Sinanodonta lucida (a mussel, no common name)
Ecological Risk Screening Summary

U.S. Fish & Wildlife Service, January 2022
Revised, March 2022
Web Version, 1/3/2023

Organism Type: Mollusk
Overall Risk Assessment Category: Uncertain

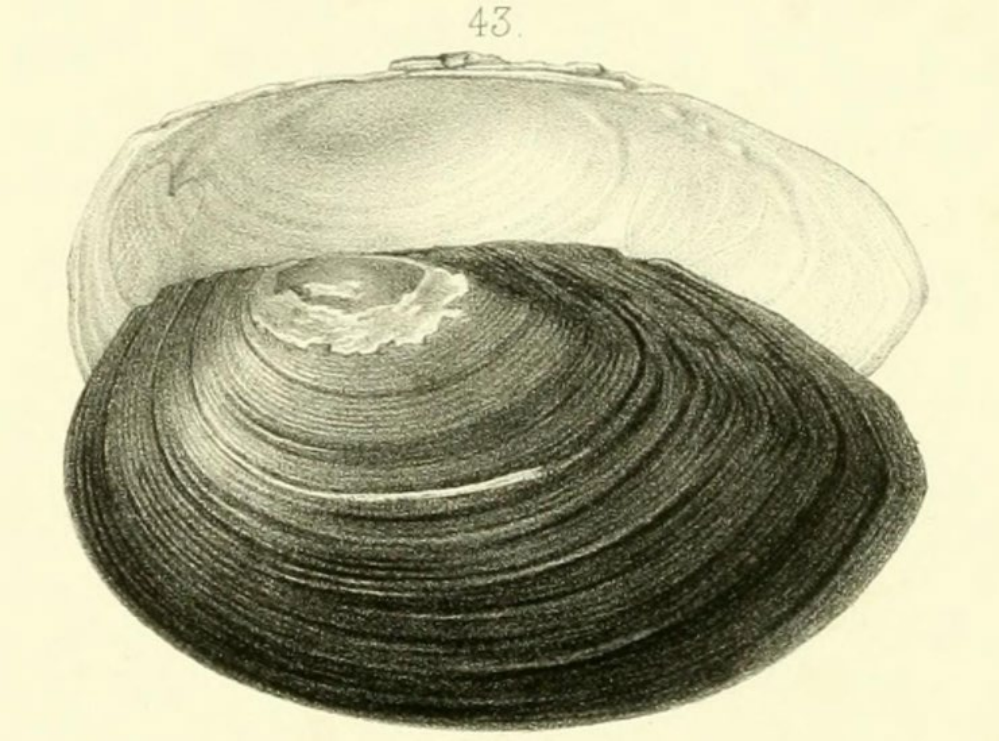

Illustration: Pierre Marie Heude. Public domain. Available: https://www.biodiversitylibrary.org/page/16006044 (January 2022).

1 Native Range and Status in the United States

Native Range

From Kondakov et al. (2018):

"Native range […] Yangtze River basin"

"Type locality: South of the Lake Tong Ting [=Hunan Province], China."

From Do et al. (2018):

"Northeast, Northwest, Red River delta [Vietnam]"

Status in the United States

No records of *Sinanodonta lucida* in trade or in the wild in the United States were found.

Means of Introductions in the United States

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

Remarks

From Lopes-Lima et al. (2017):

"*Sinanodonta lucida* was first described as *Anodonta lucida* and then assigned to *Sinanodonta* (Đặng et al., 1980) but both generic attributions are still being used (e.g., Huang et al., 2013; Pfeiffer and Graf, 2013). Additionally, recent studies based on morphological data consider *S. lucida* as a synonym of *S. woodiana* (Graf and Cummings, 2016; He and Zhuang, 2013). Due to the high genetic distance between these two taxa (12.3%; COI uncorrected p-distance), *Sinanodonta woodiana* and *Sinanodonta lucida* are here recognized as two distinct species."

