Danube Bleak (*Alburnus chalcoides*)

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, April 2020
Revised, May 2020, January 2022, March 2022
Web Version, 6/6/2022

Organism Type: Fish
Overall Risk Assessment Category: Uncertain

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1 Native Range and Status in the United States

Native Range

From Froese and Pauly (2020):

"Europe and Asia: Caspian (mostly western to southern coast, rarely found in Ural and Volga). Populations from Aral Sea basin might belong to this species [Kottelat and Freyhof 2007]. Reported from the Black Sea basin [Fricke et al. 2007]."

From Ünver and Yildirim (2011):

"The species is widely distributed throughout Black Sea, Caspian Sea and Aral Sea basins (Geldiay & Balık, 1988). Dense populations of this species are commonly found in few streams (Sakarya, Kızılırmak, Yeşilırmak & Kura Streams) flowing to the Black Sea and the tectonic lakes in the Marmara Region (Northwestern Anatolia) (Geldiay & Balık, 1988; Bogutskaya, 1997)."

From Esmaeili et al. (2018):

"[…] *A. chalcoides* is recorded from the entire southern coast of the Caspian Sea and its rivers, including Aras, Sefidrud, Lisar, Gazafrud, Shirud, Haraz, Gharasu, Tajan, Atrak, Anzali Lagoon and Gorgan Bay."

According to Froese and Pauly (2020), this species is also native to the inland waters in the following countries: Afghanistan, Armenia, Azerbaijan, Georgia, Iran, Kazakhstan, Turkey, Uzbekistan, Austria, Bulgaria, Czech Republic, Germany, Greece, Hungary, Moldova, Romania, Russia, Serbia, Slovakia, Switzerland, and Ukraine.

Status in the United States

No records of *Alburnus chalcoides* in trade or in the wild in the United States were found.

Means of Introductions in the United States

No records of *Alburnus chalcoides* in the wild in the United States were found.

Remarks

This species is also commonly referred to as the Caspian Shemaya. Information for this assessment was searched for using the valid name *Alburnus chalcoides* and the synonym *Chalcalburnus chalcoides*.

From Falahatkar et al. (2015):

"This species was described as *Chalcalburnus chalcoides*, but Bogutskaya (1997), Bogutskaya and Naseka (2004) and Kottelat and Freyhof (2007) suggested that the genera *Alburnus* and *Chalcalburnus* are the same. Thus, these two genera were merged into one genus i.e. *Alburnus*."

From Özulug and Freyhof (2007):

"[…] the genus *Alburnus* and from these, four *(A. carinatus*, *A. istanbulensis*, *A. nicaeensis*, *A. sapancae)* were described as subspecies of *Chalcalburnus chalcoides* (from Caspian Sea basin), for which the name shemayas (a common name in Russian language) has been used as an English name (Berg, 1949; Maitland, 2000). All species of *Chalcalburnus* are now considered to belong to the genus *Alburnus* (see Bogutskaya & Naseka, 2004; Freyhof & Kottelat, 2007b). All

four Turkish shemayas listed above were listed as subspecies of *C. chalcoides* by Ladiges (1960) but are considered to be synonyms of *Alburnus chalcoides* […]."

According to Ünver and Erk'akan (2005), *Alburnus chalcoides* is known to hybridize with *Leuciscus cephalus* in Tödürge Lake, Turkey.

From Ünver and Erk'akan (2005):

"Hybridization under natural conditions is a common phenomenon in freshwater fishes, in particular between cyprinids of the genera *Leuciscus* and *Chalcalburnus* (Schwartz, 1972). Most of these hybrids are the result of anthropomorphic activities such as reservoir building, modifications of rivers and introduction of exotic species, and also climate change. In Lake Todurge hybridization between chub *Leuciscus cephalus* (L.) and shemaya *Chalcalburnus chalcoides* (Guldenstadt), has been recognized."

From Freyhof and Kottelat (2008):

"Almost all long-distance migrating populations were lost (during 1950s and 1960s) as they were no longer able to reach spawning sites because of dams. It now survives in many small water courses and as landlocked populations in some reservoirs, the population usually spawns below the dams."

"Currently overfishing and pollution in the Caspian Sea could be a threat to the species."

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

According to Fricke et al. (2020), *Alburnus chalcoides* (Güldenstädt, 1772) is the current valid name for this species. It was originally described as *Cyprinus chalcoides* (Güldenstädt, 1772) and was previously known as *Chalcalburnus chalcoides* (Güldenstädt 1772).

