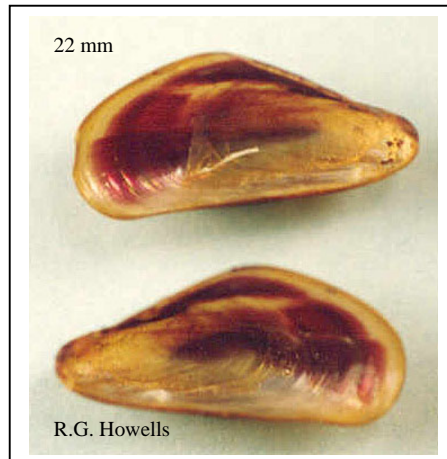
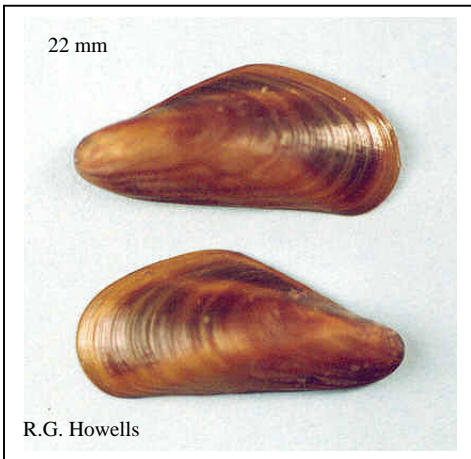


EXOTIC SPECIES ALERT

ASIAN LAKE MUSSEL

Limnoperna fortunei

Golden mussel, Asian mud mussel, Fortune's modiolus



Asian lake mussel (*Limnoperna fortunei*): exterior view (above left); interior view (above center); exterior views ventrally, laterally, and dorsally (left, top to bottom).

OVERVIEW: Asian lake mussel is native to the rivers of eastern China and south-eastern Asia. It invaded Hong Kong in 1965 and later expanded to waters in Taiwan and Japan in the 1990s. It was first found in the Western Hemisphere in the lower Rio de La Plata in Argentina in September 1991. It is presumed to have been an unintentional ballast water introduction there from a transoceanic ship. By late 1994 and 1995, Asian lake mussel had progressed upriver and invaded Uruguay. It has since entered Paraguay and Brazil. Upstream

DESCRIPTION: Asian lake mussel is a true mussel (Family Mytilidae) and more closely related to marine blue mussel (*Mytilus edulis*) than to the zebra mussels (Family Dreissenidae). Most are small, less than 35 mm shell length, though specimens up to about 55 mm have been reported. Shell shape is an oblong oval that is slightly triangular with a ridge or keel running diagonally across the shell, creating a slightly winged or alate appearance dorsally. The beak is small and set back and above the anterior (terminal) tip. The shell epidermis

BIOLOGY: Preferred habitat is reported to be flowing waters in larger rivers, but it can adapt to other environments. Asian lake mussel attaches to a wide array of solid objects. When hard substrates are lacking, tiny juveniles may adhere to small stones and then to each other creating their own solid substrate. In addition to attaching to fixed objects, they may also settle on aquatic plants and slow moving crustaceans and mollusks. Sexes are usually distinct, but hermaphrodites have been reported. Spawning occurs between 16-28° C, with a free-swimming veliger stage that lasts about 15-20 days. Asian lake mussels may mature during the first year of their 2- or 3-year life spans. Densities up to 150,000/m² have been reported.

dispersal utilized attachment to ships and advanced at about 240 km/ year. Like zebra mussel (*Dreissena polymorpha*) and quagga mussel (*D. bugensis*) in North America, Asian lake mussel is a biofouling organism that has had negative impacts on freshwater ecosystems as well as electric generating stations and other water users. Because it has established large populations in South America, the chances it could now invade the U.S. have been dramatically increased.

is a yellowish- or greenish-brown that may appear golden in clear water. Though often called golden mussel in South American literature, this name might be confused with North American yellow mussel (*Brachidontes modiolus*) or Asian clam (*Corbicula fluminea*) that is sometimes sold in the aquarium trade as golden clam or mussel. Internal color is purplish above and transparent silvery white below. Like other mytilid mussels, Asian lake mussel has adhesive byssal threads for attachment.