From Do et al. (2018):

"*Sinanodonta lucida* was reported from North Vietnam (Đăng et al. 1980). Graf and Cummings (2017) treated *S. lucida* as a junior synonym of *S. woodiana*. Bolotov et al. (2016a) reported it as a separate, valid species but from China."

"Bolotov et al. (2016a) documented seven separate lineages within what has been named *Sinanodonta woodiana*. These analyses also separate *Sinanodonta lucida* as a separate linage within the *S. woodiana* complex. This taxonomic puzzle will require further analyses to resolve this group."

Information searches for this assessment used the valid name *Sinanodonta lucida* and the synonyms *Anodon lucida* and *Anodonta lucida*.

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From MolluscaBase (2022):

"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 lucida* (Species)"

“Status accepted
Rank Species”

Size, Weight, and Age Range

From Simpson (1914, as *Anodonta lucida*):

“Length 75, height 40, diam. 20 mm.”

Environment

From MolluscaBase (2022):

“Environment […] fresh[water]”

Climate

No information on climate conditions was found for *Sinanodonta lucida.*

Distribution Outside the United States

Native

From Kondakov et al. (2018):

“Native range […] Yangtze River basin”

“Type locality: South of the Lake Tong Ting [=Hunan Province], China.”

From Do et al. (2018):

“Northeast, Northwest, Red River delta [Vietnam]”

Introduced

No records of introductions were found for *Sinanodonta lucida*.

Means of Introduction Outside the United States

No records of introductions were found for *Sinanodonta lucida*.

Short Description

From Simpson (1914, as *Anodonta lucida*):

“Shell oval or elliptical, subcompressed, inequilateral, with low, somewhat flattened beaks, whose sculpture is not known ; posterior ridge well developed, subangular above, becoming feebly double below and ending behind about on the median line; dorsal line gradually curved down to the posterior point, the dorsal wing scarcely developed ; upper anterior margin angled ; surface concentrically sculptured ; epidermis shining, fuscous ; nacre silvery, shining.”

Biology
No information on the biology of *Sinanodonta lucida* was available.

Human Uses
No information available on human uses of *Sinanodonta lucida*.

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

No information available on diseases associated with *Sinanodonta lucida*.

Threat to Humans
No information available on threat to humans.

3 Impacts of Introductions
No records of *Sinanodonta lucida* introductions were found; therefore, there is no information on impacts of introduction to evaluate.

4 History of Invasiveness
No records could be found of introductions of *Sinanodonta lucida*. According to Kondakov et al. (2018), there are no data on the nonnative range of this species. The History of Invasiveness category is therefore classified as No Known Nonnative Population.

5 Global Distribution

No georeferenced occurrences were available for *Sinanodonta lucida* (GBIF Secretariat 2021).

