

Santo Domingo Falseness (*Mytilopsis sallei*)

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, March 2012

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1 Native Range and Status in the United States

Native Range

From CABI (2018):

“It is native to the Caribbean islands and the Bay of Mexico (Marelli and Gray, 1983; Nuttall, 1990a).”

Status in the United States

This species has not been reported as introduced or established in the U.S. No documentation of U.S. trade in this species was found.

Means of Introductions in the United States

This species has not been reported as introduced or established in the U.S.

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2018):

“Kingdom Animalia
Subkingdom Bilateria
Infrakingdom Protostomia
Superphylum Lophozoa
Phylum Mollusca
Class Bivalvia Linnaeus, 1758
Subclass Heterodonta
Order Veneroida
Superfamily Dreissenoidea
Family Dreissenidae
Genus *Mytilopsis*
Species *Mytilopsis sallei* (Recluz, 1849) – Santo Domingo falsemussel”

“Taxonomic Status:

Current Standing: valid”

Size, Weight, and Age Range

From GISD (2018):

“*Mytilopsis sallei* is a small, fingernail sized mussel, growing to an average size of 25mm, although sizes range from lengths of 8-25mm, with a maximum width of 9.68mm and a maximum height of 12.58mm.”

From CABI (2018):

“Individuals can reach shell lengths of between 30 and 35 mm (Escarbassiere and Almeida, 1976; Morton, 1981), but in many populations with high densities of individuals, mean shell lengths can be less than 15 mm.”

“In Hong Kong, Morton (1989) observed that *M. sallei* completed its life cycle in a maximum of 22 months, with an average of less than 18 months.”

Environment

From GISD (2018):

“*Mytilopsis sallei* has wide temperature, salinity and oxygen tolerances. [...] In its native habitat, *M. sallei* is a colonial surface dweller of sheltered waters, for example, shallow coastal lagoons. In its introduced habitat, it is found in intertidal and shallow waters, at a range of temperatures (10-35°C) and salinities (0-27 ppt), and preferring disturbed habitats and often settling on man-made structures. It has not been found any deeper than a few metres. It prefers to settle on vertical surfaces and objects, but is found on all types of substrata.”

Climate/Range

From Palomares and Pauly (2018):

“Tropical; 28°N - 10°N, 87°E - 61°E [Rosenberg 2009]”

Distribution Outside the United States

Native

From CABI (2018):

“It is native to the Caribbean islands and the Bay of Mexico (Marelli and Gray, 1983; Nuttall, 1990a).”

Introduced

CABI (2018) lists the following as countries where *M. sallei* has been introduced: China, India, Japan, Malaysia, Philippines, Singapore, Taiwan, Thailand, Egypt, Gabon, Senegal, Mexico (Laguna Bacalar, Quintana Roo), Australia, and Fiji. The species was eradicated from Australia but current population status is not detailed for other locations.

From Tan and Morton (2006):

“The results suggest that *M. sallei* is thriving over a fairly wide salinity range in the tropical monsoon drains of Singapore, making it an excellent candidate for permanent residence, particularly as it is now widely distributed both in Singapore and in Johor Bahru [Malaysia]. A recent checklist of subtidal Singapore bivalves (Sachidhanandam & Chou, 1996, p. 527) listed *M. sallei* as “the most commonly occurring bivalve in Singapore”.”

From NIES (2018):

“Range in Japan [...] Tokyo (lower to river mouth of Sumida River), Chiba Pref. (Lake Niihama, Ichikawa), Fukuoka Pref. (Dokai Bay), Osaka Pref. (river mouth [*sic*] and ports) Shizuoka Pref. (Shimizu Port), Aichi Pref. (Nagoya Port), Wakayama Pref. (Wakayama Port), and Toyama Pref. (Toyama Bay).”