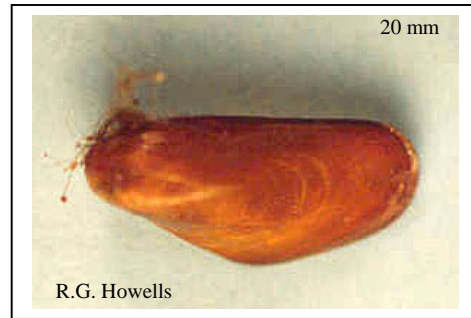
Asian lake mussel cluster on an aquatic plant stem (right).

Asian lake mussels have invaded areas with water temperatures ranging from 15.3-32.6°C, but they tolerate higher and lower temperatures; brackish water to salinity of 3 psu, with reports of tolerance of higher salinity conditions; pH ranges from 6.2-7.4 and soft waters with calcium levels down to 3.96 mg/L. Comparatively, zebra mussels perform poorly at water

temperatures above 28°C, salinity over 1-4 ppt, pH values less than 7.2, or calcium hardness less than 25 mg/L. Asian lake mussels are filter feeders and may be expected to have the same trophic impacts in waters they invade as zebra mussels have in the Great Lakes. They may be able to invade warm, soft, acid waters in the U.S. where zebra mussels have not prospered.



Asian lake mussel – angled view to show diagonal ridge.



Asian lake mussel – with byssal threads.

SIMILAR MUSSEL SPECIES IN FRESH AND BRACKISH WATERS: In fresh and brackish water areas, three species of Dreissenidae are most similar to Asian lake mussel, including introduced zebra and quagga mussels and native dark falsemussel (*Mytilopsis leucophaeata*). Zebra and quagga mussels occur in the Great Lakes with zebra mussel also present in the Mississippi River and many of its major tributaries. Dark falsemussel inhabits brackish waters of the Atlantic and Gulf coasts, but has also been documented in fresh water. Shell size is similar in each species, usually much less

than 35 mm and rarely more than 50 mm. Zebra mussel has a distinctive flat side not present in the other species. Zebra and quagga mussels typically have banding patterns on their shells, but may be completely dark or light. Dark falsemussel is usually uniformly brown, but some may show a faint suggestion of darker bands. Beaks are anterior (terminal) in all three species. All three also have a shelf-like septum located in the beak cavity inside the shell (absent in Asian lake mussel and other marine mytilids) and dark falsemussel also has a step-like apophysis located just dorsal and posterior to the septum.



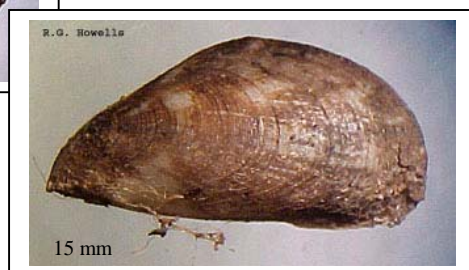
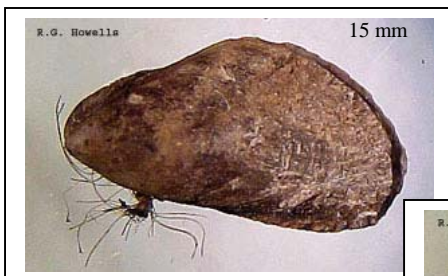
Quagga mussel (*Dreissena bugensis*) – above.



Dark falsemussel (*Mytilopsis leucophaeata*) – below.



Zebra mussel (*Dreissena polymorpha*) – above.



SIMILAR MARINE AND ESTUARINE MYTILID

MUSSELS: A number of other Mytilidae are similar to Asian lake mussel. Among these edible mussels (*Mytilus* and *Perna*) occur in high-salinity estuarine or marine environments and have terminal beaks. Other genera like *Brachiodontes* and

Geukensia have distinct ridges on the exterior of their shells. Tulip and horsemussels, genus *Modiolus*, may be most similar to Asian lake mussel, but occur in marine environments and the shell epidermis is often rough posteriorly (not roughened in Asian lake mussel).



