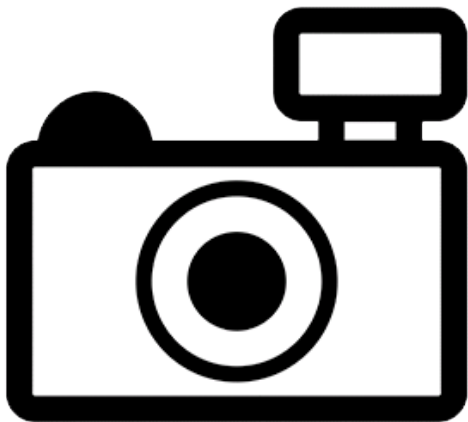


## ***Dreissena carinata* (a mussel, no common name)**

### **Ecological Risk Screening Summary**

U.S. Fish and Wildlife Service, August 2011  
Revised, July 2018 and February 2019  
Web Version, 2/5/2019



No Photo Available

## **1 Native Range and Status in the United States**

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### **Native Range**

From Stepien et al. (2014):

“[...] found primarily in the northern and central Balkan Peninsula [...] and [...] in lakes Pamvotis and Prespa (Albrecht et al. 2007[.].)”

Stepien et al. (2014) report occurrences of *D. carinata* in the countries of Greece (Lakes Dojran, Vegorit, Prespa, and Pamvotis), Macedonia (Lake Ohrid), and Montenegro (Lake Scutari).

### **Status in the United States**

This species has not been reported within the United States. There is no indication *D. carinata* is in trade within the United States.

### **Means of Introductions in the United States**

This species has not been reported in the United States.

## Remarks

MolluscaBase (2018) lists *Dreissena carinata* Dunker 1853 as the accepted taxonomic name for *Dreissena stankovici* Lvova & Starobogatov, 1982. Synonymised names include *Dreissena blanci* Westerlund, 1890; *Dreissena blanci* var. *presbensis* Kobelt, 1915; *Dreissena bourguignati* var. *blanci* Westerlund, 1890; *Dreissena chemnitzii* Westerlund & Blank, 1879; *Dreissena hellenica* Locard, 1893; *Dreissena stankovici* Lvova & Starobogatov, 1982; *Dreissena thiesae* Locard, 1893; *Tichogonia carinata* Dunker, 1853.

From Stepien et al. (2014):

“The subgenus *Carinodreissena* contains the valid taxa *Dreissena carinata* and *Dreissena blanci*; both inhabit ancient lakes in the Balkan Peninsula. We consider the once recognized *Dreissena “stankovici”* and *Dreissena “presbensis”* to be synonyms of *Dreissena carinata*; DNA and morphological evidence supports this conclusion.”

Review of *Dreissena carinata* included searches of synonymous species names to collect all available information. We do not consider *D. blanci*, which was synonymized with *D. carinata* by Albrecht et al. (2007) but separated again by Stepien et al. (2014), as a synonymous species in this report.

## 2 Biology and Ecology

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### Taxonomic Hierarchy and Taxonomic Standing

From MolluscaBase (2018):

“Biota > Animalia (Kingdom) > Mollusca (Phylum) > Bivalvia (Class) > Heterodonta (Subclass) > Euheterodonta (Infraclass) > Imparidentia (Superorder) > Myida (Order) > Dreissenoidae (Superfamily) > Dreissenidae (Family) > *Dreissena* (Genus) > *Dreissena carinata* (Species)”

“Status accepted  
Rank Species”

### Size, Weight, and Age Range

From Molloy et al. (2010):

“*Dreissena stankovici* [*D. carinata*] was described by L’vova and Starobogatov (1982) based on the analysis of 18 mussels brought by Dr. V. Zhadin from Lake Ohrid and kept in the collection of the Zoological Institute of the Academy of Science of USSR. The holotype [...] used in the species description was 40.0 mm long, 19.5 mm high, and 17.9 mm wide.”