“The first record [in Japan] was in 1974 at Shimizu Port, Shizuoka Pref. After, this species was found in Tokyo and Fukuoka (1980s), Osaka (1990s), Aichi and Wakayama (2000s).”

Means of Introduction Outside the United States

From Tan and Morton (2006):

“While we are unable to ascertain the time and likely route of invasion, the earlier reported upon first occurrences of *M. sallei* in India (introduced in ~1967; Ganapati, Lakshmana Rao & Varghese, 1971; Morton, 1981), Hong Kong (introduced in ~1980; Morton, 1981, 1987, 1989; Huang & Morton, 1983), Taiwan (introduced in ~1977; Chang, 1985) and Japan (introduced in ~1974; Habe, 1980; Ishibashi & Kosaka, 1980; Furuse & Hasegawa, 1984; Morton, 1989; Otani, 2002; Kimura & Horii, 2004) suggest that *M. sallei* was probably introduced into Singapore during the last twenty to thirty years, possibly via larvae in ballast water (Chu et al., 1997) and/or via adults attached to ships’ hulls (Carlton, 1987), as may have been the case for the abovementioned localities.”

From NIES (2018):

“[in Japan] Accidental: Hitchhiking on imported lumber or ballast water.”

From GISD (2018):

“Hull fouling is often an important factor in incursions, such as the introduction of *M. sallei* to Darwin Harbour, Australia in the 1990s (Hutchings et al. 2002). Spread [*sic*] via ballast water appears less likely because of the short duration of the larval stage (CSIRO, 2001).”

From He et al. (2017):

“The Caribbean false mussel *Mytilopsis sallei* (Récluz, 1849) is an invasive dreissenid species that was introduced into the Pacific via the Panama Canal (Morton 1981).”

Short Description

From CABI (2018):

“The larval valves are equivalve and inequilateral, and the hinge lacks a provinculum.”

“The shell and anatomy of adult *M. sallei* have been described in detail (Escarbassiere and Almeida, 1976; Morton, 1981). The heteromyarian, mytiliform valves, which are widest at the posterior and narrowest at the anterior, are slightly unequal in size, with the left valve slightly smaller than the right. The terminal umbones are usually directed ventrally. A byssal notch is well defined anteriorly on the ventral edge of the valves. Externally, the valves are often covered by a thin, radially lamellate pale brown periostracum that is prominent towards the posterior region of the shell, but usually worn in the midregion and anteriormost end of the bivalve to expose the shell surface below. Under the periostracum, some individuals may have pigmented, light to dark grey concentric markings that have given rise to the name ‘black striped mussel’, but the shell is mostly dirty white. Internally, the shell is also white or bluish white, and no nacre is present. The internal ligament is located anteriorly, and at the anterior end of each valve, a septum (hinge plate) and an apophysis (hinge lobe) can be seen. The septum receives the anterior

adductor muscles, while the apophysis anchors the anterior byssal retractor muscles. The muscle scars outlining these muscle insertions are much smaller than those of the posterior adductor and posterior byssal retractor muscles, which are located dorsally along the pallial line.”

“The animal within is light orange to pale yellow, possessing separate inhalant and exhalant siphons formed from the fusion of the inner folds of the mantle margins, which are pigmented light brown. Mantle fusion also occurs between the two siphons, as well as between the inhalant siphon and the small pedal gape. *M. sallei* possesses eulamelibranchiate ctenidia comprising two subequal demibranchs and very small labial palps (Morton, 1981).”

Biology

From GISD (2018):

“*Mytilopsis sallei* has high fecundity, rapid growth and a fast maturity rate. During their lifespan, individuals change sex, with a proportion of mussels in any population present as hermaphrodites. Eggs and sperm are spawned into the water column, where external fertilisation takes place. Tens of thousands of eggs can be released. Spawning appears to be triggered by changes in salinity - in its native range *M. sallei* has two periods of intense spawning activity apparently stimulated by rapid drops in salinity resulting from seasonal freshwater outflow (Puyana, 1995; in Bax et al. 2002). A pelagic larva develops within a day of fertilisation and then settles (NIMPIS, 2002; CSIRO, 2001).”

