

## ***Geukensia demissa***

### **Geographic Range**

The ribbed mussel is native to the Atlantic coast of North America, from the southern Gulf of St. Lawrence, Canada to northeastern Florida and along the Gulf of Mexico from Florida to Yucatan. In the mid 1800s the ribbed mussel was introduced to San Francisco Bay, California, apparently by accident, included with live oysters shipped by trans-continental rail for cultivation in the Bay. Since then it has been found in other locations on the Pacific coast, from Alamitos Bay south to Anaheim Bay, Newport Bay, Bolsa Chica Lagoon and Estero de Punta Banda, Baja California Norte, Mexico. The locations may have been sites of unrecorded oyster transplants, or the mussels may have arrived after attaching to hulls or other mobile objects.

Regions: Atlantic ocean – native, pacific – introduced

### **Habitat**

The larvae of ribbed mussels settle on subtidal oyster reefs, in intertidal salt marshes and on man-made structures in these habitats. Sometimes they attach to one another in aggregations or to clumps of hollow grass stems ( *Spartina alterniflora* ) in low marshes. They are most abundant at the lowest shore levels within salt marshes and occur in small numbers in the high marsh zone above the average high water mark.

These mussels can tolerate water temperatures up to 133 degrees F (56°C) and a wide range of salinities, from near fresh water up to 70 ppt (twice the concentration of seawater).

Habitat: saltwater

Aquatic biomes: benthic, reef, coastal, brackish water

Wetlands: marsh

Other habitat features: intertidal or littoral

### **Physical Description**

Ribbed mussel are relatively large mussels. They range from 5 - 10 cm (4 inches) in length. The largest specimen recorded reached 13 cm. The shell is moderately thin and oblong or fan shaped. The upper margin is straight or slightly convex. The dorsal and ventral margins are parallel.

The periostracum (thin, glossy outer shell layer) is glossy, brownish black with some yellow to a bleached white color. It is grooved with pronounced, unbranched, radiating ribs, largest on the upper part of the hind end above a broad umbonal ridge, fine along lower margin. These give the species its common name. The inside of the shell is pearlescent, sometimes white or bluish-gray, tinged with purple/blue or purple/red at hind margin. There are no teeth at the hinge. At the head end of the shell there is no shelf on the inside.

In the summer, the color of the mantle varies between the sexes. In females the mantle tends to be a medium chocolate brown, in males is lighter, a yellowish cream white color.

The broad umbo (hump at the center of the concentric growth lines) is a short distance behind the narrowed, rounded front end. The periostracum is often worn away around the umbo.

There is no external siphon.

Like most bivalves, the species has a muscular "foot", capable of moving the animal slowly through sediment. The foot can also secrete byssal threads -- hair-like adhesive filaments that help the mussel attach to grasses, nearby shells, or other solid objects.

One subspecies of *Geukensia demissa* is recognized. *G. d. granosissima* (Sowerby, 1914) ranges from the east and west coast of Florida to the Gulf of Mexico (Yucatan). It differs in the morphology of the shell (rib number) and ultrastructure.

Other physical features: ectothermic, heterothermic, bilateral symmetry

Sexual dimorphism: colored or patterned differently



ribbed mussel

#### Scientific Classification

Rank	Scientific Name
Kingdom	<a href="#">Animalia</a> animals
Class	<a href="#">Bivalvia</a>
Order	<a href="#">Mytiloida</a>

Rank	Scientific Name
Family	<a href="#">Mytilidae</a>
Genus	<a href="#">Geukensia</a>
Species	<i><b>Geukensia demissa</b></i>

By Michelle Nestlerode

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- **Biogeographic Regions**

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- -

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- **Habitat Regions**

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- **Aquatic Biomes**

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- **Wetlands**

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- **Other Habitat Features**

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- **Other Physical Features**
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- **Sexual Dimorphism**
- sexes colored or patterned differently

#### **Range length**

13 (high) cm

5.12 (high) in

#### **Development**

This species has a planktonic larval stage that allows for dispersal to distant locations. The larvae settle out of the water column and attach to oyster reefs, saltmarsh plants, and other solid objects in shallow or intertidal waters. They then transform into the sedentary shelled form. Subsequent growth rate and time to maturity is strongly determined by environmental conditions, including tidal exposure, temperature, and available food.

Development: metamorphosis

#### **Reproduction**

Ribbed mussels are broadcast spawners. At a particular time of year, individuals release eggs and sperm into the water, and fertilization occurs there.