### Environment

From Zacharias et al. (2002):

“Most of the [Greek] lakes exhibit summer thermal stratification, which are [*sic*] particularly pronounced in deep lakes (Trichonis, Megali Prespa, Volvi, Vegorititis and Amvrakia). The large

and deep lakes that are not covered by ice or are covered very rarely, and the small shallow lakes that do not freeze (minimum surface temperature of  $>4^{\circ}\text{C}$  and a maximum surface temperature of  $25^{\circ}\text{C}$ ) are considered warm monomictic lakes with only one mixing period. Lakes Kastoria, Mikri Prespa, Ioannina [also known as Pamvotis] and Doirani [also known as Dojran] are characterized by a minimum temperature of  $<4^{\circ}\text{C}$ , are covered by ice almost every 2–4 years, and can be considered as dimictic (Koussouris et al. [1989]).”

“From late autumn to late spring (October to March), the water columns of most lakes are well oxygenated by wind action.”

“Mean annual pH values [in Greek lakes] are 7.8-8.6, according to data from the last 15 years of measurements during summer [...].”

From Albrecht and Wilke (2008):

“The temperature of Lake Ohrid’s pelagic water ranges from  $6^{\circ}\text{C}$  (below 150 m depth, year-round) to  $24\text{--}27^{\circ}\text{C}$  (at the surface during summer) (Naumoski et al., 2007; Matzinger et al., [2006]).”

From Sadori et al. (2015):

“The lake surface [of Lake Scutari] is only at ca. 5–10 m.a.s.l. [meters above sea level], being quite variable through the years as not only the rainfall but also numerous rivers and subterranean springs abundantly feed the lacustrine water (Jacobi, 1978). [...] It has [...] an average depth between 5 and 6 m.”

## **Climate/Range**

From Albrecht and Wilke (2008):

“The local climate [of Lake Ohrid] is influenced by the proximity to the Adriatic Sea, by the surrounding mountains, and by the thermal capacity of Lake Ohrid itself (Watzin et al., 2002). Average monthly air temperatures range from  $26^{\circ}\text{C}$  during summer to  $-1^{\circ}\text{C}$  during winter. Precipitation averages around  $750\text{ mm year}^{-1}$  and is at a minimum during summer (Watzin et al., 2002).”

From Sadori et al. (2015):

“Although the climate of the area is Mediterranean, with pronounced summer aridity ( $<50\text{ mm}$  of rainfall in July), very high rainfall amounts are recorded on the mountains surrounding the lake [Scutari, also known as Shkodra]. [...] In Shkodra, the mean annual air temperature is between  $14$  and  $16^{\circ}\text{C}$ , with the highest average temperature recorded in August ( $21.4\text{--}27.5^{\circ}\text{C}$ ) and the lowest average in January ( $0.5\text{--}6.5^{\circ}\text{C}$ ) (APAWA and CETI, 2007).”

## Distribution Outside the United States

### Native

From Stepien et al. (2014):

“[...] found primarily in the northern and central Balkan Peninsula [...] and [...] in lakes Pamvotis and Prespa (Albrecht et al. 2007[.].)”

Stepien et al. (2014) report occurrences of *D. carinata* in the countries of Greece (Lakes Dojran, Vegoritis, Prespa, and Pamvotis), Macedonia (Lake Ohrid), and Montenegro (Lake Scutari).

### Introduced

This species has not been reported beyond its native range.

## Means of Introduction Outside the United States

This species has not been reported beyond its native range.

## Short Description

From Molloy et al. (2010):

“When viewed laterally [...], the dorsal longitudinal ridge rises at a relatively steep angle from the beak [...], reaches its maximum height, and then immediately descends toward the posterior [...]. Thus, the dorsal longitudinal ridge of *D. stankovici* [*D. carinata*] typically has a prominent peak [...]. The posterior end of the shell is evenly rounded and smoothly transforms from the dorsal longitudinal ridge to ventral edge [...]. In the posterior 2/3 to 3/4 of the shell, the ventral edge is convex [...], but in the anterior 1/4 it is typically concave at the byssal depression [...]. Shells are monotonic gray and of equal length. In young mussels, the periostracum is olive brown with rounded (not zigzagging) dark stripes. The slightly concave region on the myophore plate formed by the scars of the anterior adductor and anterior pedal retractor muscles is in the shape of an equilateral triangle [...]. The muscle scars resulting from the attachments of the posterior byssal retractor muscle [...] and posterior adductor muscle [...] are approximately equal in size.”

