



Cipangopaludina chinensis

Mollusks-Gastropods

Chinese Mystery Snail

Cipangopaludina chinensis is commonly known as the Chinese Mystery Snail. It is a large freshwater snail with populations in estuarine and tidal regions. It is native to China, but the extent of its range is not clear, owing to confused taxonomy with the Japanese Mystery Snail. It has become widespread in ponds, lakes and reservoirs throughout North America, with incursions into some estuarine areas. It is introduced in the estuarine Sacramento-San Joaquin Delta and the tidal Columbia River on the West Coast and the tidal Schuylkill and Potomac Rivers on the East Coast. Introduced specimens are also known from freshwater sites in Hawaii and the Netherlands. This species is generally found in lakes, ponds, or slow-flowing rivers with sandy to muddy substrates, often in densely vegetated areas. This species is abundant in some regions and may have had local impacts on fisheries; however, it has been regarded as a relatively benign invader, with little known about its ecological impacts.

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Invasion History

First Non-native North American Tidal Record: 1925

First Non-native West Coast Tidal Record: 1938

First Non-native East/Gulf Coast Tidal Record: 1925

General Invasion History:

Cipangopaludina chinensis is native to fresh waters of China. The extent of its range in Asia is not clear, owing to confused taxonomy. The taxonomic distinctness of *Heterogen. japonica* (Japanese Mystery Snail) has been debated (Clench and Fuller 1965; Jokinen 1982), but the two species are now recognized as distinct (Smith 2000). *Cipangopaludina chinensis* was first found in North America as a living food item in Chinese markets in San Francisco in 1892. By 1911, they were established in freshwater sites between San Jose and San Francisco, and were collected in the estuarine Sacramento-San Joaquin Delta by 1938 (Cohen and Carlton 1995). This large handsome freshwater snail quickly found its way into the aquarium trade and is frequently kept in aquaria and goldfish ponds. In addition to the pet trade, these snails can be dispersed on boats and trailers, or with the shipment and sale of ornamental aquatic plants. Adults can survive air exposure for up to four weeks, and small juveniles (6-8 mm) can survive for 3-14 days, depending on temperature and humidity (Havel 2011).

Cipangopaludina chinensis has become widespread in scattered locations, mostly ponds, lakes, and reservoirs, but sometimes also colonizing river systems from California to British Columbia and Florida to Maine and Quebec. It has also been found in many locations in the interior of the continent, including the Great Lakes. It is known from tidal fresh waters of several estuaries on the East and West coast, but to our knowledge has not been found in brackish water. Overall, it has been collected in 29 states (Jokinen 1982; USGS Nonindigenous Aquatic Species Program 2010). Populations are probably more numerous than the widely separated records indicate. However, some of the records probably refer to *Heterogen japonica* (Clench and Fuller 1965; Jokinen 1982; Smith 2000). *Cipangopaludina chinensis* was also introduced to fresh waters of Hawaii (Cowie 1998), and most recently, to the Netherlands (Soes et al. 2011).

North American Invasion History:

Invasion History on the West Coast:

Cipangopaludina chinensis was first found in North America as a living food item in Chinese markets in San Francisco in 1892. By 1911, they were established in freshwater sites between San Jose and San Francisco, and were collected in the estuarine Sacramento-San Joaquin Delta by 1938 (Cohen and Carlton 1995). Specific records (undated) are from Suisan City and Stockton (Clench and Fuller 1965).

Cipangopaludina chinensis is abundant through the freshwaters of the Delta (Cohen and Carlton 1995). In 2009, the Chinese Mystery snail was found to be established in Freshwater Lagoon, a coastal lake in Humboldt County (USGS Nonindigenous Aquatic Species Program 2013).