From ITIS (2020):

Kingdom Animalia
Subkingdom Bilateria
Infrakingdom Deuterostomia
Phylum Chordata
Subphylum Vertebrata
Infraphylum Gnathostomata
Superclass Actinopterygii
Class Teleostei
Superorder Ostariophysi
Order Cypriniformes
Superfamily Cyprinoidea
Family Cyprinidae
Genus *Alburnus*

Size, Weight, and Age Range

From Froese and Pauly (2020):

"Max length : 40.0 cm TL male/unsexed; [Muus and Dahlstrom 1968]; common length : 20.0 cm TL male/unsexed; [Berg 1964]; common length :28 cm TL (female)"

From Falahatkar et al. (2015):

"In adults, its Standard Length (SL) is 14.20-19.99 cm (Svetovidov, 1945). Its average Total Length (TL) is 15.06 cm in males (1-4 years) and 17.57 cm in females (1-5 years) and the average weight is 24.7 g and 41.7 g in males (1-4 years) and females (1-5 years), respectively (Rahmani et al., 2009). […]. In adults, its Standard Length (SL) is 14.20-19.99 cm (Svetovidov, 1945). Its average Total Length (TL) is 15.06 cm in males (1-4 years) and 17.57 cm in females (1-5 years) and the average weight is 24.7 g and 41.7 g in males (1-4 years) and females (1-5 years), respectively (Rahmani et al., 2009). The reported maximum TL in Siahroud River (central of the south Caspian Sea basin) is 24.20 cm and in the Gorganroud River (the southeastern of the south Caspian Sea basin) is 24.30 cm, both being a five-year-old female (Patimar et al., 2010). The reported maximum TL of males in Siahroud River is 21.30 cm and in Gorganroud River is 20.75 cm. All fish with TL ≥ 21.30 cm and ≥ 20.80 cm in Siahroud and Gorganroud rivers were female (Patimar et al., 2010). This needs to be noted that the sex ratio reduces with increasing TL. […] The fish growth rate at first three years of life is more than that of the second three years (Holčík and Oláh, 1992). In Haraz and Shiroud rivers, the age groups of 2+ years for males and 3+ years for females are the most abundant age groups (Rahmani, 2008)."

From Patimar et al. (2010):

"There were large among-population differences in the length distributions […]. In the Siahroud, Caspian shemaya was the most abundant in 171-180 mm length interval, while in the Gorganroud in 140-145mm length class; mainly corresponding to 3+ and 2+ age groups respectively. The maximum length observed in the Siahroud was 242mm and in the Gorganroud 243mm, both being a five-year-old female."

From Ünver and Yildirim (2011):

"The fork length and weight of captured 456 fish specimens ranged from 43 to 213 mm and from 0.50 to 116.00 g, respectively. The measured age range of the specimens was between 0 and 5 years, and it was found that 4th age group was dominant in the population."

Environment

From Froese and Pauly (2020):

"Freshwater; brackish; pelagic; potamodromous [Riede 2004]. […] 5°C - 20°C [Baensch and Riehl 1995; assumed to represent recommended aquarium water temperature]"

From Falahatkar et al. (2015):

"The Caspian Shemaya lives in both brackish and freshwater, downstream, coastal lakes, estuaries, and adjoining areas of seas where salinity is lower than 14 ppt (Kottelat and Freyhof, [2007]). Commonly, this fish lives near to surface, but Knipovich (1921) reported this species from depths of 23.8-25.6 m in the Iranian shore of the Caspian Sea."

Climate

From Froese and Pauly (2020):

"Temperate; […] [Baensch and Riehl 1995; assumed to represent recommended aquarium settings]; 61°N - 38°N, 9°E - 55°E"

Distribution Outside the United States

Native

From Froese and Pauly (2020):

"Europe and Asia: Caspian (mostly western to southern coast, rarely found in Ural and Volga). Populations from Aral Sea basin might belong to this species [Kottelat and Freyhof 2007]. Reported from the Black Sea basin [Fricke et al. 2007]."