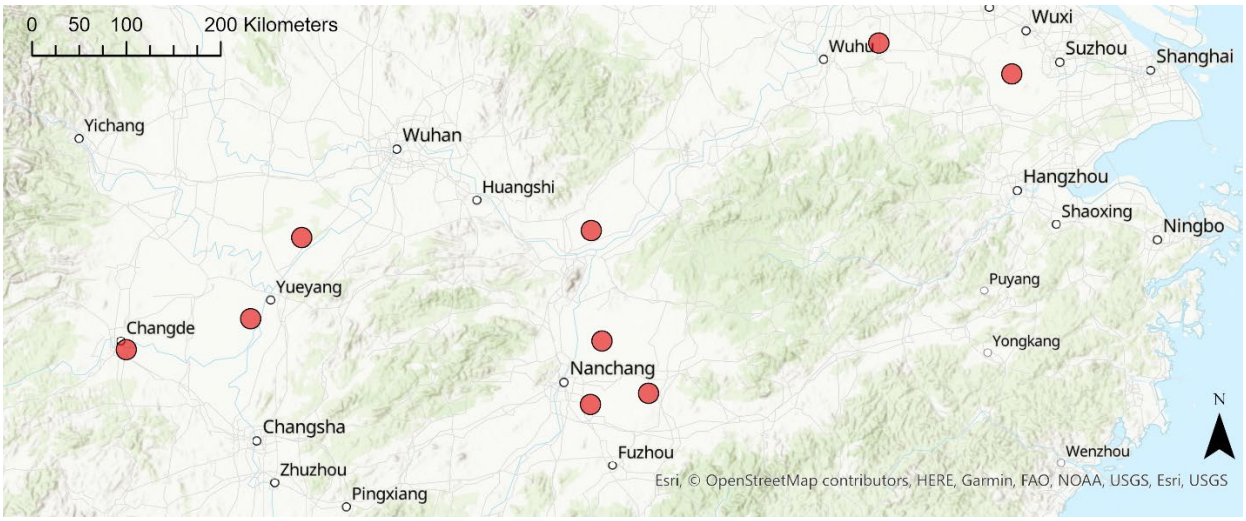

Figure 1. Map of the Yangtze River basin in China showing approximate locations (red dots) where *S. lucida* has been reported in China, according to Liu et al. (2020). Map created with ArcPro v2.8.3 (Esri, Redlands, California).