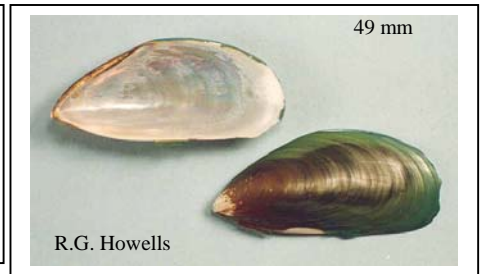
Blue mussel (*Mytilus edulis*)

Marine and moderate to high salinity estuarine; Atlantic coast, introduced on the West Coast and Gulf of Mexico.



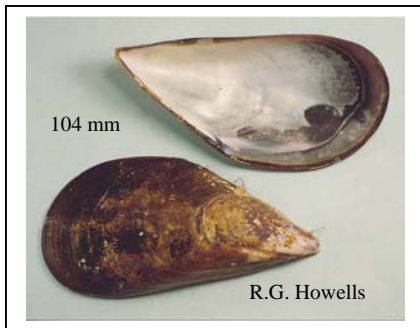
Brown mussel (*Perna perna*)

Marine and high salinity estuarine; native to the south Atlantic; introduced in the Gulf of Mexico, Texas and Mexico



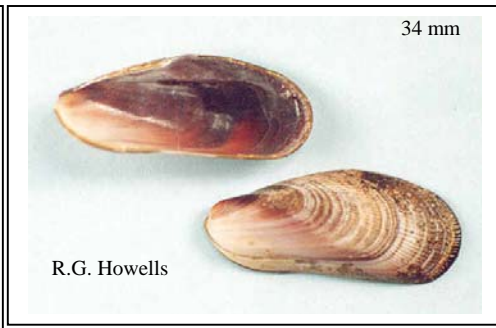
Green mussel (*Perna viridis*)

Marine, high salinity estuarine; introduced in Florida, likely to invade elsewhere.



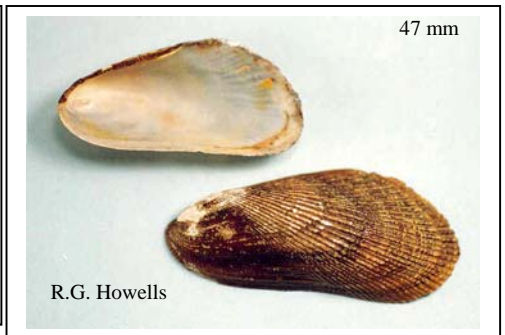
Mediterranean mussel (*Mytilus galloprovincialis*)

Marine and high salinity estuarine; Mediterranean Sea and Eastern Atlantic Ocean, introduced on the Pacific Coast; closely related to blue mussel.



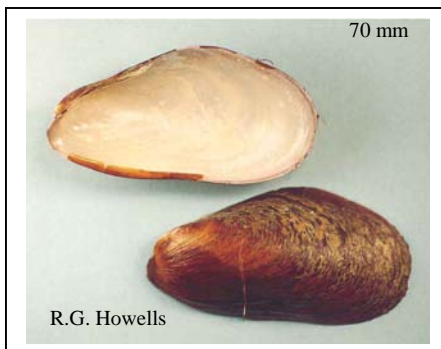
Rodriguez Mussel (*Brachiodontes modiolus*)

Marine and estuarine; South Atlantic (this species) others elsewhere; some American species are euryhaline.



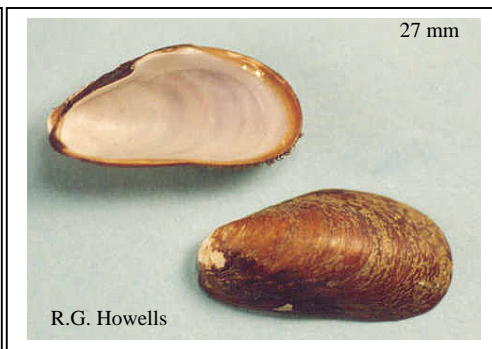
Ribbed mussel (*Geukensia demissa*)

Moderate to high salinity estuarine Atlantic and Gulf of Mexico, introduced in San Francisco Bay.



