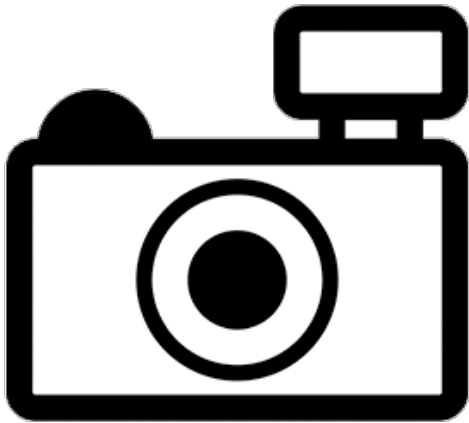


Stellate Tadpole-goby (*Benthophilus stellatus*)

Ecological Risk Screening Summary

Web Version – 10/30/2017



No Photo Available

1 Native Range and Status in the United States

Native Range

From Freyhof and Kottelat (2008):

“Gulf of Taganrog and limans of eastern coast of the Sea of Azov; also along western coast especially in high-water years when the species is recorded in central parts of the sea, too (Iljin, 1927a, 1927c, 1930; Maiskiy, 1955, 1960). The species is formally described from Voronezh (Upper Don R. system, 51.8°N 33.5°E) but have never been recorded in Don so up since (Fedorov, 1960). According to our samplings, along the main course of Don it only occurs up to the upper reach of Tsymlyansk Reservoir. *Benthophilus stellatus* may be present in Severskiy Donetz and Manych (Solodovnikov, 1930; Vitkovskiy, 2000) and in Lower Kuban' River (Emtyl' et al., 1988) together with *Benthophilus durrelli* but this needs clarification.”

From Froese and Pauly (2016):

“Europe: Black Sea, Sea of Azov and Caspian rivers and estuaries.”

From Polačik et al. (2008):

“*B. stellatus* was represented only by single individuals found mainly at downstream sites [of Danube River, Bulgaria] (Table 1 [in source]).”

Status in the United States

There are no records of *Benthophilus stellatus* in the United States.

From Baker et al. (2015):

“Not established in North America, including the Great Lakes”

Means of Introductions in the United States

There are no records of *Benthophilus stellatus* in the United States. The following details the potential vectors of introduction for this species.

From Baker et al. (2015):

“*Benthophilus stellatus* is predicted to be introduced to the Great Lakes via ballast water (Kolar and Lodge 2002, Ricciardi and Rasmussen 1998). *Benthophilus stellatus* may be introduced to the Great Lakes via ships declaring “No Ballast on Board” (NOBOB), which are exempt from ballast water exchange. The majority of ships entering the Great Lakes are NOBOB vessels and 43% of these ships contain residual water with less than 10‰ salinity (NOAA Final Report 2005). In the study, the temperature of the residual water from the vessels sampled ranged from -0.7 to 23.9°C; thus *Benthophilus stellatus* is likely to survive the salinity and temperature of ballast water from most NOBOB vessels.”

Remarks

No additional remarks.

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From Eschmeyer et al. (2016):

“*stellatus*, *Doliichthys* Sauvage [H.-E.] 1874:336 [Revue et Magasin de Zoologie (Ser. 3) v. 2 [1874]] Don River at Voronezh [Woronesch], Russia. Syntypes: MNHN 0000-7341 (2). Type catalog: Bauchot et al. 1991:21. •Valid as *Benthophilus stellatus* (Sauvage 1874) -- (Berg 1949:1114, Miller in Whitehead et al. 1986:1025, Coad 1995:30, Kottelat 1997:175, Reshetnikov et al. 1997:753, Vasil'eva 1998:130, Coad 1998:103, Bogutskaya et al. 2001:47, Vasil'eva 2003:S43, Pinchuk & Miller in Miller 2004:257, Bogutskaya & Naseka 2004:219, Boldyrev & Bogutskaya 2004:130, Vassilev & Pehlivanov 2005:182, Boldyrev & Bogutskaya 2007:63, Kottelat & Freyhof 2007:563, Vasil'eva 2007:150, Neilson & Stepien 2009:96, Kovačić &

Patzner 2011:184, Parin et al. 2015:478). **Current status:** Valid as *Benthophilus stellatus* (Sauvage 1874). Gobiidae: Gobiinae.”