## Biology

From Wilke et al. (2010):

“Interestingly, there also has been a spread of specimens of *D. stankovici* [*D. carinata*] from Lake Ohrid into the Skutari system. This is, however, not surprising as the only outflow of Lake Ohrid, the Drim River, runs along Lake Skutari.”

“Our data also indicate that immigration and emigration of *Dreissena* specimens may occur on a regular basis in the Balkans.”

## **Human Uses**

No uses have been reported for this species and there is no indication *D. carinata* is in trade in the United States or elsewhere.

## **Diseases**

No diseases have been reported for this species.

## **Threat to Humans**

No information available.

## **3 Impacts of Introductions**

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This species has not been reported beyond its native range.

## 4 Global Distribution

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No georeferenced occurrences were available for *D. carinata* (GBIF Secretariat 2017).



**Figure 1.** Map of Balkan Peninsula lakes where *Dreissena carinata* has been reported (Stepien et al. 2014). Map: Minestrone. Public domain. Available: <https://commons.wikimedia.org/w/index.php?curid=1524448>. (February 2019).

## 5 Distribution Within the United States

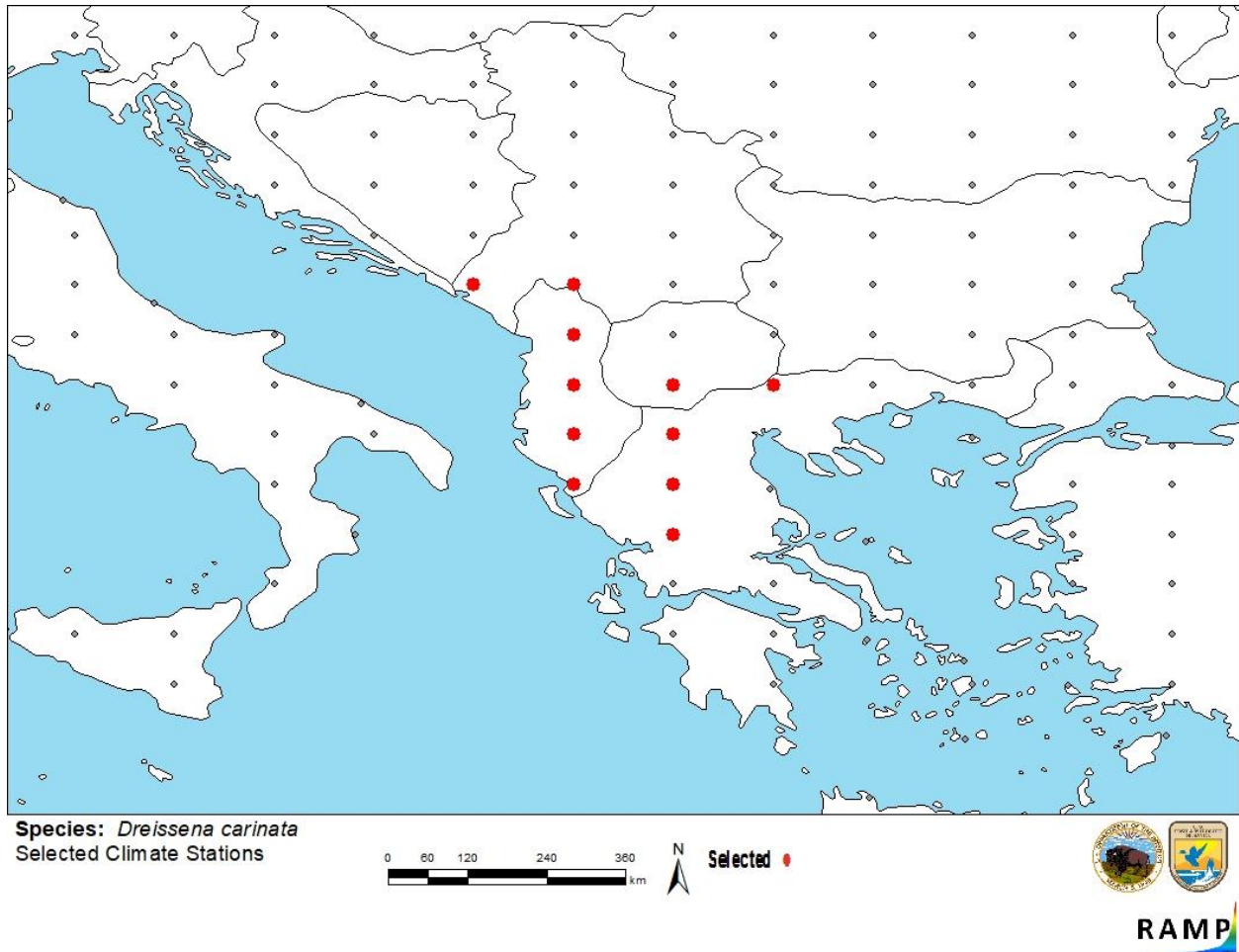
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This species has not been reported within the United States.