Cipangopaludina chinensis was found in the Columbia River estuary in 2002 (Sytsma et al. 2004). One specific location is from Longview, Washington in the tidal fresh region of the estuary (USGS Nonindigenous Aquatic Species Program 2013). The Chinese Mystery Snail has been

reported found from in ponds, reservoirs and rivers in the Pacific drainage from British Columbia through California (Jokinen 1982; USGS Nonindigenous Aquatic Species Program 2013). However, in 2022, a survey in the middle Sacramento River, found only Japanese Mystery Snails (*Heterogen japonica*). Further genetic sampling will be need to determine the status of the two Mystery Snails in Pacific drainages and estuaries,

Invasion History on the East Coast:

In 1914, *Cipangopaludina chinensis* was found in the Muddy River, in Fenway Park, Boston, Massachusetts, where it may have been accidentally introduced with goldfish (Johnson 1918). It was soon introduced, probably by aquarium releases, and the flooding of riverside fish ponds, to the basins of several major rivers. It has now been reported from many lakes in New England, but not from tidal waters, to our knowledge (USGS Nonindigenous Aquatic Species Program 2013). In the Hudson River Basin, *C. chinensis* was first collected at Niskayuna, Schenectady County, New York 1920. It is now abundant in scattered locations in ponds, but has not been reported from tidal waters of the Hudson (Strayer 1987; Mills et al. 1997). In the Maritime provinces of Canada, *Cipangopaludina chinensis* has been found in inland lakes in Nova Scotia, New Brunswick, and Newfoundland, with a first collection in 1955 in Yarmouth, Nova Scotia, and increasing frequency through the 1990s and 2000s (McAlpine et al. 2016).

The Chinese Mystery Snail was introduced to Fairmount Park, Philadelphia, and was established in the tidal Schuylkill River by 1925 (Richards and Adams 1929). Dundee (1974) lists additional records from the Delaware River in New Jersey and Pennsylvania (PA) (Dundee 1974). *Cipangopaludina chinensis* was collected from ponds in Lancaster and Lebanon, PA in the Susquehanna drainage (Clench and Fuller 1965). In 2000 and 2001, many shells were found in the tidal Susquehanna at Susquehanna State Park near the mouth of Deer Creek (Fofonoff, unpublished data). No living snails were found, but the abundance of shells in shallow waters suggests a substantial population. In the Potomac River, specimens were collected at Jones Point Lighthouse, Alexandria, Virginia (VA) in 1960 (United States National Museum of Natural History Collections) and from '1/4 mile below Woodrow Wilson Bridge' (Academy of Natural Sciences of Philadelphia collection, no date, Dundee 1974). Several dead shells were found at Dyke Marsh, Alexandria VA, 1997-2000 (Fofonoff personal observation). Live snails were found on blocks anchoring settling plates near a power plant in Alexandria in 1999 (Ruiz et al., unpublished data). However, most recently collected large Mystery Snails in the Potomac appear to be *Heterogen japonica* (Japanese Mystery Snail) although a few fit descriptions of *C. chinensis* (Fofonoff, personal observation). A field survey and re-examination of museum specimens is desirable. It is possible that both species are present, but competition, hybridization, or species replacement is possible. Recent studies in the Potomac have found onlu

In the Great Lakes - St. Lawrence River basin, *Cipangopaludina chinensis* was first recorded in the Niagara River in 1931 and became well established by 1942. It (or its congener *B. japonica*) was introduced to Lake Erie by fishermen as food for Channel Catfish (*Ictalurus punctatus*) and became abundant in Sandusky Bay, Ohio (Mills et al. 1993). This snail became established in the St. Lawrence and Ottawa Rivers around Montreal by 1971 (Jokinen 1982; Stanczykowska et al. 1971). In the upper Great Lakes, this snail was collected in Green Bay, Wisconsin on Lake Michigan (Dundee 1974) and at the mouth of the Thunder Bay River, in Alpena, Michigan (USGS Nonindigenous Aquatic Species Program 2010).

Invasion History in Hawaii:

Cipangopaludina chinensis was introduced to the Hawaiian Islands around 1900, probably as a food item by Chinese immigrants (Cowie 1998). It was not found in a survey of coastal fresh and brackish streams in Oahu (Englund et al. 2000). It appears to be confined to fresh inland waters.