From ITIS (2016):

“Taxonomic Status: Current Standing: valid”

“Kingdom: Animalia

Subkingdom Bilateria

Infrakingdom Deuterostomia

Phylum Chordata

Subphylum Vertebrata

Infraphylum Gnathostomata

Superclass Osteichthyes

Class Actinopterygii

Subclass Neopterygii

Infraclass Teleostei

Superorder Acanthopterygii

Order Perciformes

Suborder Gobioidi

Family Gobiidae

Genus *Benthophilus*

Species *Benthophilus stellatus* (Sauvage, 1874)”

Size, Weight, and Age Range

From Froese and Pauly (2016):

“Max length: 13.5 cm TL male/unsexed; [Berg 1965]; 11.0 cm TL (female)”

Environment

From Freyhof and Kottelat (2008):

“Shallow coastal lagoons and lowland rivers, in fresh and brackish water with salinity below 12‰. In rivers, prefers mainstream, more than 3 m deep and with mud bottom. In Sea of Azov over sand, avoiding silted areas.”

From Froese and Pauly (2016):

“Freshwater; brackish; demersal.”

From Baker et al. (2015):

“It has been observed in coastal waters with dissolved oxygen levels of 8-10 mg/L (Snigirov et al. 2012).”

Climate/Range

From Froese and Pauly (2016):

“Temperate; 4°C - 20°C [Baensch and Riehl 1991]; 56°N - 36°N, 22°E - 54°E”

Distribution Outside the United States

Native

From Freyhof and Kottelat (2008):

“Gulf of Taganrog and limans of eastern coast of the Sea of Azov; also along western coast especially in high-water years when the species is recorded in central parts of the sea, too (Iljin, 1927a, 1927c, 1930; Maiskiy, 1955, 1960). The species is formally described from Voronezh (Upper Don R. system, 51.8°N 33.5°E) but have never been recorded in Don so up since (Fedorov, 1960). According to our samplings, along the main course of Don it only occurs up to the upper reach of Tsymlyansk Reservoir. *Benthophilus stellatus* may be present in Severskiy Donetz and Manych (Solodovnikov, 1930; Vitkovskiy, 2000) and in Lower Kuban' River (Emtyl' et al., 1988) together with *Benthophilus durrelli* but this needs clarification.”

From Froese and Pauly (2016):

“Europe: Black Sea, Sea of Azov and Caspian rivers and estuaries.”

From Polačik et al. (2008):

“*B. stellatus* was represented only by single individuals found mainly at downstream sites [of Danube River, Bulgaria] (Table 1[in source]).”

Introduced

From Baker et al. (2015):

“*Benthophilus stellatus* was first reported in 2011 in the Upper Dnieper River basin in Belarus (Rizevsky et al. 2013). It has been reported in the Danube River in Bulgaria (Vassilev et al. 2008). It has been reported in the Kuybyshev and Cheboksary Reservoir in Russia (Kasyanov and Klevakin 2011, Semenov 2010). It occurs in the Kiev reservoir of the Dneiper River in Ukraine (Witkowski and Grabowska 2012). This species occurs in the middle part of Don River (Sindilariu and Freyhof 2003).”

From Sindilariu and Freyhof (2003):

“*Benthophilus stellatus* represent an additional species, passing the Iron Gate II in Danube in the middle 1999th, being already abundant in the River Dnieper up to Kiev and in middle River Don.”

From Rizevsky et al. (2013):

“The first stellate tadpole-goby *Benthophilus stellatus* was recorded in the upper Dnieper River in Belarus on November 10, 2011 using a hand net at a depth of 0.6 m. On August 25, 2012 a second individual of stellate tadpole-goby was caught using a beach seine from a depth of approx. 2 m (Figures 2 and 3 [in source material]).”

