Sinanodonta lauta (a mussel, no common name)

Ecological Risk Screening Summary

U.S. Fish & Wildlife Service, February 2022

Revised, March 2022

Web Version, 12/22/2022

Organism Type: Mollusk

Overall Risk Assessment Category: Uncertain

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1 Native Range and Status in the United States

Native Range

From Vinarski (2019):

"Distribution North and East Asia: Japan and Korea, Russian Far East (coastal rivers southwest of Vladivostok)"

From Kondakov et al. (2020a):

"In Russia, native populations of *S. lauta* were recorded from a few coastal freshwater basins in the southern Primorye Region close to the boundary of North Korea, […]."

Status in the United States

No records of *Sinanodonta lauta* in the wild in the United States were found.

Sinanodonta lauta has been found for sale in the United States (Aquatic Arts 2022).

Means of Introductions in the United States

No records of *Sinanodonta lauta* in the wild in the United States were found.

Remarks

According Vinarski (2019) the following are synonyms of *Sinanodonta lauta*: *Anodonta lauta*, *Anodontites lautus*, and *Sinanodonta ovata*. All synonyms were used in the literature search.

From Kondakov et al. (2020b):

"Additionally, we previously noted *Sinanodonta lauta* (Martens, 1877) under the name *Sinanodonta ovata* Bogatov & Starobogatov, 1996 (e.g. Bespalaya et al. 2018; Kondakov et al. 2018), which is considered a junior synonym of the first species (Manuel Lopes-Lima, pers. comm., 2019)."

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From Vinarski (2019):

"Animalia (Kingdom) > Mollusca (Phylum) > Bivalvia (Class) > Autobranchia (Subclass) > Heteroconchia (Infraclass) > Palaeoheterodonta (Subterclass) > Unionida (Order) > Unionoidea (Superfamily) > Unionidae (Family) > Unioninae (Subfamily) > Cristariini (Tribe) > *Sinanodonta* (Genus) > *Sinanodonta lauta* (Species)"

Size, Weight, and Age Range

From Kondakov et al. (2020a):

"The maximum age of these mussels in our samples from the Belovo area is 8–12 years […]"

"The maximum age of these mussels in our samples from the Lower Volga is 15–17 years[…]"

From Aquatics Art (2022):

"Average adult size: 3 inches (7.6 cm)"

Environment

From Vinarski (2019):

"Environment […] fresh"

From Kondakov et al. (2020b):

"[…] plain water bodies […]."

From Aquatic Arts (2022):

"Temperature: 65° - 85° F (18° - 29° C) [assumed to be recommended aquarium temperatures]"

Climate

From Kondakov et at. (2020a):

"In its turn, *S. lauta* may be a more cold tolerant species […]"

From Kondakov et al. (2020b):

"[…] plain water bodies of inland desert areas such as Middle Asia."

Distribution Outside the United States

Native

From Vinarski (2019):

"Distribution North and East Asia: Japan and Korea, Russian Far East (coastal rivers southwest of Vladivostok)"

From Kondakov et al. (2020a):

"In Russia, native populations of *S. lauta* were recorded from a few coastal freshwater basins in the southern Primorye Region close to the boundary of North Korea, […]."

Introduced

From Kondakov et al. (2020a):

"[…] *S. lauta* were firstly discovered in an artificially heated section of the Yenisei River, Eastern Siberia. Here, we report that these mussels successfully colonized the downstream of the Volga River, where they established rather abundant populations (3–36% of the total samples of freshwater mussels). Furthermore, these species were recorded from the Belovo Reservoir, Ob River, Western Siberia"

From Kondakov et al. (2020b):

"*S. lauta* and *S. woodiana*, have established viable populations in Kazakhstan […]"

"A well-established population of *Sinanodonta lauta* was found in the downstream section of Ili River basin [China] […]"

"A single haplotype of *Sinanodonta lauta* was found in Kazakhstan that is identical to the haplotype recorded from a non-native population of this species in the Yenisei River, Eastern Siberia (Bespalaya et al. 2018)."

From Zieritz et al. (2020):

"The only other population of freshwater mussels found in our surveys was that of *Sinanodonta lauta* in a pond in Lawas District, Limbang Division [Malaysia], about 2.5 km east of the border to Brunei […] Density was very high and several dozen specimens were sampled within 15 min."

"Whilst native mussels are likely declining in northern Borneo, our study revealed the introduction of a second non-native freshwater mussel species (in addition to *S*. cf. *woodiana*) to this island, i.e. *S. lauta*."