“*Mytilopsis sallei* is a suspension feeder, feeding on zooplankton, phytoplankton and other suspended particulate organic matter (NIMPIS, 2002).”

Human Uses

No information available.

Diseases

No information available. No OIE-reportable diseases have been documented for this species.

Threat to Humans

No information available.

3 Impacts of Introductions

From GISD (2018):

“*Mytilopsis sallei* is an extremely prolific and fecund species, being ecologically similar to its relation the zebra mussel *Dreissena polymorpha*. It has been responsible for massive fouling on wharves and marinas, seawater systems (pumping stations, vessel ballast and cooling systems) and marine farms. In preferred habitats, it forms dense monospecific groups that exclude most other species, leading to a substantial reduction in biodiversity in infected areas (NIMPIS, 2002; CSIRO, 2001).”

From CABI (2018):

“In Visakhapatnam port, India (Ganapati et al., 1971; Morton, 1981), Hong Kong (Morton, 1989) and Taiwan (Liao et al., 2010), *M. sallei* causes severe fouling.”

From Liao et al. (2010):

“Juvenile mussels infested on embryo or larva of hard clam by fouling hard clam’s whole body, which interferes with physiological behavior of feeding and moving, leading to a decrease in the growth rate of hard clam and even causing mortality. Therefore, invasive *M. sallei* causes not only the abundance declines in native hard clam but also the undesirable changes in aquaculture system function and economic losses. After establishment in hard clam farms, most invasive *M. sallei* are not easily eradicated. Recently, no attempt has been made to estimate most nonmarket losses, including reduction in native biodiversity and declines in aquaculture goods and services.”

From Cai et al. (2014):

“High density of mussels consumes a large of [*sic*] phytoplankton from the water which results in the lack of primary producers (Baudinet, et al., 1990). [...] Before *M. sallei* invaded Xiamen Maluan Bay [China], the phytoplankton abundance was high, after the establishment of *M. sallei*, the phytoplankton abundance was low and stabilized at a low abundance (Lin & Yang, 2006).”

“To understand the impact of the invasive bivalve *M. sallei* on a native macrofaunal fouling community, it is essential to determine the spatial and temporal distribution of *M. sallei* and other fouling macrofauna as well as the relationship between *M. sallei* and environmental factors. Our results demonstrated significant positive correlations between density and biomass of *M. sallei* and water temperature and COD [chemical oxygen demand], and a significantly negative correlation with pH. BIOENV analysis showed that water temperature, pH, COD, and DIP [dissolved inorganic phosphate] were key environmental factors affecting the community structure of fouling macrofauna in Yundang Lagoon [Xiamen, China]. These results confirmed that the invasive species changed the density and biomass composition of fouling macrofauna and reduced the species diversity index during the summer period, and somewhat worsened the aquatic environmental quality in Yundang Lagoon because the pH and the DO were the lowest, and the BOD and the COD were the second lowest in summer among four seasons.”

From Tan and Morton (2006):

“Indigenous mangrove flora and fauna form an impressive component of life in tidal monsoon drains in Singapore, but *M. sallei* is now by far the dominant fouling species of the upper reaches of such man-made habitats, together with the cosmopolitan barnacle *Balanus amphitrite* (Darwin). It is conceivable that such large populations of filter-feeders might be serving to keep the drain waters clean, but they are also an important source of larvae which may eventually be taken up in the ballast water of ocean-going vessels and thus exported elsewhere. The fact that Singapore is now one of the busiest ports in the world makes this very likely. The role of *M. sallei* in consolidating and redistributing sediment in the water column has also not been

investigated, but the implications of such activities certainly deserve further study, particularly since *Dreissena polymorpha* introduced into the great lakes of North America has changed Saginaw Bay, Lake Huron, from a pelagic-dominated system to a benthic/pelagic system which will have long term effects on food web structure and productivity at higher trophic levels (Fahnensteil et al., 1995).”