“In recent years stellate tadpole-goby *Benthophilus stellatus* has become widespread in the Volga, Don and the Dnieper River basins (Copp et al. 2005). Stellate tadpole-goby has been recorded in all Dnieper reservoirs in the Ukraine, including the Kiev Reservoir (Zymbalevskaja et al. 1989).”

From Ivancheva and Ivanchev (2008):

“Starry goby *Benthophilus stellatus* in the Oka was first recorded near the city of Spassk in summer 2002 (Ivancheva and Ivanchev, 2004a), and in January 2003, near the city of Shilovo (Babushkin et al., 2003). Near the eastern boundary of the protection zone of the reserve near Lake Travnoe, it was first caught with the bottom fishing rod by the state inspector of the reserve on June 12, 2003. During control catches in the Oka from September to October 2003 in the area of Krasnyi Kholm, four individuals were caught with fine mesh small drag seine (0.053% of the total number of caught fish).”

From Reshetnikov et al. (2012):

“It is noteworthy that other gobiid species also actively migrate up the Volga, reaching the Oka. The stellate tadpolegoby, *Benthophilus stellatus* (Sauvage, 1874), occurred earlier in the Caspian Sea and the Volga delta, and was only rarely found 30 km north of Astrakhan. Now it has been recorded in many reservoirs of the Middle Volga: first, in the 1970s, in the Kuibyshev Reservoir, and at present it is common in the Kuibyshev, Saratov, and Gorky Reservoirs (Evlanov et al., 1998).”

From Karpova (2016):

“[...] encountered later in many water bodies of the NCC [North Crimean Channel] system along with seven new species—the big-scale sand smelt *Atherina pontica*, the blackstriped pipefish *Syngnathus abaster*, the southern ninespine stickleback *Pungitius platygaster*, the percarina *Percarina demidoffii*, the Danube ruffe *Gymnocephalus baloni*, the stellate tadpole-goby *Benthophilus stellatus*, and *Benthophiloides brauneri*.”

Means of Introduction Outside the United States

From Rizevsky et al. (2013):

“Findings of this species upstream of the Kiev Reservoir indicate the ongoing spread to Belarus, and an increasing number Ponto-Caspian gobiids in the Dnieper River basin. Its successful spreading and naturalization in Belarus confirms the important role of the Central Invasion

Corridor as a significant invasion route for Ponto-Caspian species (Panov et al. 2009; Semenchenko et al. 2011).”

From Ivancheva and Ivanchev (2008):

“The appearance of ten new species was recorded as a result of oriented releases from fish farms (*A. anguilla*), unintended introduction (*C. idella*), natural dispersal (*P. pungitius*, *N. melanostomus*, and *B. stellatus*), and improvement of the study of the region (*C. melanoleuca*, *P. percunurus*, and *R. albipinnatus*).”

From Reshetnikov et al. (2012):

“This species was possibly introduced into the Volga reservoirs together with fish food species brought to the Middle Volga from the lower reaches of the Volga and Don (Evlanov et al., 1998; *Atlas presnovodnykh* [...], 2002 [Reshetnikov 1998]; *Ryby v zapovednikakh* [...], 2010 [Reshetnikov 2010]).”

Short Description

From Froese and Pauly (2016):

“This species is distinguished from its congeners by the following characters: a tubercle between eyes; sparse granules on flanks, backward only to below D2 base, rare between upper lateral and dorsal rows of tubercles; head width 94-104 % HL; tubercles in dorsal row 27-30, ventral row 22-25, upper lateral row 10-16 (slightly smaller posteriorly), lower lateral row with few tiny tubercles or absent; chin barbel slightly compressed, thick, about equal in length with eye diameter; origin of D2 in front of anal origin; transverse rows of neuromasts on flank 19-23; no spot in front of D2; sides with dark blotches and irregular dots; a blotch around base of first dorsal usually reaching origin of D2 [Kottelat and Freyhof 2007]; head and body covered with spinulose bony platelets; rounded caudal fins and ventral suckers [Patzner et al. 2011].”