From Ünver and Yildirim (2011):

"The species is widely distributed throughout Black Sea, Caspian Sea and Aral Sea basins (Geldiay & Balık, 1988). Dense populations of this species are commonly found in few streams (Sakarya, Kızılırmak, Yeşilırmak & Kura Streams) flowing to the Black Sea and the tectonic lakes in the Marmara Region (Northwestern Anatolia) (Geldiay & Balık, 1988; Bogutskaya, 1997)."

From Esmaeili et al. (2018):

"[…] *A. chalcoides* is recorded from the entire southern coast of the Caspian Sea and its rivers, including Aras, Sefidrud, Lisar, Gazafrud, Shirud, Haraz, Gharasu, Tajan, Atrak, Anzali Lagoon and Gorgan Bay."

According to Froese and Pauly (2020), this species is also native to the inland waters in the following countries: Afghanistan, Armenia, Azerbaijan, Georgia, Iran, Kazakhstan, Turkey, Uzbekistan, Austria, Bulgaria, Czechia, Germany, Greece, Hungary, Moldova, Romania, Russia, Serbia, Slovakia, Switzerland, and Ukraine.

Introduced

From Innal and Erk'akan (2006):

"This species was transplanted by DSI [State Hydraulic Works, Turkey]. The first recorded transfers were into Akköy Dam Lake (Kayseri) in 1969, Isparta Gölcük Lake in 1970–1971,

Sarımsaklı Dam Lake (Kayseri) in 1970–1975, Bayındır Dam lake (Ankara) in 1971, Gölköy (Bolu) Lake in 1975 (Anonymous 1988). It has successfully maintained populations in these areas [of Turkey]."

According to Froese and Pauly (2020), whether this species is native to Croatia and Bosnia Herzegovina is questionable.

From Yang et al. (2017):

"Due to its high tolerance to saline-alkali waters and potential economical value, this species was introduced into China from Uzbekistan in 2001. From then on, aquaculture of the fish has been initiated in many provinces of China."

Means of Introduction Outside the United States

From Innal and Erk'akan (2006):

"Improvement of wild stocks"

Short Description

From Falahatkar et al. (2015):

"The body is elongated, compressed, and moderately deep with moderate size. The mouth is terminal without barbels. Its abdomen has an obvious scaleless sharp keel from vent to throat. There is a well-developed pelvic axillary scale. The branched rays of the dorsal fin 7-9, branched rays of the anal fin 12-19 after 3 spines, lateral line scales 54-74, gill rakers 18-25 and total vertebrae 42-45 (Svetovidov, 1945; Coad, 2015). Unlike other populations of the Caspian Shemaya which the last unbranched rays in their dorsal fin are soft, those rays of Iranian Caspian Shemaya transformed as a smooth sharp spine (Svetovidov, 1945). In deepest part of the body, a narrow dark band runs in both sides of body from the head to the caudal fin (Coad, 2015). Inferior mandible is protruded. This species has two rows of the pharyngeal teeth with formula of 2.5-5.2 and rarely 2.4-5.2, 2.5-4.2 and 2.5-5.3 (Svetovidov, 1945; Coad, 2015). Their teeth are protracted, thin, curved inward, and well-hooked at the tip. In addition, the teeth are strongly serrated on the anterior border of their length, and have a narrow and concave surface. Its swim bladder is pointed posteriorly and its gut is elongated s-shape (Svetovidov, 1945; Coad, 2015). The Caspian Shemaya has a metallic silvery body and its dorsal part bears a contrasting olive-green color. Both dorsal and caudal fins are grayish, and the pectoral, ventral, and anal fins are colorless to whitish. The iris is bright silver and its peritoneum is light brown in color (Coad, 2015)."

From Froese and Pauly (2020):

"Vertebrae: 42 - 45. Diagnosed from its congeners in Caspian and Black Sea basin by having the following characters: anal fin origin about 1½ -2½ scales behind last branched dorsal ray; lateral line with 54-65 + 4-5 scales; anal fin rays with 13-15½ branched rays; 18-23 gill rakers; ventral keel exposed for 8-12 scales in front of anus (up to almost 80% of distance between anus and pelvic base); head length 20-24% SL; predorsal length 52-56% SL; caudal peduncle depth 1.9-

2.4 times in its length; nuptial males with few, large tubercles; lacking dark midlateral stripe. Morphology is variable which has been considered to be an adaptation to different habitats, but data suggest that this is probably due to several species being confused under this species [Kottelat and Freyhof 2007]."