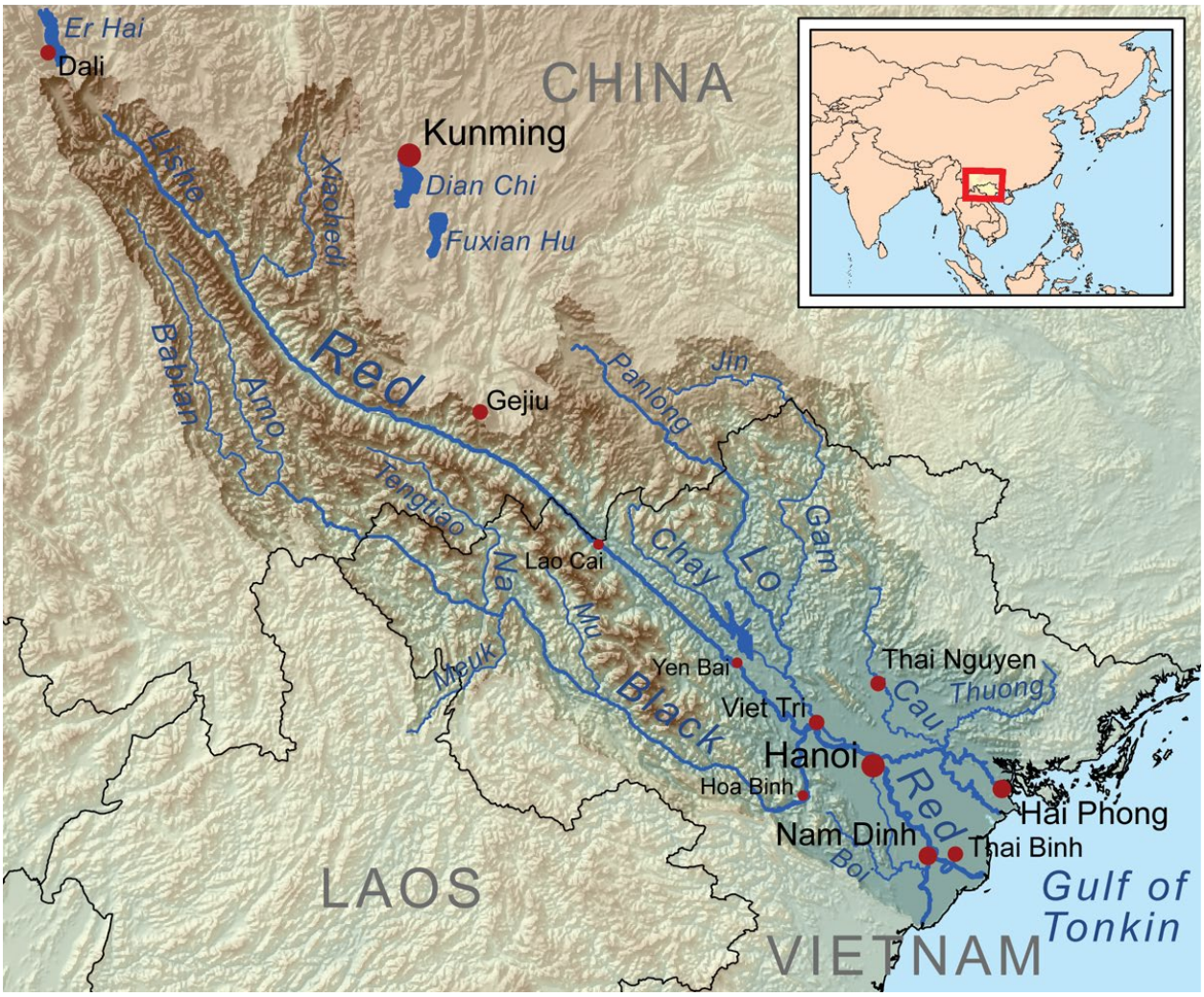

Figure 2. Map of the Red River basin in southern China and Northern Vietnam. The range of *Sinanodonta lucida* in Vietnam is reported as, "Northeast, Northwest, Red River delta [Vietnam]" by Do et al. (2018). Map from Kmusser. Licensed under CC BY-SA 3.0. Available: https://commons.wikimedia.org/wiki/File:Redriverasiamap.png (January 2022). No georeferenced locations for *S. lucida* in Vietnam were found, but the range map printed in the supplement to Do et al. (2018) was used to select source locations for climate matching.

6 Distribution Within the United States

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

7 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Sinanodonta lucida* with the contiguous United States was medium to high across much of the eastern and central United States but low across the western United States. The highest match was in southwestern Florida, with other of high match extending up the Atlantic coast between Florida and North Carolina and across the southern Great Plains from

northeastern Oklahoma through southeastern Nebraska to western Missouri. Areas of low match occurred west of the Rocky Mountains and in the Northeast. The overall Climate 6 score (Sanders et al. 2021; 16 climate variables; Euclidean distance) for the contiguous United States was 0.114, High (scores greater than 0.103, inclusive, are classified as high). The following States had high individual Climate 6 scores: Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Missouri, North Carolina, Oklahoma, South Carolina, Texas, and Virginia. The following States had medium individual Climate 6 scores: Alabama, Arizona, Arkansas, Nebraska, and Tennessee. All other States had low individual scores.