From Baker et al. (2015):

“*Benthophilus stellatus* is a brown colored goby fish. A tubercle that is present between the eyes distinguishes this species from other gobies (Kottelat and Freyhof 2007). This species has granules on its flanks that extend down to below the D2 base, but are rare between the upper lateral and dorsal rows of tubercles. Tubercles are in dorsal row 27-30, ventral row 22-25, and upper lateral row 10-16, but are few or absent on the lower lateral row. The chin barbell is slightly compressed, thick, and about equal the length of the eye diameter. The D2 origin is in front of the anal origin. The transverse rows of neuromasts are on flank 19-23. There is no spot in front of D2. The sides have dark blotches and irregular dots. There is a blotch around the base of the first dorsal and usually reaches the origin of D2. The head and body is covered with spinulose bony platelets (Patzner et al. 2011). The caudal fins and ventral suckers are rounded.”

Biology

From Freyhof and Kottelat (2008):

“Spawns after first winter, in May-June. Females die shortly after spawning, males some weeks later. Feeds mainly on molluscs, insects and crustaceans.”

From Froese and Pauly (2016):

“Feeds on mollusks, crustaceans, insect larvae and small fishes [Miller 1986; Kottelat and Freyhof 2007]. Eggs are pear-shaped [Miller 1986].”

Human Uses

No information on human uses of *Benthophilus stellatus* was found.

Diseases

No information on diseases of *Benthophilus stellatus* was found.

Threat to Humans

From Froese and Pauly (2016):

“Harmless”

From Baker et al. (2015):

“It has not been reported that *Benthophilus stellatus* poses a threat to human health or water quality. There is no evidence that this species negatively impacts infrastructure, economic sectors, recreational activities and associated tourism, or the aesthetic appeal of the areas it inhabits.”

3 Impacts of Introductions

No records of demonstrated impacts from *Benthophilus stellatus* were found.

From Baker et al. (2015):

“There is insufficient information available to determine whether *Benthophilus stellatus* poses a threat to other species or water quality. There are no reports on how it affects or interacts with other species. It is unknown whether this species alters the physical components of the ecosystem.”