Invasion History Elsewhere in the World:

In 2009 and 2010, specimens of *Cipangopaludina chinensis* were found in three freshwater ponds in the Netherlands. These are the first records of this snail known from Europe (Soes et al. 2011).

Description

Cipangopaludina chinensis is a large freshwater snail known as the Chinese Mystery Snail. The shell is dextrally coiled and somewhat globular, with a large aperture and bluntly pointed spire. The umbilicus is small and partly covered by the parietal lip of the aperture. The aperture is large and oval. The operculum is brown with concentric growth lines. The shell is thin, but strong. The adult shell has 6-7 whorls, which are strongly rounded and convex, with clear sutures. The whorls are marked with transverse growth lines and a pattern of shallow dents (malleations), like those made with a ball-peen hammer. (This is the source of the old species/subspecies name 'malleatus', from 'malleus' which is Latin for 'hammer'.) Shells which are smaller than 35 mm have a carina (keel) on the body whorl, but this becomes obscured as the shell grows. The spire forms a 60-70 degree angle. Shells may reach 60-75 mm in length. The color of the shell is light-brown to olive green, while the lip is black. Description from: Clench and Fuller 1965; Stanczykowska et al. 1971; Jokinen 1992; Smith 2000; and Soes et al. 2011.

The common name, 'Mystery Snail', is applied to several snails of the family Viviparidae, which are kept in aquaria. Instead of laying egg masses, the snails brood their young. The release of the small, crawling snails can surprise aquarium-keepers. Some authors have considered *C. chinensis* and *Heterogen japonica* (Japanese Mystery Snail, formerly *C. japonica*) to be conspecific, possibly ecophenotypes, while others have treated them as distinct (Clench and Fuller 1965; Jokinen 1982; Jokinen 1992). Smith (2000) provided a detailed morphological analysis, showing that the two forms show consistent differences, even as embryos in the brood pouch. Differences in the size of the larval shell (protoconch) contribute to differences in the shape of the adult shell, and the 'pointiness' of the spire, which is blunter in *C. chinensis* and sharper in *H. japonica*. However, Ryan (2015) found many snails fitting the morphologies of *C. chinensis* and *H. japonica*, with many intermediates, in the

Potomac River, and referred to the snails in the river as *Bellamya* spp.

There has been disagreement over the correct name for this group of viviparous snails, Smith (2000) applied the genus name *Bellamya* to the Chinese and Japanese 'mystery snails'. In a detailed morphological study of *H. japonica*, Van Bocxmaer and Strong (2016) restricted the genus *Bellamya* to African species, and reinstated the genus *Cipangopaludina* for the Asian snails.

Taxonomy

Taxonomic Tree

Kingdom: Animalia
Phylum: Mollusca
Class: Gastropoda
Subclass: Prosobranchia
Order: Architaenioglossa
Family: Viviparidae
Species: chinensis

Synonyms

Cipangopaludina chinensis (None, None)
Cipangopaludina chinensis malleata (None, None)
Paludina malleata (Reeve, 1863)
Viviparus chinensis malleatus (None, None)
Viviparus malleatus (None, None)
Bellamya chinensis (Smith, 2000)

Potentially Misidentified Species

Hexagen japonica

This Asian freshwater snail (Japanese Mystery Snail) is very similar, but has a more acute spire, less rounded whorls, and lacks the 'malleated' shell surface. The species are frequently confused, and once were regarded by some biologists as conspecific, so their range is uncertain (Smith 2000). Morphological and genetic analysis has confirmed the separate status of the two species (Hirano et al. 2015; Bocxlaer and Stong 2016; Fowler et al. 2022).

Viviparus georgianus

This North American freshwater snail (Banded Mystery Snail), native to the Mississippi Basin and Southeast US, is marked with four chestnut-colored bands (Clench and Fuller 1965; Jokinen 1992).