Means of Introduction Outside the United States

From Kondakov et al. (2020a):

"Based on our molecular data, we propose that the recent invasion of *Sinanodonta woodiana* and *S. lauta* in Russia was associated with fish stocks imported from Kazakhstan. The rapid expansion of these mussels throughout Russia was caused by a human-mediated dispersal of infested fishes from a site(s) of initial invasion to other freshwater systems […]"

From Kondakov et al. (2020b):

"[…] was probably introduced in 1961-1971 from the Sungari River, a Chinese tributary of the Amur River."

"We assume that *Sinanodonta lauta* was introduced with these fishes, […]"

From Zieritz et al. (2020):

"The specimens had been intentionally introduced to the pond by the owner a few years before, who had bought them from a market in Lawas town."

Short Description

From Kondakov et at. (2020a):

"External shell patterns of *S. woodiana* and *S. lauta* are similar within each sampling area:rounded shells with green periostracum from the Volga River and somewhat elongated shells with dark-brown periostracum from the Ob Basin […]"

Biology

From Aquatic Arts (2022):

"While it is a fairly sedentary species, the Taiwan Pond Mussel does have a few important requirements. It must be partially embedded in the substrate so that it can filter feed."

Human Uses

Sinanodonta. lauta can be found in the aquarium trade and for purchase online such as at Aquatic Arts (2022).

Diseases

No records of OIE- reportable diseases (OIE 2022) were found for *Sinanodonta lauta*.

No information on diseases was found for *Sinanodonta lauta*.

Threat to Humans

No information on threats to humans for *Sinanodonta lauta* was found.

3 Impacts of Introductions

No realized impacts of introductions were found for *Sinanodonta lauta*, the following are potential impacts of its introduction.

From Kondakov et al. (2020a):

*"*We hypothesize that successful colonization of this protected area by *Sinanodonta* [including *S. lauta*] species may lead to even worse consequences, including the decline of native Unionidae mussels. Conversely, it may become a new and abundant food resource for aquatic vertebrates, both aboriginal and introduced, e.g. the muskrat *Ondatra zibethicus* (Linnaeus, 1766) (Rodentia: Cricetidae) (Shiryaev 1976; Kondakov et al. 2020[b])."

4 History of Invasiveness

Sinanodonta lauta is reported as introduced in Kazakhstan, Borneo (Malaysia), and Eastern Siberia. Colonization has been hypothesized to lead to consequences such as the decline of native Unionidae mussels, but no evidence was found suggesting this is a realized impact of its introduction. It is found in the aquarium trade, but lack of information indicates that trade is not substantial. The history of invasiveness is classified as Data Deficient for these reasons.

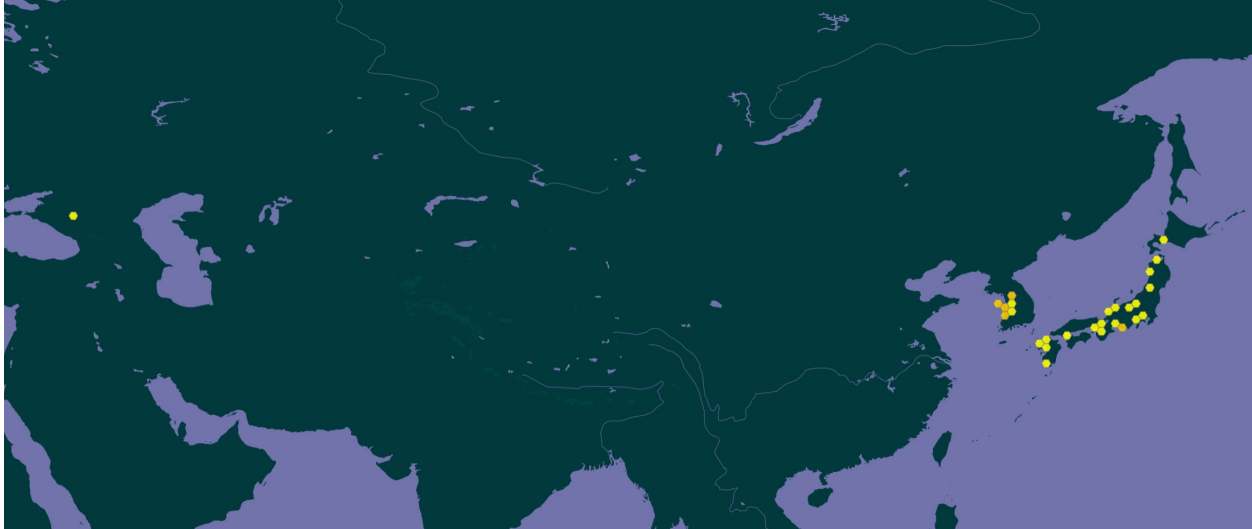# 5 Global Distribution

Figure 1. Known global distribution of *Sinandonta lauta*. Observations are reported from Japan, Russia, and South Korea. Map from GBIF Secretariat (2022). The point in western Russia was not used in the climate matching analysis as the recorded collection location does not match the coordinates given.