4 Global Distribution

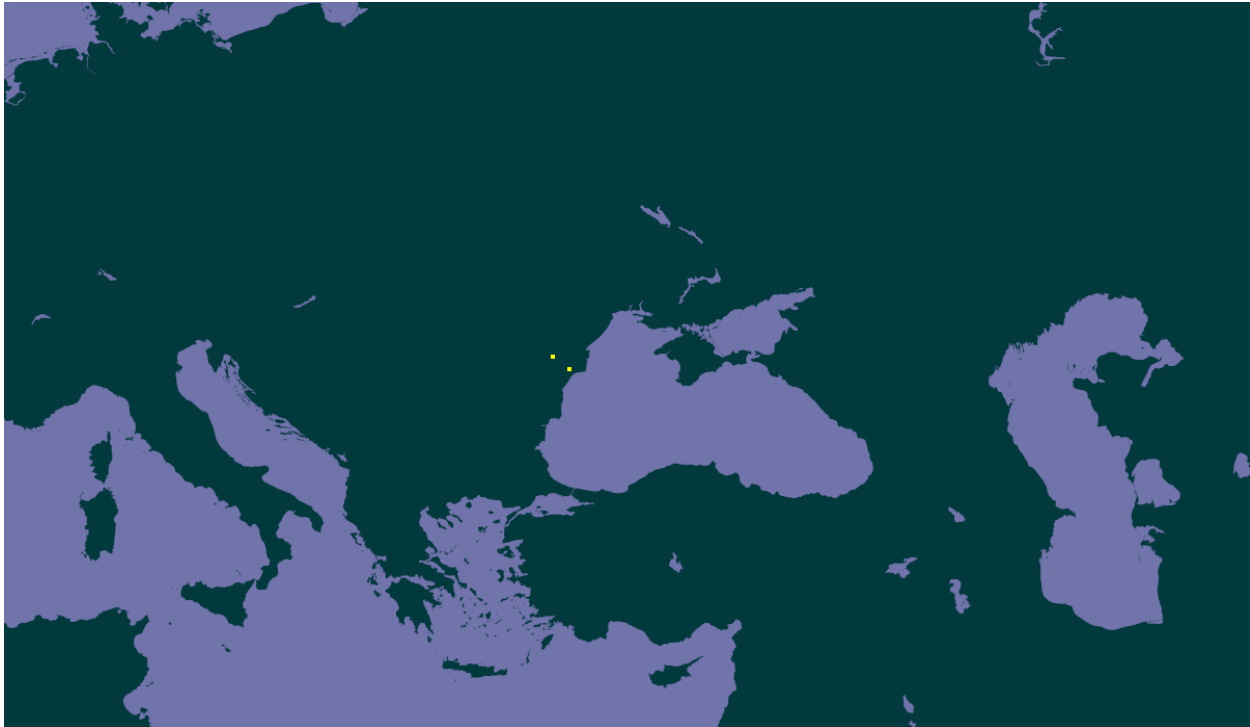


Figure 1. Known global distribution of *Benthophilus stellatus*. Map from GBIF (2013).



Figure 2. Global distribution of *Benthophilus stellatus*. Map from Freyhof and Kottelat (2008).