Ecology

General:

Cipangopaludina chinensis (Chinese Mystery Snail) is a large, viviparous freshwater snail. It has separate sexes, with females tending to be larger than males (up to ~150% larger). Females can produce eggs in their first year, at about 40 mm, but most of the population's egg production takes place in the 4th and 5th years (Stanczykowska et al. 1971). Females produce up to 102 embryos per brood (Crabbe 1929, cited by Jokinen 1982). Eggs are brooded in a uterus, and are hatched and released during the warmer months, at about 4 mm shell length (Jokinen 1982). A population in the St. Lawrence River, near Montreal, was estimated to have a maximum longevity of about 5 years (Stanczykowska et al. 1971).

Cipangopaludina chinensis has not been reported from brackish habitats, to our knowledge. It is generally found in lakes, ponds, or slow-flowing rivers with sandy to muddy substrates, often in densely vegetated areas (Clench and Fuller 1965; Jokinen 1982; Jokinen 1992). It prefers waters with high levels of calcium ion, usually above 10 ppm, and a pH above 7 (Jokinen 1982; Jokinen 1992). It feeds on bottom detritus and benthic microalgae. Some viviparids have the ability to filter-feed using their gills, but in *C. chinensis*, planktonic algae does not make up a significant part of the diet (Jokinen 1982; Solomon et al. 2010). These snails are prone to great population booms and busts. Predators include crayfishes (Olden et al. 2009), catfishes (Mills et al. 1993), and, probably, air-breathing predators such as gulls, raccoons, otters, etc.

Food:

attached algae

Consumers:

Catfish, shorebirds

Trophic Status:

Herbivore

Herb

Habitats

General Habitat	Fresh (nontidal) Marsh	None
General Habitat	Grass Bed	None
General Habitat	Coarse Woody Debris	None
General Habitat	Nontidal Freshwater	None
General Habitat	Tidal Fresh Marsh	None
General Habitat	Marinas & Docks	None
General Habitat	Canals	None
Salinity Range	Limnetic	0-0.5 PSU
Salinity Range	Oligohaline	0.5-5 PSU
Tidal Range	Subtidal	None
Vertical Habitat	Epibenthic	None

Life History

Tolerances and Life History Parameters

Minimum Salinity (‰)	0.2	This is a freshwater species (Netherlands, Collas et al. 2017).
Minimum pH	6.5	New York state, range for 32 populations (Jokinen 1992)
Maximum pH	7.8	New York state, range for 32 populations (Jokinen 1992)
Minimum Length (mm)	30	Minimum size of a female with eggs, 28 mm for a mature male (Stanczykowska et al. 1971, St. Lawrence River, Quebec)
Maximum Length (mm)	75	Maximum size of a female, 48 mm for a male, Stanczykowska et al. 1971, St. Lawrence River, Quebec)
Broad Temperature Range	None	Cold temperate-tropical
Broad Salinity Range	None	Nontidal Limnetic-Tidal Limnetic