From Mohadasi et al. (2013):

"Comparison of the lagoon and river inhabitants specified that in similar ages, lagoon specimens have larger size, more fusiform body shape and slimmer caudal region. Comparison among three rivers populations revealed that the Lisar population bear the bigger abdominal circumference, and upper position of mouth."

"Also, the results of this study revealed that fish in a lagoon which is rich [sic] in terms of nutrition than rivers, are bigger in size. […] The results showed that Lisar specimens have upturned mouths but other populations have terminal mouths. […] The results showed a significant difference in size of studied groups. The population of Anzali Lagoon has a larger and more curved body shape than others and their body curvature increases with increase of fish size. […] The Anzali population (having better food condition with relatively bigger size) that lives in a lentic environment, shows more fusiform body shape than other populations."

Biology

From Froese and Pauly (2020):

"Adults predominantly prey on planktonic crustaceans, terrestrial insects and small fish while larvae and young juveniles feed on zooplankton, algae and insect larvae. Spawn in small rivers or streams with heavy current on gravel bottom. Landlocked populations found in reservoirs spawn in reservoir tributaries [Kottelat and Freyhof 2007]. Eastern populations migrate upstream for spawning [Kottelat 1997]. Males assemble and wait at the spawning grounds for ripe females, which arrive later. Deposit sticky eggs which adhere on pebbles or stones. Embryonic development lasts 2-3 days, with larvae first staying among gravel for 8-11 days, then actively migrating to shallows and backwaters. Adults migrate back to sea, lakes or estuaries soon after spawning to forage. Young juvenile undertake downriver migration in autumn of same year or next spring. […]"

From Falahatkar et al. (2015):

"It spawns in spring in the Anzali lagoon at 10-29.0 cm with a mean weight of 64.7 g (Holčík and Oláh, 1992; Karimpour et al., 1993) in March and peaks in May and at the beginning of June (Karimpour et al., 1993). All the spawning fish were 2-5 year-old but most of them (63%) were 3-year-old. The males will reach maturity one year earlier than females in 2-4 year-old i.e. the females mature in 3-5 year-old (Holčík and Oláh, 1992; Karimpour et al., 1993). […]. *Alburnus chalcoides* spawns intermittently while has three batches of eggs. It lays two of them only within a period of 18-19 days (Svetovidov, 1945; Coad, 2015). The Caspian Shemaya is a semi-anadromous species. Female matures and spawns one year later than male, while they are larger than males (Bagherian and Rahmani, 2007). In addition, females form the majority (57%) of the migrated fish (Coad, 2015). Sometimes larger fish mature and spawn earlier (Karimpour et al.,

1993; Rahmani et al., 2009). During spawning period, the Caspian Shemaya enters the rivers (for long distances upstream) in autumn and move upstream. […] Males are marked with small tubercles scattered on top of the head and fine tubercles on the anterior flank scales during spawning periods (Bagherian and Rahmani, 2007). Sexual proportion is unbalanced in females' favor (1:1.54) in Siahroud and Gorganroud rivers (Patimar et al., 2010) and Shiroud River (1:2.36) (Rahmani et al., 2009). Males are somewhat territorial. […] *Alburnus chalcoides* spawns from April to July in Siahroud River, and from March to June in the Gorganroud River, and its peak is in May in both rivers (Patimar et al., 2010). Nikoo et al. (2010) measured serum sex steroids of *A. chalcoides* during spawning in the Valiabad River and concluded that this fish may be a multiple spawner. Spawning occurs in 0.2-0.7 m depth, water flow rate about 1 m/s, and 18-26°C, often with a lot of splashing (Kottelat and Freyhof, 2007b). Since adults were caught in July and February and young fish were found in the southern Caspian Sea throughout the year, it concluded that Iranian populations spawn throughout the year (Svetovidov, 1945). […] Rahmani et al. (2009) reported a peak gonadosomatic index for males in May and for females in early June in the Shiroud River. *Alburnus chalcoides* has 1.5 mm eggs in diameter as early as 13 March (with a standard length of 213.2 mm) and 1.7 mm on 4 June (with a total length of 154.6 mm) (Karimpour et al., 1993). Mean absolute fecundity of the Caspian Shemaya from the southern Caspian Sea basin has been reported 3568 eggs in Haraz River (Rahmani, 2006), 6630 eggs in the Anzali lagoon with a mean relative fecundity is 140 eggs/g of body weight (Karimpour et al., 1993), 3900 eggs with diameter reaching 1.17 mm in the Shiroud River (Rahmani et al., 2009), 8426 eggs (average 212 eggs/g) with mean diameters of 1.40 mm in the Siahroud River (Patimar et al., 2010) and 4215 eggs (average 112 eggs/g) with mean diameters of 1.40 mm in Gorganroud River (Patimar et al., 2010)."