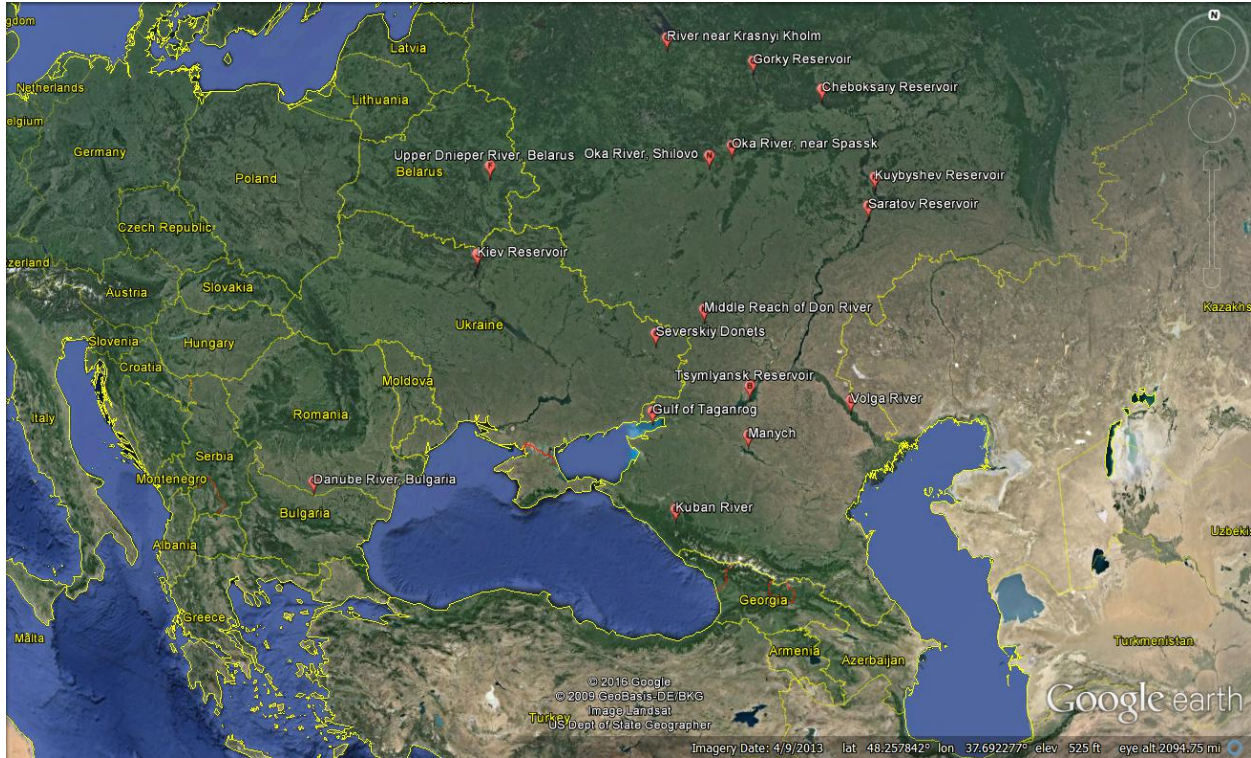


Figure 3. Global distribution of *Benthophilus stellatus*. Map compiled using Google Earth (Google Inc. 2011) and text based locations from Sindilariu and Freyhof (2003), Freyhof and Kottelat (2008), Ivancheva and Ivanchev (2008), Polačik et al. (2008), Rizevsky et al. (2013), Reshetnikov et al. (2012), and Baker et al. (2015).

Text based distributions were compiled into Figure 3 as it was clear neither of the maps provided by Freyhof and Kottelat (2008) or GBIF (2013) were complete distributions of the species; Figure 3 provides a better, although still not complete, distribution of *Benthophilus stellatus*.

The record of *Benthophilus stellatus* in Crimea (Karpova 2016) was not detailed enough to determine a location to use as a source point in the climate match.

5 Distribution Within the United States

There are no records of *Benthophilus stellatus* in the United States.

6 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Benthophilus stellatus* was high in the Great Lakes Basin, the Finger Lakes region of New York, and in pockets in the southwest. The match was low along the Pacific, Gulf, and southern Atlantic coasts, and in parts of New England. It was medium everywhere else. The Climate 6 score (Sanders et al. 2014; 16 climate variables; Euclidean distance) for the Continental U.S. was 0.377, high, and high in Arizona, Colorado, Connecticut, Idaho, Illinois, Indiana, Iowa, Kansas, Maine, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, Nevada, New Mexico, New York, North Dakota, Ohio, Pennsylvania, Rhode Island, South Dakota, Utah, Virginia, Vermont, West Virginia, Wisconsin, and Wyoming.