General Impacts

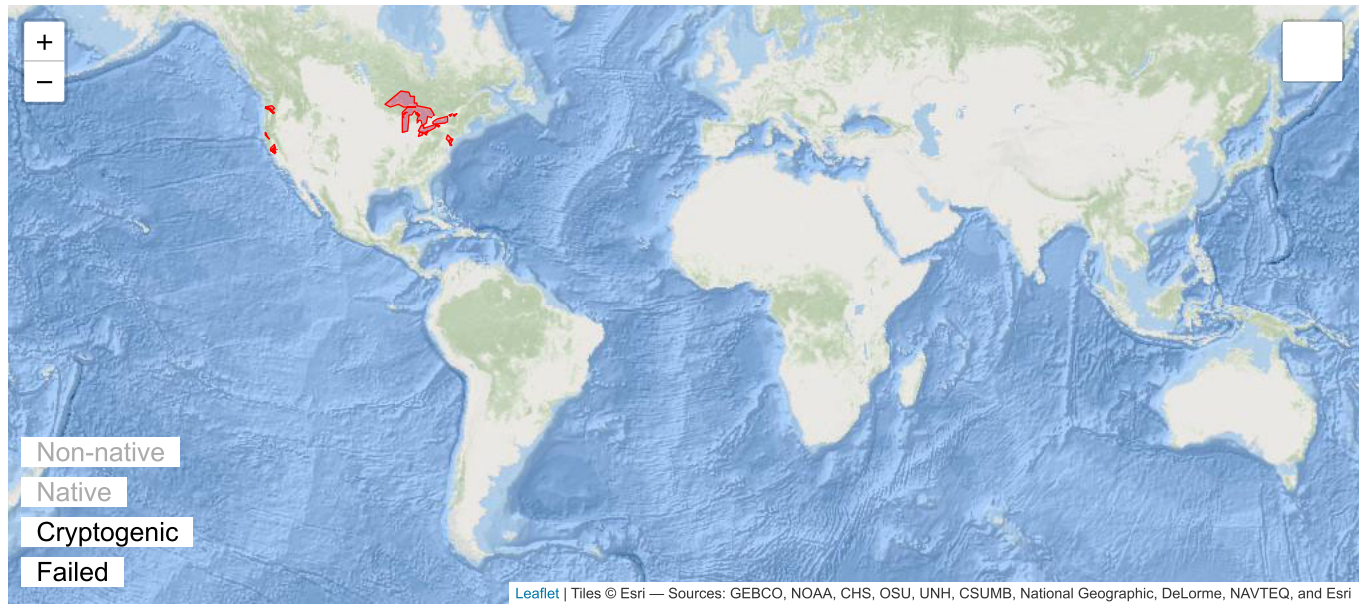
Cipangopaludina chinensis (Chinese Mystery Snail) is an attractive and popular aquarium and fishpond snail as well as a food item once sold in Chinese markets in the United States (Jokinen 1982). This species is abundant in some regions and may have had local impacts on fisheries, either as food for fishes or by interfering with fishing (Mills et al. 1993). However, it has been regarded as a relatively benign invader, with little known about its ecological impacts.

Competition: In recent mesocosm experiments, conducted in Wisconsin, *C. chinensis* negatively affected the abundance of the native snails *Lymnaea stagnalis* and *Physa gyrinus*, decreasing their abundance by 32% and 22% respectively (Johnson et al. 2009). In the combined presence of the Rusty Crayfish and *C. chinensis*, abundance of *L. stagnalis* declined by 90%, while *C. chinensis* was less affected by the presence of the

crayfish, with a decreased abundance of small individuals, but no reduction in biomass (Johnson et al. 2009). With a larger size and thicker shell, *C. chinensis* is less vulnerable to crayfish predation than the native snails (Johnson et al. 2009). A field survey of Wisconsin lakes indicated that the effects of *C. chinensis* on native snail occurrence and diversity were smaller than the mesocosm study indicated. However, several species of native snails tended to be rare or absent when *C. chinensis* was abundant (Solomon et al. 2010).

Herbivory: In mesocom experiments, the addition of *C. chinensis* to an assemblage of three native snails resulted in decreased biomass of sediment and wall periphyton (Johnson et al. 2009).

Regional Distribution Map



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Search:

Bioregion	Region Name	Year	Invasion Status	Population Status
GL-I	Lakes Huron, Superior and Michigan	1974	Def	Estab
GL-II	Lake Erie	1945	Def	Estab
GL-III	Lake Ontario	1931	Def	Estab
L043	_CDA_L043 (Door-Kewaunee)	1974	Def	Estab
L066	_CDA_L066 (Thunder Bay)	2006	Def	Estab
L071	_CDA_L071 (Saginaw River)	2008	Def	Estab
L084	_CDA_L084 (Lake St. Clair)	2013	Def	Unk
L096	_CDA_L096 (Sandusky)	1968	Def	Estab
L099	_CDA_L099 (Cuyahoga)	1965	Def	Estab
L106	_CDA_L106 (Niagara)	1931	Def	Estab

Showing 1 to 10 of 18 entries

[Previous](#) [2](#) [Next](#)

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