From Patimar et al. (2010):

"In both rivers, in the present study, the overall sex ratio was unbalanced in favor of females, probably either the consequence of higher survival rate and greater longevity of females or the greater endurance of females to environmental variability. The observed sex ratio was contrary to the one found by Rahmani (2006) and Balik and Sari (1994) who reported predominance of males in the Haraz and Shiroud (Southern Caspian basin) and in one dam lake of Turkey respectively, while Karimpour et al. (1993) proposed female dominance in overall sex ratio in the Anzali lagoon and Azari-Takami and Rajabi-Nezhad (2002) in Sefidroud river (southwest of Caspian Sea). Predominance of females also has been reported in Turkey (Balik et al., 1996; Tarkan et al., 2005). It seems that sex ratio of Caspian shemaya is highly significant throughout its range of distribution in the south Caspian basin. It seems that different sex ratio is a characteristic feature of this species in different rivers."

From Ünver and Yildirim (2011):

"The number of spawned-unspawned fish from 168 specimens captured between April-August, was determined. According to macroscopic observation of gonads, the egglaying commenced in the second half of May. The ratio of spawned fish was 9.5% in May. It reached 50% in July and no ripe fish were found in August. According to the seasonal changes in the gonadosomatic index, egg diameter, egg number in per one gram ovarium and ratio of egg laying, it was revealed that the spawning in *A. chalcoides* population began in May and continued until end of

July. Average, minimum and maximum egg numbers of *A. chalcoides* as a function of age groups, variation coefficients and the proportional (%) incremental values [PIV (%)] of the average egg numbers (Table V). Egg numbers in the ovary varied from 2265 to 16540. Average egg numbers for II. and V. age groups were 3020 and 13424, respectively. The proportional incremental values decreased with increasing age of fish. The development of the gonads is connected in the majority of fishes with the formation of secondary sexual characteristics. The most frequent secondary sexual difference is that of size between the sexes. The female is usually larger than the male, which ensures the largest fecundity of the stock. This difference in size is often achieved through the earlier maturation of males and their shorter life span (Nikolsky, 1963). Slastenenko (1955) have stated that the size at maturity in 14-18 cm (FL) when the fish was two or three years old in Black Sea Basin. In Demirköprü Dam Lake, the length of first spawning has been determined to be 18.80-20.46 cm (Balık & Sarı, 1994). […]. The same species will often spawn at different times of the year in different regions according to the ecological and geographic conditions (Nikolsky, 1963). The spawning migration is a movement away from the overwintering or feeding grounds to the spawning grounds (Nikolsky, 1963). It has been previously reported that the adult individuals of bleak after April, began to migrate to Acısu Stream, which flows into the lake and they laid eggs on a bottom covered with sand or pebbles in relatively fastflowing and shallow sites of the stream (Ünver & Erk'akan, 2005). The bleak is a lacustrine and rheophilous species and migrate upstream for spawning (Slastenenko, 1955; Geldiay & Balık, 1988)."

Human Uses

From Froese and Pauly (2020):

"Fisheries: commercial; aquaculture: commercial"

From Falahatkar et al. (2015):

"*Alburnus chalcoides* is a commercial or semi-commercial species in Iran (Sattari et al., 2004)."

From Yang et al. (2017):

"Moreover, the fish has high commercial value (Daei et al., 2009) and is caught for consumption in southern regions of the Caspian Sea (Mohaddasi et al., 2013) and in the regions of Lake Toduige (Ünver, 1998). Due to its high tolerance to saline-alkali waters and potential economical [*sic*] value, this species was introduced into China from Uzbekistan in 2001. From then on, aquaculture of the fish has been initiated in many provinces of China."