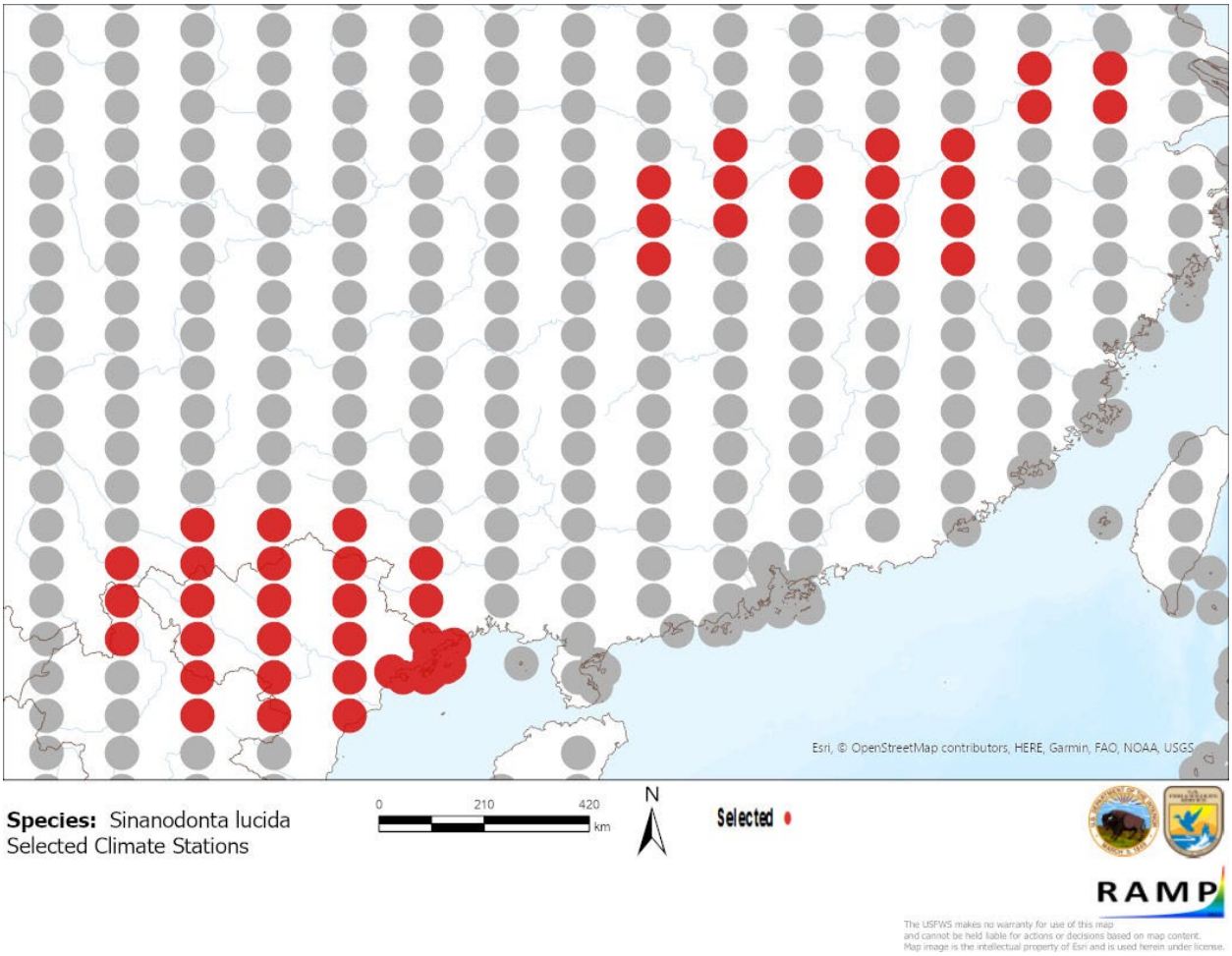

Figure 3. RAMP (Sanders et al. 2021) source map showing weather stations in Asia selected as source locations (red; China, Vietnam, Laos) and non-source locations (gray) for *Sinanodonta lucida* climate matching. The distribution of *S. lucida* was derived from range maps and generalized occurrences reported in Do et al. (2018) and Liu et al. (2020). Selected source locations are within 100 km of one or more of these generalized occurrences; they do not necessarily represent the locations of occurrences themselves.