Additional locations in Kazakhstan, Siberia, and Borneo for *Sinandonta lauta* were described in Kondakov et al. (2020a, b) and Zieritz et al. (2020). A few observations in Kondakov et al. (2020a) were from power plant thermal flows and were not used to select source points for the climate match.

6 Distribution Within the United States

No records of *Sinanodonta lauta* in the wild in the United States were found.

7 Climate Matching

Summary of Climate Matching Analysis

Most of the contiguous United States had a medium to high climate match for *Sinanodonta lauta*. Areas of high match were found in the southern Rocky Mountains, northern Midwest, and southern Atlantic Coast. Areas of low match were concentrated on the Pacific Coast stretching inland to the desert southwest and northern Rocky Mountains. The overall Climate 6 score (Sanders et al. 2021; 16 climate variables; Euclidean distance) for the contiguous United States was 0.641, High (scores of 0.103 and

above, exclusive, are categorized as high). Most States had a high individual Climate 6 score. Massachusetts and Washington had medium individual scores. California and Rhode Island had low individual scores.
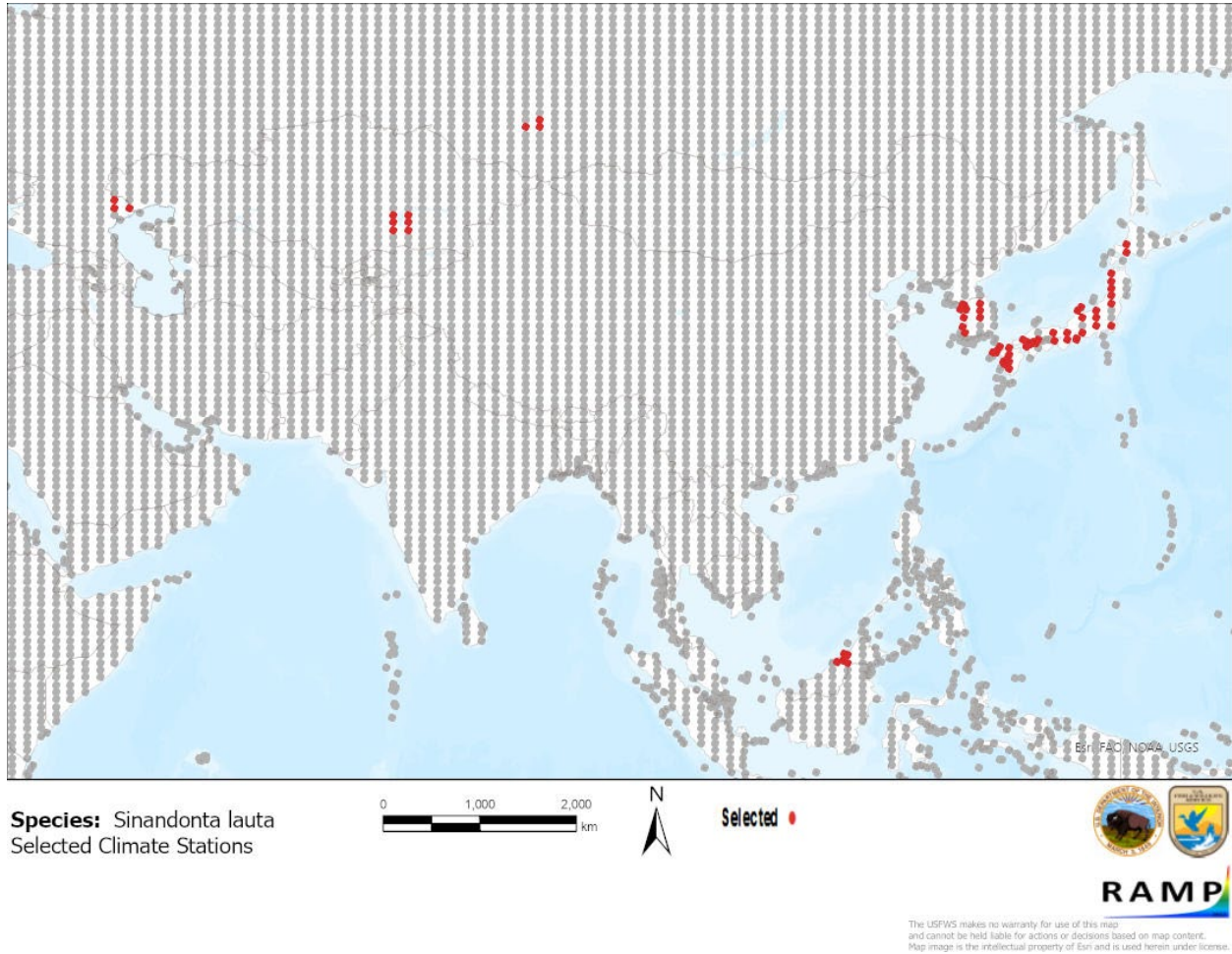