Diseases

No records of OIE-reportable diseases (OIE 2020) were found for *Alburnus chalcoides.*

From Yildirim and Ünver (2012):

"The metazoan parasites of the Danube bleak, *Alburnus chalcoides* (Güldenstädt, 1772), were determined in Tödürge Lake, since the parasite fish fauna had not yet been studied in this system. A total of 106 specimens were collected from October 2004 to September 2005. Six parasite

species were found: two monogeneans (*Diplozoon paradoxum* and *Diplozoon megan*), one digenean (*Posthodiplostomum cuticola*), one cestode (*Bothriocephalus acheilognathi*), one nematod (*Rhabdochona* sp.), and one copepod (*Argulus foliaceus*). About 87.7% of the Danube bleak examined were infected by at least one parasite: *Rhabdochona* sp. (4080 specimens), *Posthodiplostomum cuticola* (312 specimens) and *Diplozoon megan* (159 specimens) being the dominant parasites."

According to Poelen et al. (2014) *Alburnus chalcoides* can be the host to the following parasites and diseases: *Ascocotyle calceostoma*, *Sphaerostomum kurensis*, *Dactylogyrus wunderi*, *Dactylogyrus sphyrna*, *Dactylogyrus minor*, *Dactylogyrus haplogonus*, *Dactylogyrus chalcalburni*, *Paradiplozoon pavlovskii*, *Dactylogyrus*, *Molnaria intestinalis*, *Contracaecum squali*, *Anisakis schupakovi*, *Cucullanus dogieli*, *Porrocaecum reticulatum*, *Posthodiplostomum brevicaudatum*, *Bucephalus polymorphus*, *Ascocotyle coleostoma*, *Clinostomum marginatum*, *Asymphylodora kubanicum*, *Sphaerostomum bramae*, *Phyllodistomum elongatum*, *Allocreadium isoporum*, *Dioctophyma renale*, *Posthodiplostomum cuticula*, *Cosmocephalus obvelatus*, *Dactylogyrus vistulae*, *Philometra rischta*, *Tylodelphys clavate*, *Paradilepis scolecina*, *Caryophyllaeus laticeps*, *Diplostomum spathaceum*, *Proteocephalus torulosus*, *Raphidascaris acus*, *Gnathostoma hispidum*, *Corynosoma strumosum*, *Bothriocephalus acheilognathi*, *Philometra ovata*, *Eustrongylides excisus*, and *Ligula intestinalis*.

Threat to Humans

From Froese and Pauly (2020):

"Harmless"

3 Impacts of Introductions

There are no reported impacts of introductions available in the literature. However, this species is reported to hybridize with other species in the genera *Leuciscus* and *Alburnus* according to Ünver and Erk'akan (2005).

4 History of Invasiveness

Alburnus chalcoides has been introduced and become established in portions of Turkey outside its native range. The species has been introduced to aquaculture facilities in China, although there is no information on whether the species has also been introduced into the wild there. There is no information available on impacts of these introductions. The history of invasiveness is classified as Data Deficient.

5 Global Distribution

Figure 1. Known global established populations of *Alburnus chalcoides*. Map from GBIF Secretariat (2021). Locations are in Germany, Austria, Romania, Bulgaria, Turkey, Ukraine, Uzbekistan, Russia, and Iran. A reported occurrence in China (not shown) was not used to select source points for the climate match because it is unknown whether this represents a wild, established population.

Georeferenced coordinates for *A. chalcoides* occurrences within the native range in Afghanistan, Armenia, Azerbaijan, Georgia, Kazakhstan, Czech Republic, Greece, Hungary, Serbia, Slovakia, and Switzerland were not reported in the literature and therefore not used to select source points for the climate match.

6 Distribution Within the United States

No records of *Alburnus chalcoides* in the wild in the United States were found.

7 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Alburnus chalcoides* was generally medium to high for the contiguous United States with small areas of low climate match. High climate matches occurred in the Rocky Mountain region, southern Nevada and surrounding areas of California and Arizona, the Great Lakes region, the central Appalachian Mountains, and around Lake Champlain. Medium

matches occurred across much of the central United States, the Southeast, and coastal New England. Low climate matches occurred in the Pacific Northwest, along the Gulf of Mexico from Louisiana to Florida, and in the southern Appalachian Mountains. The overall Climate 6 score (Sanders et al. 2021; 16 climate variables; Euclidean distance) was 0.783, high. (Scores greater than 0.103 are classified as high.) All States had a high individual Climate 6 score except for Louisiana and Mississippi, which had medium individual Climate 6 scores, and Florida, which had a low individual Climate 6 score.