4 Global Distribution



Figure 1. Known global distribution of *Mytilopsis sallei*. Map from GBIF Secretariat (2017). Points located in Peru were excluded from the climate matching analysis because they represent fossil specimens. Point located in Australia was excluded from the climate matching analysis because the population was eradicated. Points located near Indonesia are offshore, outside of the range of habitats used by *M. sallei* and were not included in the climate matching analysis. No georeferenced occurrences were available for parts of the current species range in mainland China, India, Malaysia, Philippines, Thailand, Egypt, Gabon, Senegal, or Fiji.

5 Distribution Within the United States

This species has not been reported as introduced or established in the U.S.

6 Climate Matching

Summary of Climate Matching Analysis

The Climate 6 score (Sanders et al. 2018; 16 climate variables; Euclidean distance) for the contiguous United States was 0.016, which is a medium climate match. The range for a medium climate match is between 0.005 and 0.103. The climate match was high overall in Florida, North Carolina, and South Carolina, medium in Alabama, and low in all other states. In general, there were high matches along the coast of North and South Carolina, in the panhandle and southern peninsula Florida, and far south Texas. The remainder of the coastal Southeast from New Jersey to Texas and inland areas of the Mid-Atlantic was a medium match. The Northeast, Midwest, and West had a low match.

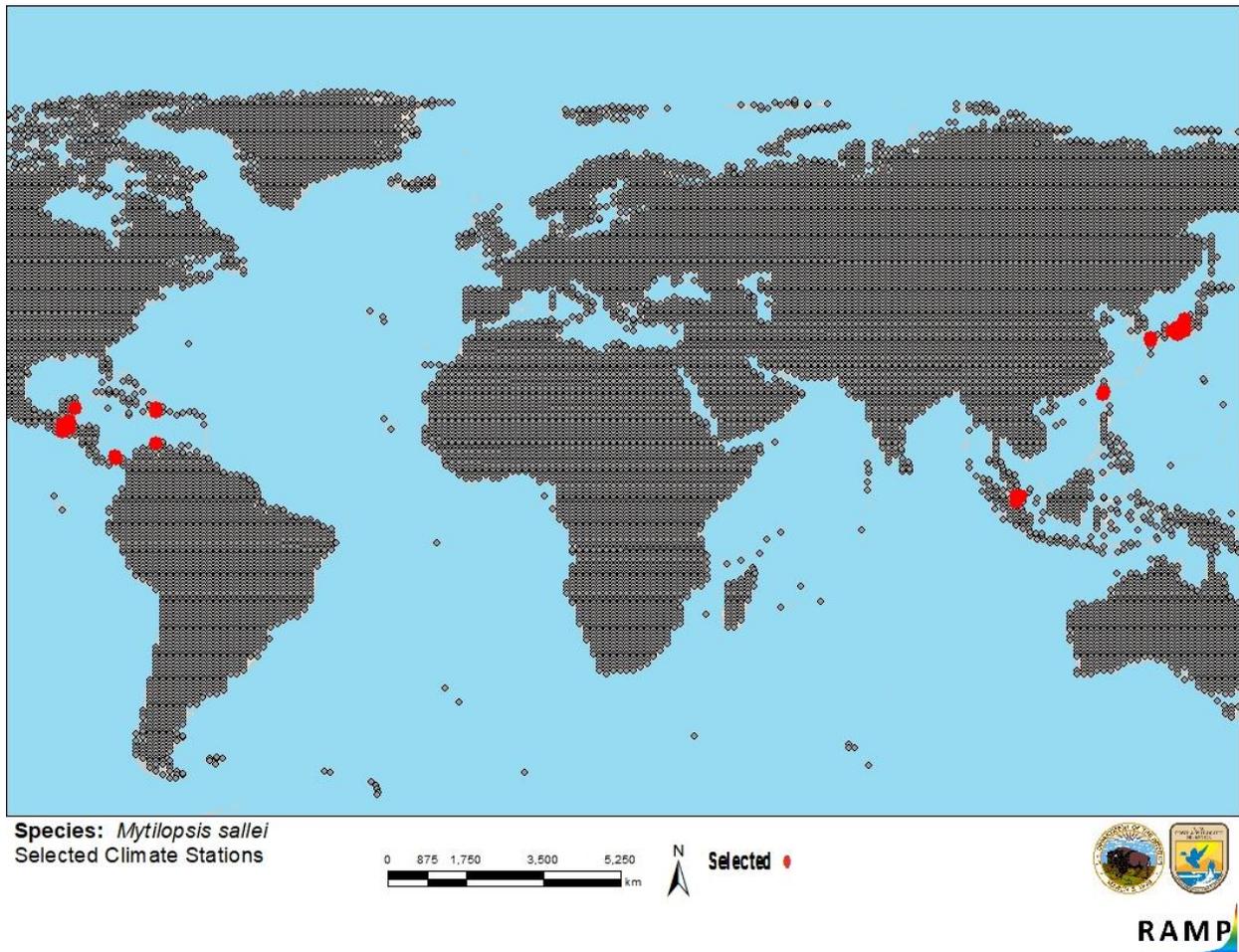


Figure 2. RAMP (Sanders et al. 2018) source map showing weather stations selected as source locations (red; Haiti, Dominican Republic, Mexico, Belize, Guatemala, Panama, Colombia, Singapore, Taiwan, Japan) and non-source locations (gray) for *Mytilopsis sallei* climate matching. Source locations from GBIF Secretariat (2017).