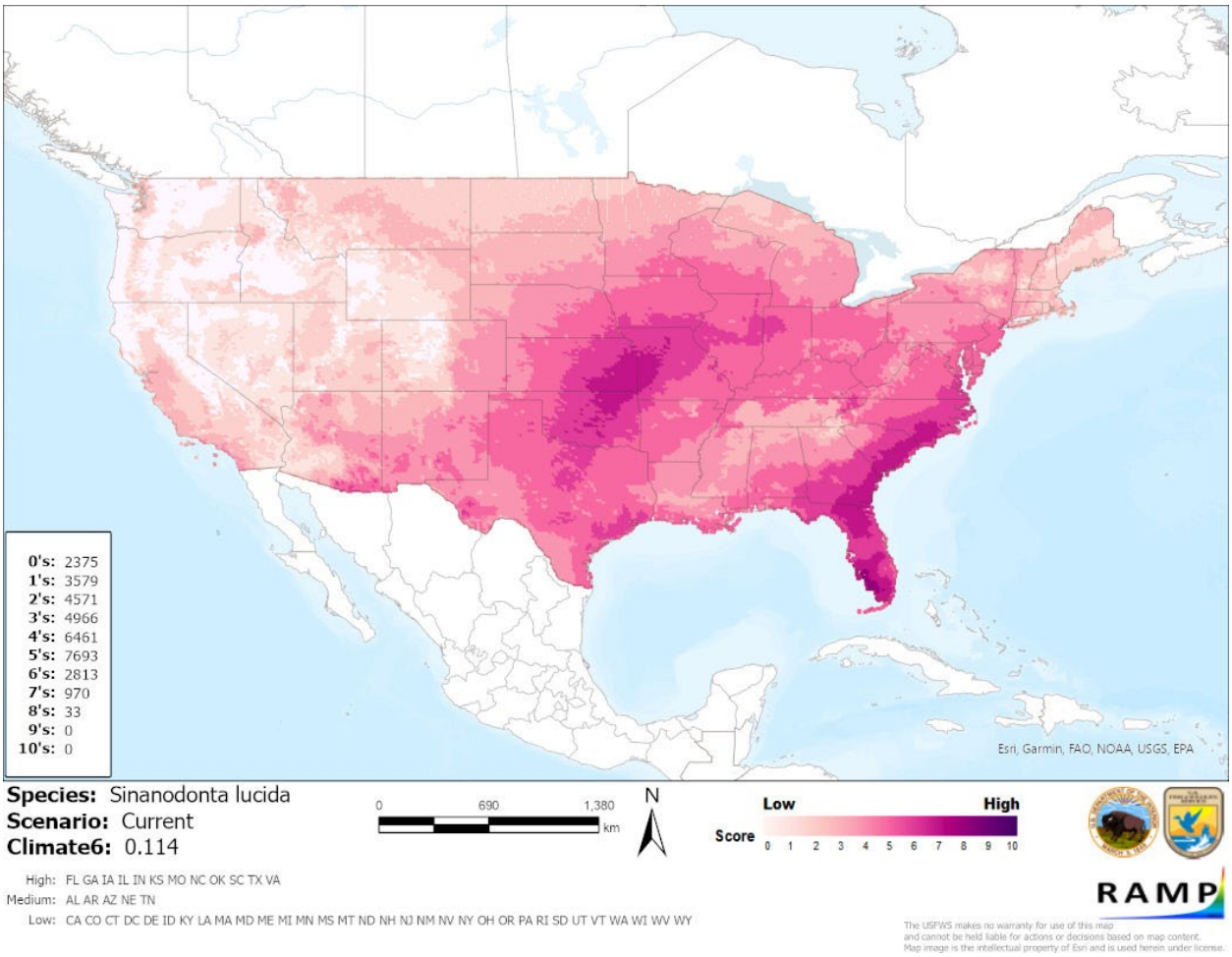

Figure 4. Map of RAMP (Sanders et al. 2021) climate matches for *Sinanodonta lucida* in the contiguous United States based on source locations derived from Do et al. (2018) and Liu et al. (2020). Counts of climate match scores are tabulated on the left. 0/Pale Pink = Lowest match, 10/Dark Purple = Highest 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 is little information available about *Sinanodonta lucida*. While a physical description of the species was available, no information about its biology or habitat requirements could be found. Climate match certainty is low because no georeferenced distribution points were found; instead, the climate match is based on verbal descriptions or approximate maps of the species'

range found in scientific literature. Information on the biology and distribution of *S. lucida* is needed to assess the risk this species poses to the contiguous United States with greater certainty. The certainty of this assessment is low.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Sinanodonta lucida is a freshwater mussel native to eastern and southeastern Asia. Its described range includes the Yangtze River basin in China and the Red River basin in northern Vietnam. There are no known nonnative populations of *S. lucida* outside of this range, and no trade history was found. This species has a high climate match overall with the contiguous United States, especially in the interior and along the southeastern coast; areas of low match were found in the West and Northeast. Due to a lack of available information about the range and biology of this species, the certainty of assessment is Low. The overall risk assessment category is Uncertain.