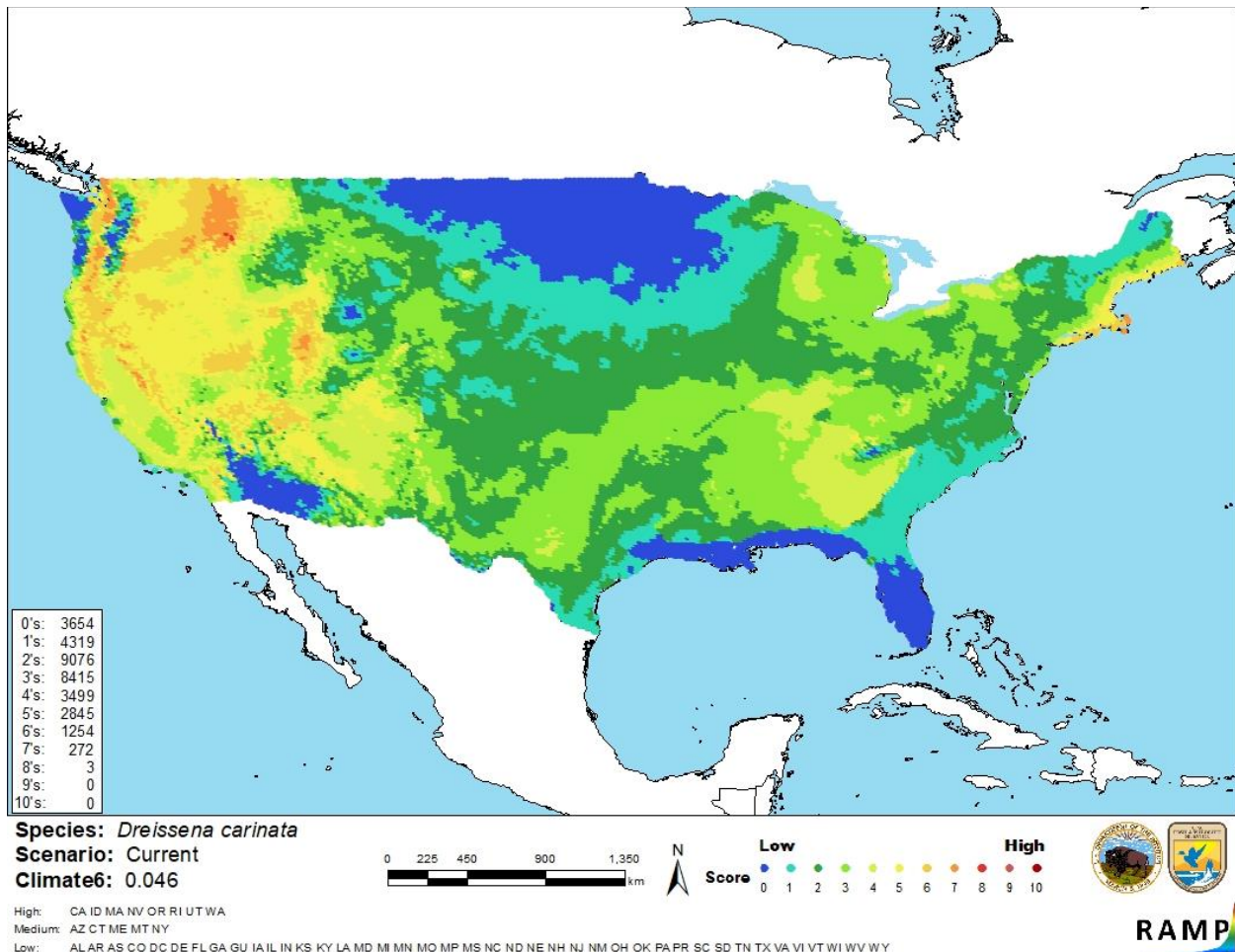
## 6 Climate Matching

### Summary of Climate Matching Analysis

The climate match (Sanders et al. 2018; 16 climate variables; Euclidean Distance) for *Dreissena carinata* with the contiguous United States is low overall, represented by a Climate6 score of 0.046. The range of scores representing a low match is 0.000 to 0.005, inclusive. Locally, high matches occurred in disjunct regions of the western States of California, Idaho, Nevada, Oregon, Utah, and Washington, as well as in southern coastal New England.



**Figure 2.** RAMP (Sanders et al. 2018) source map showing weather stations in southeastern Europe selected as source locations (red; Albania, Greece, Kosovo, Macedonia, Montenegro) and non-source locations (gray) for *D. carinata* climate matching. Source locations are based on verbal reports of occurrences in Stepien et al. (2014).



**Figure 3.** Map of RAMP (Sanders et al. 2018) climate matches for *Dreissena carinata* in the contiguous United States based on source locations reported by Stepien et al. (2014). 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
$0.000 \leq X < 0.005$	Low
$0.005 < X < 0.103$	Medium
$\geq 0.103$	High

## 7 Certainty of Assessment

Most of the research that is available for *Dreissena carinata* addresses the morphology, taxonomy, and distribution of the species. Little biological information is available. Taxonomy does not yet appear to be fully settled, as evidenced by different taxonomies in different sources. Further information is needed to confidently assess the risk this species poses to the contiguous United States. Certainty of this assessment is low.