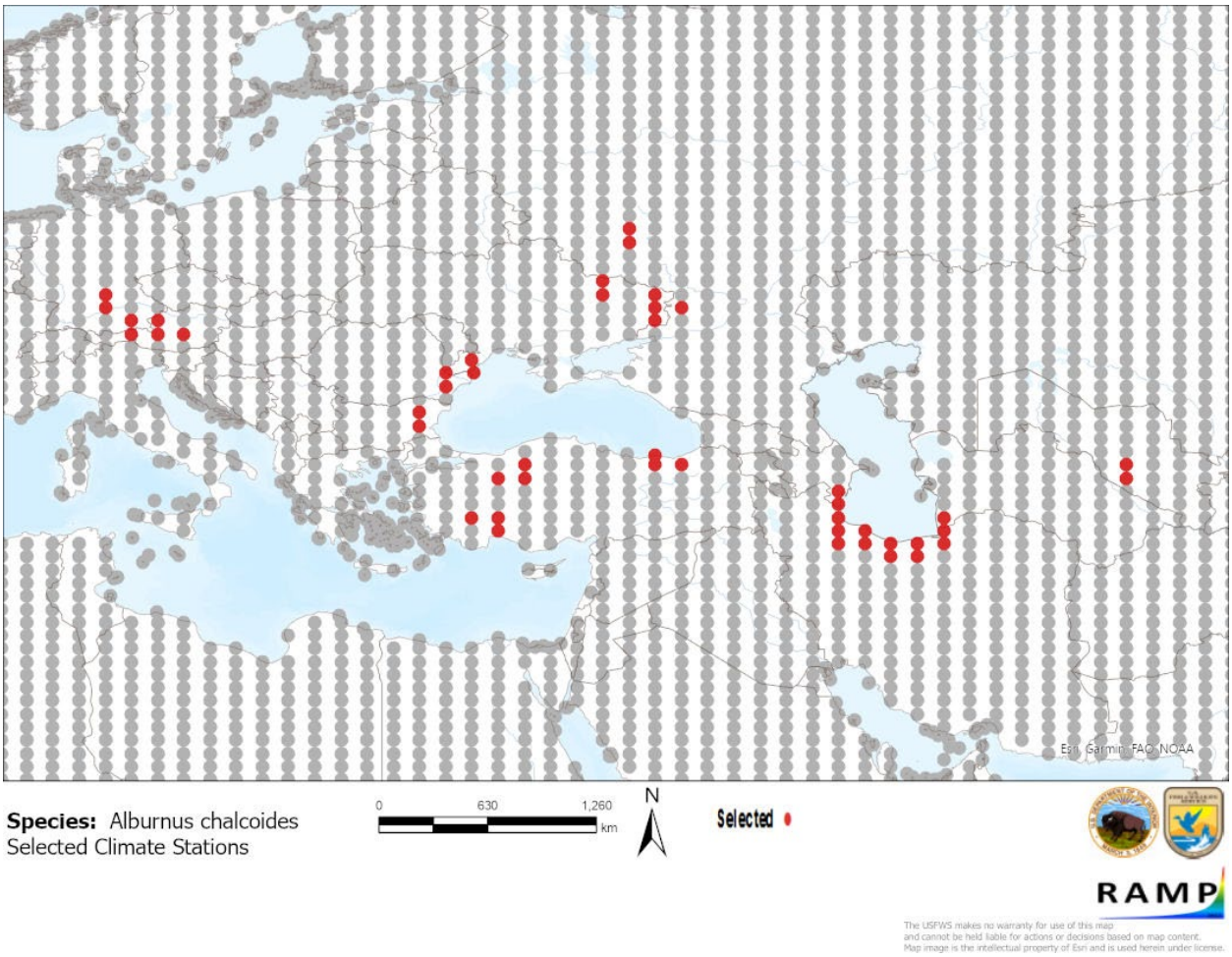

Figure 2. RAMP (Sanders et al. 2021) source map showing weather stations in eastern Europe and western Asia selected as source locations (red; Germany, Austria, Bulgaria, Romania, Ukraine, Russia, Turkey, Iran, Azerbaijan, Turkmenistan, and Uzbekistan) and non-source locations (gray) for *Alburnus chalcoides* climate matching. Source locations from GBIF Secretariat (2021). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