Sexual maturation in this species is primarily determined by body weight, and this in turn is strongly influenced by the environment of individual mussels. Along the edge of the marsh, mussels usually become sexually mature during their second growing season. The minimum size for gametogenesis is around 12 mm. The average size for the sexually mature ribbed mussel is greater than 20 mm. A few meters from the edge of the marsh, the minimum size increases to about 17 mm. Higher up on shore, it is not uncommon to see mussels greater than 35 mm that do not show any external characteristics of gametogenesis. Mussels that are farther from the marsh edge tend to grow slower as a result of shorter submergence and feeding time, which can delay maturation an additional year compared to the mussels along the edge of the marsh. The ribbed mussel spawns by external fertilization, sperm and eggs are released into the water column.

Gametogenesis begins in early spring and peaks in June and July. Maximum reproduction occurs between June and August, depending on location, and larvae can be found into early fall.

Key reproductive features: iteroparous, seasonal breeding, separate sexes, sexual reproduction, broadcast spawning

There is practically no parental investment in this species -- eggs do not receive substantial provisioning, and there is no interaction with offspring after gametes are released.

### **Lifespan/Longevity**

The age of ribbed mussels can be determined by back counting the annual growth ribs on the shell.

Mortality of plankton larvae is unknown. Mortality rates of juveniles in the year following settlement have been recorded to average about 55 % partially due to winter icing on the marsh.

Even though mussels are less abundant higher on shore, survivorship increases with increasing tidal height. Some reach 15 years or older. Mussels on the marsh edge tend to be around 6 or 7 years old.

### **Behavior**

Once settled, ribbed mussels are normally very sedentary. They can move slowly, but will do so only if forced to by changes in their environment.

These mussels are most active when submerged -- they open their shells and pump water through their body to feed, obtain oxygen, and dispose of wastes. When exposed by low tide, they close their shells for protection, and to retain moisture. However, unlike many aquatic bivalves, they sometimes "air-gape," opening their shell a bit while still exposed to air, perhaps for gas exchange, or to reduce their temperature by evaporation.

Mussels in an inter-connected clump will close their shells when neighboring mussels do, apparently detecting the movement through byssal threads.

Most ribbed mussels live in aggregations, which can reach densities of up to 2,000-3,000 per square meter in New England and 10,000 per square meter in Jamaican Bay in New York.

### **Food Habits**

When covered with water, the mussel opens and cilia on its gills draw water and food in. The ribbed mussel's primary diet consists of microscopic plankton and particles of detritus.

### **Predation**

The primary defense of ribbed mussels is their shell. In their native range, their main predator is the blue crab ([Callinectes sapidus](#)). The mud crab [Panopeus herbstii](#) is also known to feed on them. Higher survivorship in mussels high in the intertidal zone suggest that marine predators are more important than terrestrial ones.

Shore birds, including clapper rails ([Rallus longirostris](#)), [willets](#), and [dunlins](#) have been recorded feeding on them in San Francisco Bay (Cohen, 2005). One study found ribbed mussels to be more than half the prey (by volume) in stomachs of California clapper rails ([Rallus longirostris obsoletus](#)).

Some rails have been found to have ribbed mussels clamped to their toes, and others are found missing toes.

### **Ecosystem Roles**

Mussels are important in changing nutrient dynamics of marsh and estuary. They help cycle energy, phosphorous and nitrogen.

The ribbed mussel has a mutualistic relationship with marsh grass, [Spartina alterniflora](#). Mussels attach to the base of the stem with their byssal threads. As a byproduct of their filter-feeding, they deposit fecal material on the surrounding sediment. This stimulates the grass to grow by increasing the soil nitrogen. Overall they increase marsh net primary production and stability.

[Geukensia demissa](#) is a host for the flatworm, [Paravortex gemellipara](#).

### **Mutualist Species**

- marsh grass, [Spartina alterniflora](#)

### **Commensal/Parasitic Species**

- a flatworm, [Paravortex gemellipara](#).

### **Economic Importance for Humans: Positive**

These mussels help maintain saltmarshes, which are important nurseries for food fish and shellfish. Ribbed mussels can also be very useful bioindicators for pollution assessment studies. The mussel is also an important prey species for desirable shellfish and bird species.

Ribbed mussels are edible, but are generally not considered to taste good. They can accumulate toxins from their environment, especially while exposed at low tide, and so should not be harvested then.

- **Positive Impacts**
- research and education

### **Economic Importance for Humans: Negative**

There should be no low tide collection of mussels. Mussels retain the pollution inside when their shells are closed. This can cause humans to become sick if eaten.

The high abundance and biomass of *Geukensia demissa* in Pacific coast wetlands (where it is not native) is a concern for conservation of these threatened habitats