## 8 Risk Assessment

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### Summary of Risk to the Contiguous United States

*Dreissena carinata* is a mussel indigenous to selected freshwater lakes within the Balkan region of Europe. However, despite taxonomists' efforts to address the ambiguous *Dreissena* genus, the taxon and distribution for *D. carinata* is still somewhat debated. There are no reports of *D. carinata* beyond its native range, so the history of invasiveness is uncertain. Climate match to the contiguous United States was low overall, with high matches found locally in Massachusetts, Rhode Island, and six western States. The overall risk posed by *D. carinata* is uncertain.

### Assessment Elements

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

## 9 References

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

Albrecht, C., and T. Wilke. 2008. Ancient Lake Ohrid: biodiversity and evolution. *Hydrobiologia* 615:103-140.

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## 10 References Quoted But Not Accessed

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**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.**

Albrecht, C., R. Schultheiß, T. Kevrekidis, B. Streit, and T. Wilke. 2007. Invaders or endemics? Molecular phylogenetics, biogeography and systematics of *Dreissena* in the Balkans. *Freshwater Biology* 52(8):1525-1536.

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Jacobi, G. Z. 1978. Zoobenthos from sublacustrine springs in Lake Skadar, Crna Gora, Yugoslavia. *Verhandlungen der Internationalen Vereinigung für Theoretische und Angewandte Limnologie* 20:1067-1077.

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