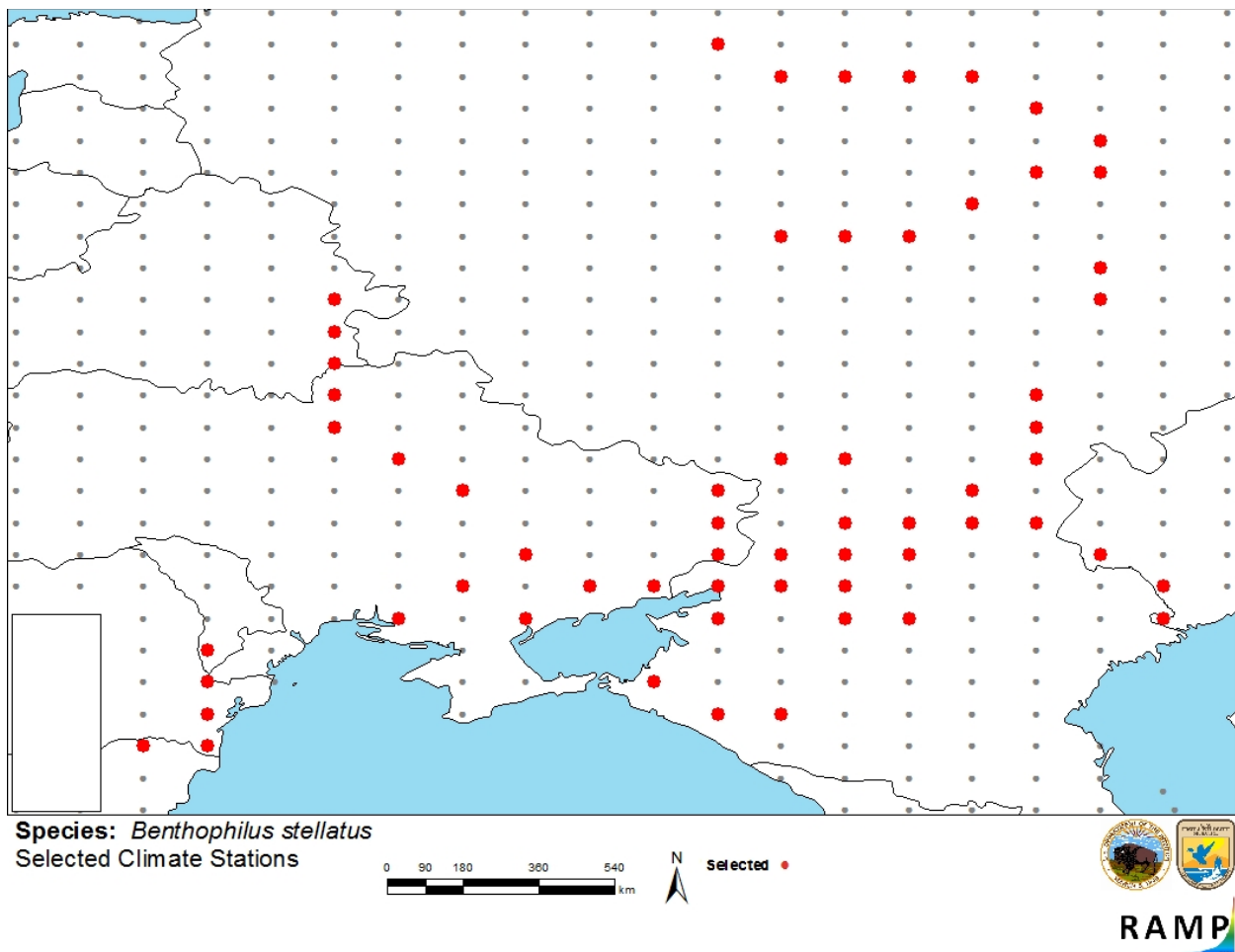


Figure 4. RAMP (Sanders et al. 2014) source map showing weather stations selected as source locations (red) and non-source locations (gray) for *Benthophilus stellatus* climate matching. Source locations from Sindilariu and Freyhof (2003), Freyhof and Kottelat (2008), Ivancheva and Ivanchev (2008), Polačik et al. (2008), GBIF (2003), Rizevsky et al. (2013), Reshetnikov et al. (2012), and Baker et al. (2015).

The source points along the rivers indicated in the text based distributions were included, following the distribution indicated in Figure 3.

