. B3).

Eyes:

Siphons:

Foot:

Operculum: Solid, horny, and brown operculum with spiral lines originating in the bottom half (Fig. A1a).

Radula:

Possible Misidentifications

Snails in the genus *Littorina* (family Littorinidae) are very common members of the intertidal, however their similarity in shell morphology renders species difficult to differentiate. Species level identification requires examination of the penis and pallial oviduct (Reid 1996, 2007). A similar but smaller genus of another family is *Lacuna*, the small 'chink' shell, which has a groove, or chink, between the large whorl and the columella. *Littorina* lacks this groove. The Lacunidae are often found in eelgrass, (*Littorina* is not), and are never in the upper intertidal area, as *Littorina* often is (Kozloff 1974a).

There are seven species in the genus *Littorina* locally. Of those species, at least three also have the solid shell and absence of columellar groove found in *L. plena*. *Littorina planaxis* is an inhabitant of the outer shore intertidal although individuals are also found in Puget Sound, Washington and, occasionally in more marine parts of Oregon's estuaries. It is stout and globose, and usually larger than *L. scutulata* (Brusca and Brusca 1978), with a broad, flat, polished columella (Keep and Longstreth 1935). *Littorina planaxis* is essentially a southern form, although it does occur occasionally in Puget Sound (Kozloff 1974a), and its niche is generally taken over northwards at about Cape Arago, Oregon, by *L. sitkana* (Ricketts and Calvin 1971). *Littorina sitkana* is a fat, globose littorine, with rounded columella, and strong spiral ridges on its whorls. It can be white to black, but is often a yellowish brown (Keep and Longstreth 1935). A smaller variety was formerly called *L. rudis*. This

species can be strongly striped, or rough and striated. It is fairly common in salt marshes, and can be up to 15 mm tall (Kozloff 1974a).

Littorina (Algamorda)

newcombiana (= *subrotundata*) is a small, rare salt marsh littorine originally thought to be a freshwater snail. It is light colored, with four rounded whorls, and usually striped. The shell is smooth, thin and covered with a brown periostracum and the aperture is almost circular. It is only about 5 mm long, and has a simple gap, (not a groove) between the whorl and the columella (Keen and Coan 1974). It is found quite high in the intertidal area of the marsh.

Littorina littorea, is an Atlantic species that was introduced into California bays 100 years ago. It is quite thick-shelled, globose and brown to black, with fine dark spiral bands (Abbott 1968). It has not yet been reported in Oregon (Carlton and Roth 1975).

Ecological Information

Range: Type locality is San Francisco, California (Mastro et al. 1982), with known range from Sitka, Alaska to Cabo San Lucas, Baja California.

Local Distribution: Local distribution in outer coast and bays including Coos Bay, South Slough, and the Siuslaw River, near Florence (Matthews 1979).

Habitat: Snails are often found on rocks and pilings on both the rocky outer coast and protected shores. *Littorina plena* is most abundant on sheltered shores and can often be found in salt marshes (Reid 1996), but rarely found in eelgrass (Kozloff 1974a). Individuals are very tolerant of near-terrestrial conditions (Brusca and Brusca 1978).

Salinity: Individuals are found near full sea water (e.g., salinities of 30) on the open coast, as well as in conditions of somewhat reduced salinity (Carlton and Roth 1975). This species does not penetrate upper (and fresher) parts of estuary (Coos Bay). The salinity tolerance ranges from 22–24 (Brusca and Brusca 1978).

Temperature: Occurs over a wide range.

Tidal Level: Individuals are not found more than a few feet above high tide line but are found at higher levels in salt marshes (Kozloff 1974b). *Littorina* spp. are "just above the reach of the waves, along the shores of the entire bay" (San Francisco, California, Packard 1918).

Associates:

Abundance: Individuals are relatively common in rocky areas (Brusca and Brusca 1978). *Littorina plena* and *L. scutulata* are probably the most common littorine in bays, as well, at least in more open coastal habitats.

Life-History Information

Reproduction: Dioecious (separate sexes) with internal fertilization. Most copulation occurs in spring and summer, *en masse*, with a spawning season of April to early October. Sexual maturity occurs when shells are ~2–3 mm in height (by 1 year of age) and they produce negatively-buoyant pelagic egg cases, the morphology of which can be a reliable species indicator (Fig. B1 and supplemental images on our website). At 12–14°C, *L. plena* veligers hatch after 8 days with an initial size of ~135 µm. The planktonic period of the planktotrophic veligers can last 4+ weeks, although competency to settle can be reached by 3 weeks (Hohenlohe 2002). Egg capsules contain pink embryos (although other colors in different regions have been reported (Buckland-Nicks and Chia 1973) and random color variations within a region are sometimes encountered. *Littorina plena* egg capsules are large (~1,100 µm in diameter), with near-equal flat rims (smaller rim is >90% the diameter of the larger rim), and generally have ~6–47 embryos (considerably more than *L. scutulata*, see description in this guide). A third egg capsule is also produced and exhibits a morphology with only one rim. The number of embryos per capsule may vary geographically (Hohenlohe 2002). The penis can be observed by grasping the spire of a submerged snail positioned aperture-up, providing a surface for the snail to grab onto (e.g., probe), and gently pulling away. The penis is orange-pink in color and is attached just behind the base of the right tentacle. The

penis in *L. plena* exhibits a bifurcation that occurs further from the tip resulting in a long and often-coiled projection (see supplemental images on our website). The pallial oviduct in females is also distinctive but requires removal of the shell to be seen.

Larva:

Juvenile:

Longevity: The lifespan of the congener, *L. scutulata*, is estimated to be at least 7 years (Behrens 1974). The longevity of *L. plena* is not known.

Growth Rate:

Food: Herbivorous. Littorines rasp microscopic (e.g., *Endocladia*, unicellular green and blue green algae, diatoms), and macroscopic algae (e.g., *Cladophora*, *Pelvetia*, *Rhodoglossum*) from rocks (Castenholz 1961; Dahl 1964).

Predators: Crabs, fish, birds, and predatory gastropods.

Behavior: Individuals live in a "home territory", i.e., they stay in a small area near a certain pool and "emerge by night, and submerge by day" (Abbott and Haderlie 1980). Snails are generally active when submerged and are often found clustered in groups and/or in crevices during low tide.

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