Figure 2. RAMP (Sanders et al. 2021) source map showing weather stations in Asia selected as source locations (red; Borneo (Malaysia), Japan, Kazakhstan, Russia, South Korea) and non-source locations (gray) for *Sinanodonta lauta* climate matching. Source locations from Kondakov et al. (2020a, b), Zieritz et al. (2020), and GBIF Secretariat (2022). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.
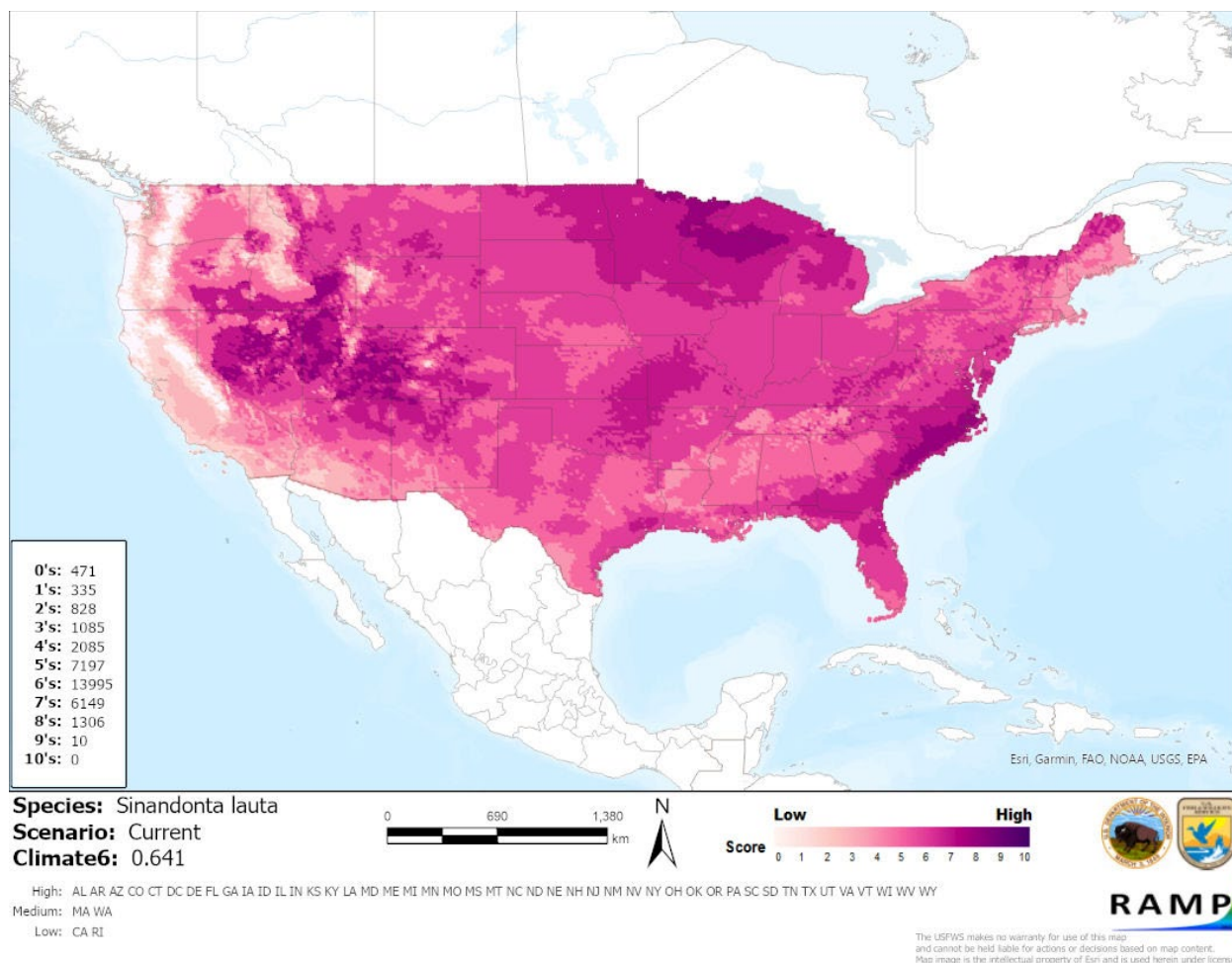
Figure 3. Map of RAMP (Sanders et al. 2021) climate matches for *Sinanodonta lauta* in the contiguous United States based on source locations reported by Kondakov et al. (2020a, b), Zieritz et al. (2020), and GBIF Secretariat (2022). Counts of climate match scores are tabulated on the left. 0/Light Pink = Lowest match, 10/Dark Purple = Highest match.