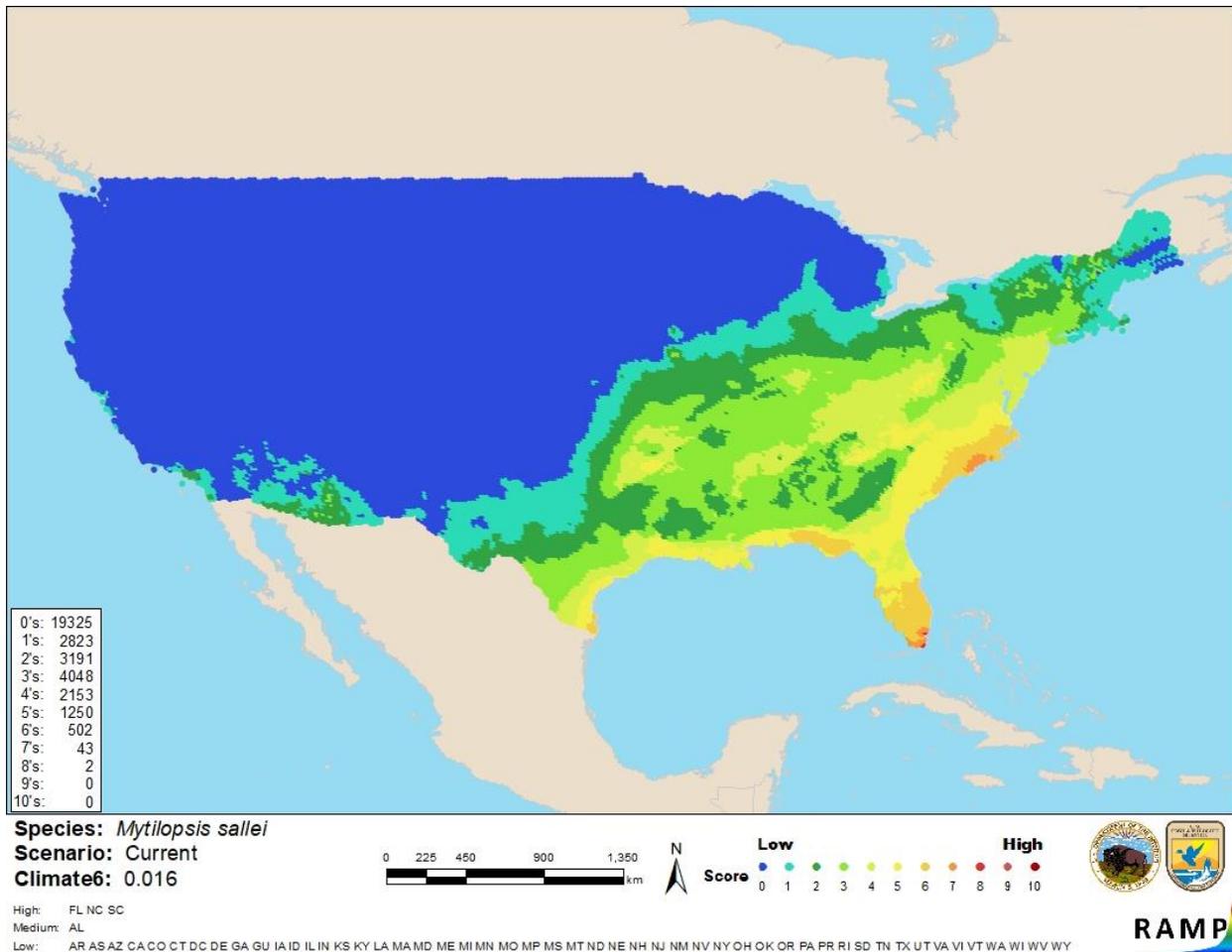


Figure 3. Map of RAMP (Sanders et al. 2018) climate matches for *Mytilopsis sallei* in the contiguous United States based on source locations reported by GBIF Secretariat (2017). 0=Lowest match, 10=Highest match.

The “High”, “Medium”, and “Low” climate match categories are based on the following table:

Climate 6: Proportion of (Sum of Climate Scores 6-10) / (Sum of total Climate Scores)	Climate Match Category
$0.000 < X < 0.005$	Low
$0.005 < X < 0.103$	Medium
≥ 0.103	High

7 Certainty of Assessment

There is adequate information available about *Mytilopsis sallei*. *M. sallei* biology, means of introduction, and impacts of introduction outside of its native range have all been well-documented. Negative impacts of this species have been reported from multiple ecosystems and are well-documented in the scientific literature. Certainty of this assessment is high.

8 Risk Assessment

Summary of Risk to the Contiguous United States

Mytilopsis sallei, the Santo Domingo False mussel, is a small mussel species native to the Caribbean islands and the Bay of Mexico. *M. sallei* is tolerant to a wide range of temperatures and salinities. *M. sallei* has a well-documented history of invasiveness in Asia. It reduces and excludes other species, reduces phytoplankton abundance, fouls boats and marine equipment, causes economic losses, and is difficult to eradicate. *M. sallei* has also been introduced to Australia. *M. sallei* has not been reported as introduced or established in the United States, but it has a medium climate match with the contiguous United States. The most likely means of introduction are as hitchhikers on ship hulls or in ballast water, and through the Panama Canal. No further information is needed to adequately assess the risk this species poses, so the certainty of this assessment is high. The overall risk assessment category is also high.

Assessment Elements

- **History of Invasiveness (Sec. 3): High**
- **Climate Match (Sec. 6): Medium**
- **Certainty of Assessment (Sec. 7): High**
- **Overall Risk Assessment Category: High**

9 References

Note: The following references were accessed for this ERSS. References cited within quoted text but not accessed are included below in Section 10.

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10 References Quoted But Not Accessed

Note: The following references are cited within quoted text within this ERSS, but were not accessed for its preparation. They are included here to provide the reader with more information.

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