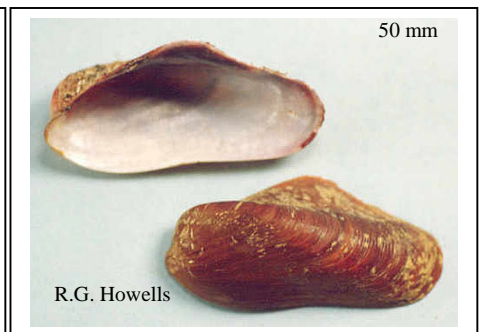
Northern horse mussel (*Modiolus modiolus*)

Marine; Boreal, North Atlantic and North Pacific oceans; tulip or American horse mussel of the southern U.S. is similar.



Fat horse mussel (*Modiolus capax*)

Marine; Pacific Coast from California to Peru; larger, to over 150 mm.



Adriatic horse mussel (*Modiolus adriaticus*)

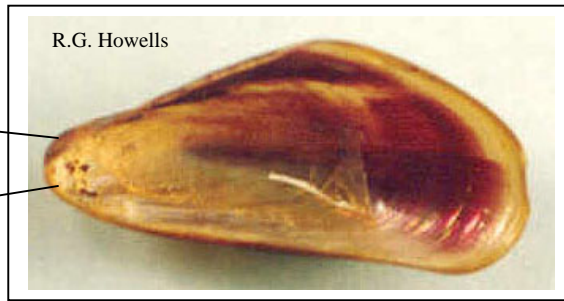
Marine; Mediterranean Sea; has a very highly developed diagonal ridge and wing.

INTERIOR SHELL VIEWS OF MYTILIDAE AND DREISSENIDAE:

Asian lake mussel (*Limnoperna fortunei*)
Family Mytilidae

Beaks not terminal

No septum or apophysis

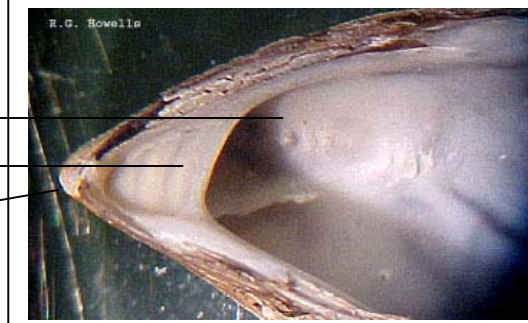


Zebra mussel (*Dreissena polymorpha*)
Family Dreissenidae

No step-like apophysis

Shelf-like septum inside beak

Beak terminal



Dark falsemussel (*Mytilopsis leucophaeata*)
Family Dreissenidae

Beak terminal

Shelf-like septum inside beak

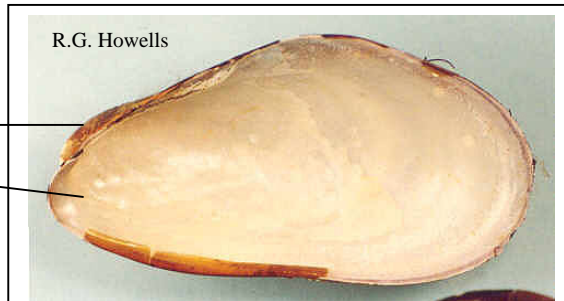
Step-like apophysis



Northern horse mussel (*Modiolus modiolus*)
Family Mytilidae

Beak not terminal

No septum or apophysis



Blue mussel (*Mytilus edulis*)
Family Mytilidae

No septum or apophysis

Beak terminal



REPORT any Asian lake mussels found in U.S. waters to the nearest state fish and game agency, U.S. Fish and Wildlife Service, or U.S. Geological Survey office immediately!