The High, Medium, and Low Climate match Categories are based on the following table:

Climate 6: (Count of target points with climate scores 6-10)/ (Count of all target points)	Overall Climate Match Category
0.000≤X≤0.005	Low
0.005<X<0.103	Medium
≥0.103	High

8 Certainty of Assessment

There was very little information available on the biology and ecology of *Sinanodonta lauta*. *Sinanodonta lauta* has been recorded outside of its native range in Kazakhstan, Borneo, and Siberia but location information could only be deciphered for Kazakhstan. There were no known impacts of those introductions found but some potential impacts were recorded. This species has been recorded as for sale in the United States, but the overall trade volume or history was not found. The certainty of assessment for *Sinanodonta lauta* is low because of the lack of impacts of introductions available.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Sinanodonta lauta, is a freshwater mussel native to East Asia in Japan, Korea, and Eastern Russia. This species can be found in the aquarium trade in the United States, but the extent of its trade is unknown. *Sinanodonta lauta* has been reported as introduced and established in Kazakhstan, Borneo (Malaysia), and Siberia with no known impacts of those introductions found. The history of invasiveness is classified as Data Deficient. The overall climate match for the contiguous United States is High. Most of the country had a medium to high match with areas of high match concentrated in the southern Rocky Mountains, northern Midwest, and southern Atlantic Coast. The certainty of assessment is Low due to a lack of information on impacts of introductions. The overall risk assessment category for *Sinanodonta lauta* is Uncertain.

Assessment Elements

- **History of Invasiveness (Sec. 4): Data Deficient**

- **Overall Climate Match Category (Sec. 7): High**

- **Certainty of Assessment (Sec. 8): Low**

- **Remarks, Important additional information: No additional remarks**

- **Overall Risk Assessment Category: Uncertain**

10 Literature Cited

Note: The following references were accessed for this ERSS. References cited within quoted text but not accessed are included below in Section 11.

Aquatic Arts. 2022. Taiwan pond mussel (*Sinanodonta lauta*). Available:
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Kondakov AV, Konopleva ES, Vikhrev IV, Bespalaya YV, Gofarov MY, Kabakov MB, Tomilova AA, Vinarski
MV, Bolotov IN. 2020b. Phylogeographic affinities, distribution and population status of the non-
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and Wildlife Service.

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borneensis* and first record of the non-native *Sinanodonta lauta*. Biodiversity and Conservation
29:2235–2253.

11 Literature Cited in Quoted Material

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.

Bespalaya YV, Bolotov IN, Aksenova OV, Gofarov MY, Kondakov AV, Vikhrev IV, Vinarski MV. 2018. DNA barcoding reveals invasion of two cryptic *Sinanodonta* mussel species (Bivalvia: Unionidae) into the largest Siberian river. Limnologica 69:94–102.

Kondakov AV, Palatov DM, Rajabov ZP, Gofarov MY, Konopleva ES, Tomilova AA, Vikhrev IV, Bolotov IN. 2018. DNA analysis of a non-native lineage of *Sinanodonta woodiana* species complex (Bivalvia: Unionidae) from Middle Asia supports the Chinese origin of the European invaders. Zootaxa 4462(4):511–522.

Shiryaev VV. 1976. Determining biomass of mollusks consumed by muskrat. Soviet Journal of Ecology 7(3):276–277.