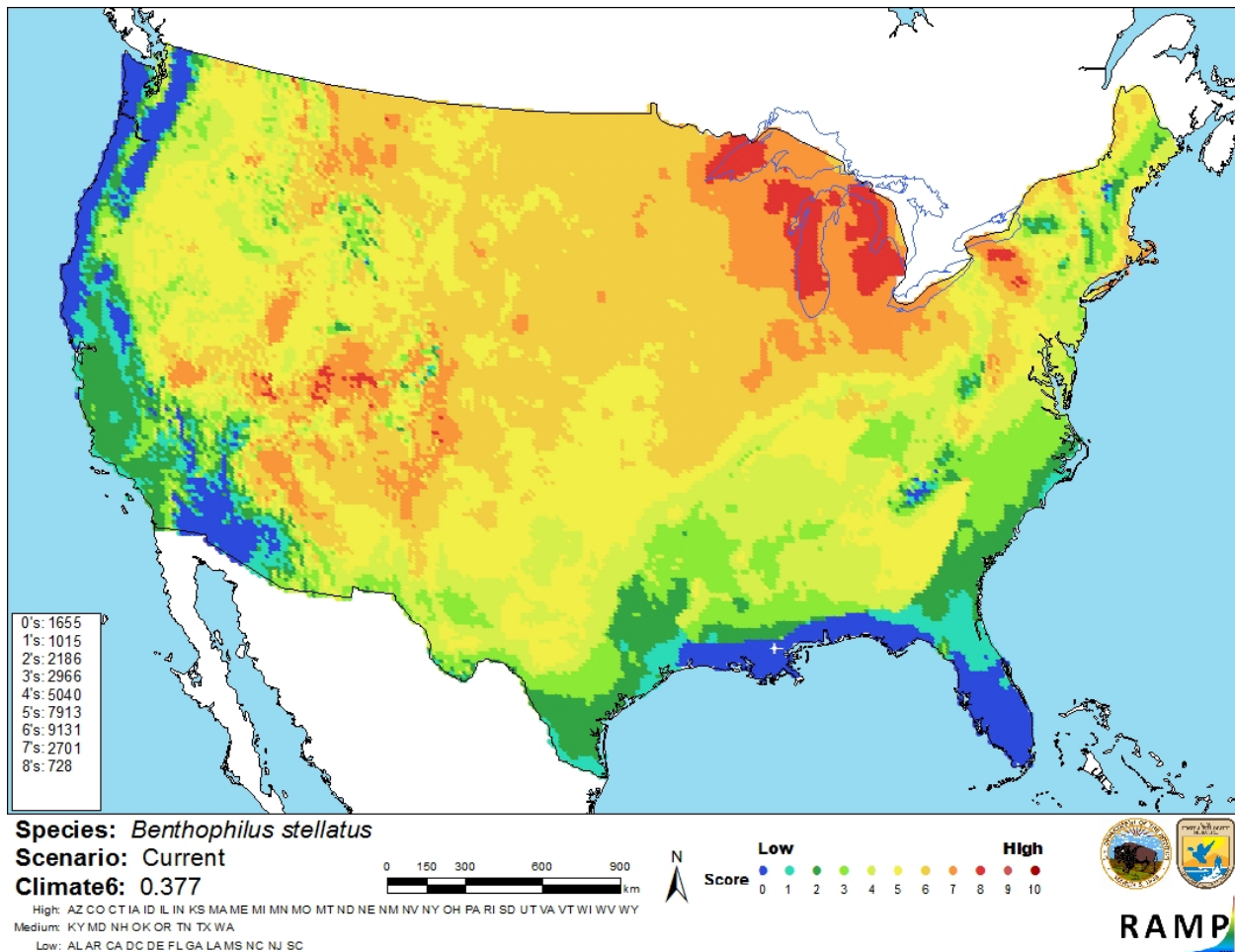


Figure 5. Map of RAMP (Sanders et al. 2014) climate matches for *Benthophilus stellatus* in the contiguous United States based on source locations reported by Sindilariu and Freyhof (2003), Freyhof and Kottelat (2008), Ivancheva and Ivanchev (2008), Polačik et al. (2008), GBIF (2003), Rizevsky et al. (2013), Reshetnikov et al. (2012), and Baker et al. (2015). 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

The certainty of assessment is medium. There was adequate ecological and biological information available. Records of introductions were found for many locations. Records of

impacts of introductions were not found. It should be noted that many of the results found during the literature search were originally published in Russian and therefore information on impacts may be known but not yet available in English. The full distribution of *Benthophilus stellatus* is unknown. The datasets either do not exist or were not shared with databases the author had access to.

8 Risk Assessment

Summary of Risk to the Contiguous United States

The history of invasiveness for *Benthophilus stellatus* is not documented. Many records of introduction were found, most resulting in established populations. Records of impacts of those introductions were not found. It is unknown if that reflects a lack of impacts, research on impacts, or research published in English. The climate match is high. The match was high for almost all of the Great Lakes Basin, where ships claiming NOBOB could introduce this species (Baker et al. 2015). The certainty of assessment is medium. The overall risk assessment category is uncertain. There is a strong history of introductions that result in established populations and a strong climate match with many areas in the continental United States. There would need to be credible evidence of negative impacts from this species in its invaded range to elevate the overall risk assessment category to high.

Assessment Elements

- **History of Invasiveness (Sec. 3): None Documented**
- **Climate Match (Sec. 6): High**
- **Certainty of Assessment (Sec. 7): Medium**
- **Remarks/Important additional information No additional remarks.**
- **Overall Risk Assessment Category: Uncertain**

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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.

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