Assessment Elements

- **History of Invasiveness (Sec. 4): No Known Nonnative Population**
- **Overall Climate Match Category (Sec. 7): High**
- **Certainty of Assessment (Sec. 8): Low**
- **Remarks, Important additional information:** Some authors have considered this species to be a synonym of *Sinanodonta woodiana*.
- **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.

Do VT, Tuan LQ, Bogan AE. 2018. Freshwater mussels (Bivalvia: Unionida) of Vietnam: diversity, distribution, and conservation status. Freshwater Mollusk Biology and Conservation 21:1–18.

GBIF Secretariat. 2021. GBIF backbone taxonomy: *Sinanodonta lucida* (Heude, 1878). Copenhagen: Global Biodiversity Information Facility. Available: https://www.gbif.org/species/8130443 (September 2022).

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 4462:511–522.

Liu X, Yang X, Zanatta DT, Lopes-Lima M, Bogan AE, Zieritz A, Ouyang S, Wu X. 2020. Conservation status assessment and a new method for establishing conservation priorities for freshwater mussels (Bivalvia: Unionida) in the middle and lower reaches of the Yangtze River drainage. Aquatic Conservation: Marine and Freshwater Ecosystems 30:1000–1011.

Lopes-Lima M, Froufe E, Ghamizi M, Mock KE, Kebapçı Ü, Klishko O, Kovitvadhi S, Kovitvadhi U, Paulo OS, Pfeiffer III JM, Raley M. 2017. Phylogeny of the most species-rich freshwater bivalve family (Bivalvia: Unionida: Unionidae): Defining modern subfamilies and tribes. Molecular Phylogenetics and Evolution 106:174–191.

MolluscaBase, editors. 2022. *Sinanodonta lucida* (Heude, 1878). World Register of Marine Species. Available: https://www.marinespecies.org/aphia.php?p=taxdetails&id=1251114 (March 2022).

[OIE] World Organisation for Animal Health. 2022. Animal diseases. Available: https://www.oie.int/en/what-we-do/animal-health-and-welfare/animal-diseases/ (January 2022).

Sanders S, Castiglione C, Hoff M. 2021. Risk Assessment Mapping Program: RAMP. Version 4.0. U.S. Fish and Wildlife Service.

Simpson CT. 1914. Descriptive catalogue of the Naiades, or pearly freshwater mussels. Ann Arbor, Michigan: Ann Arbor Press.

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.

Bolotov IN, Vikhrev I, Bespalaya Y, Artamonova V, Gofarov M, Kolosova J, Kondakov A, Makhrov A, Frolov A, Tumpeesuwan S, Lyubas A, Romanis T, Titova K. 2014. Ecology and conservation of the endangered Indochinese freshwater pearl mussel, *Margaritifera laosensis* (Lea, 1863) in the Nam Pe and Nam Long rivers, Northern Laos. Tropical Conservation Science 7:706–719.

Đặng NT, Thái TB, Phạm VM. 1980. Định loại đ ng v t không xương s ng nước ngọt B c Vi t Nam. [The classification of freshwater invertebrates of North Vietnam]. Hanoi, Vietnam: Nhà Xu t bản Khoa học và Nhà Xu t bảnKhoa học và Kỹ thu t. (In Vietnamese.)

Graf DL, Cummings KS. 2016. The MUSSEL Project Database. Available: http://musselproject.uwsp.edu/db/.

He J, Zhuang Z. 2013. The freshwater bivalves of China. Haxheim, Germany: Conchbooks.

Huang X-C, Rong J, Liu Y, Zhang M-H, Wan Y, Ouyang S, Zhou C-H, Wu X-P. 2013. The complete maternally and paternally inherited mitochondrial genomes of the endangered freshwater mussel *Solenaia carinatus* (Bivalvia: Unionidae) and implications for Unionidae taxonomy. PLoS ONE 8(12):e84352.

Pfeiffer JM, Graf DL. 2013. Re-analysis confirms the polyphyly of *Lamprotula* Simpson, 1900 (Bivalvia: Unionidae). Journal of Molluscan Studies 79(3):249–256.