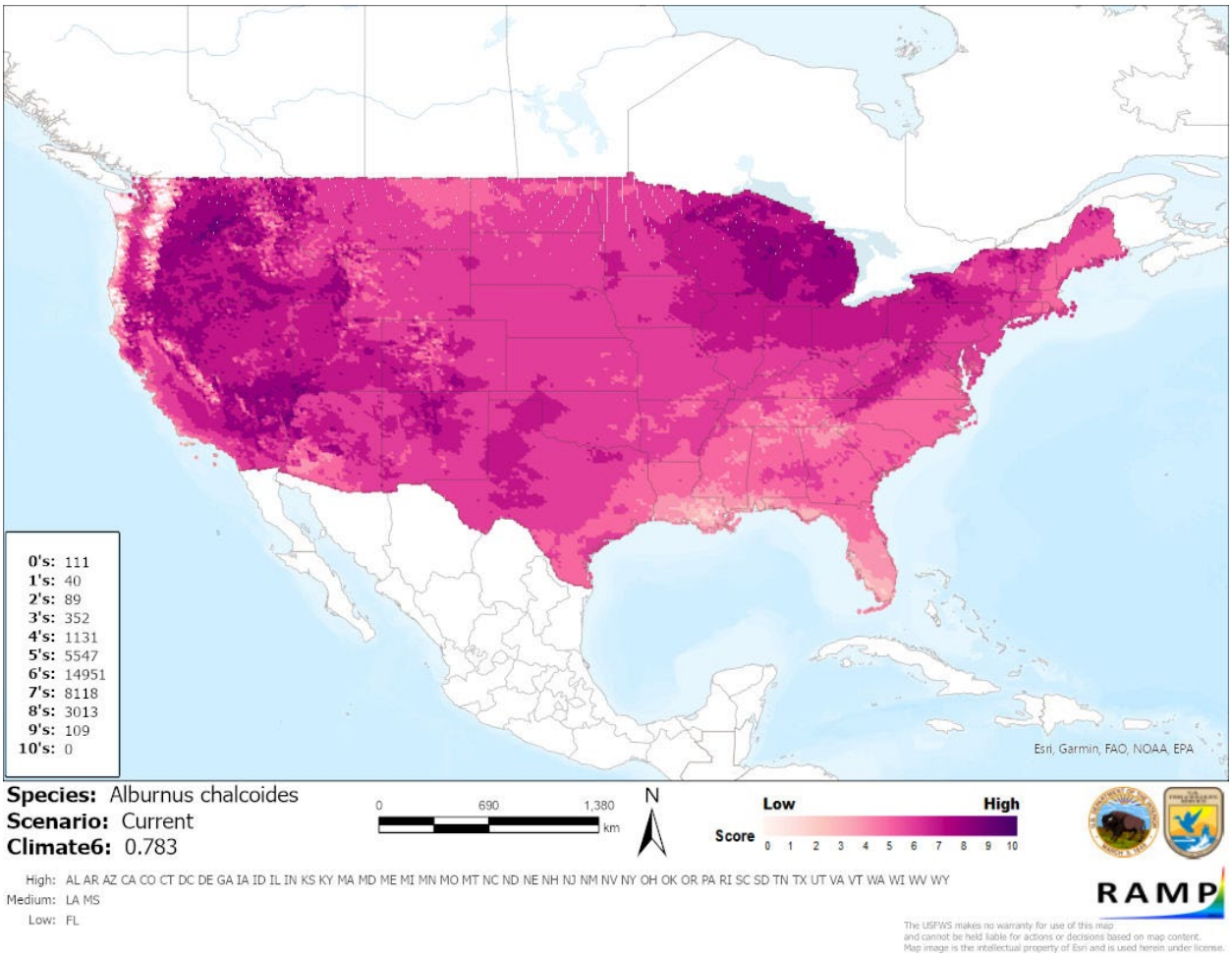

Figure 3. Map of RAMP (Sanders et al. 2021) climate matches for *Alburnus chalcoides* in the contiguous United States based on source locations reported by GBIF Secretariat (2021). Counts of climate match scores are tabulated on the left. 0/Light Pink = Lowest match, 10/Dark Purple = Highest match.

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 is considerable taxonomic uncertainty for *Alburnus chalcoides* leading to potential misidentifications in the literature. Records of introductions were found for China and Turkey; in Turkey, introductions have resulted in establishment outside the native range. There is no

information on impacts of introductions available. Additionally, georeferenced occurrences within its native range were limited. Therefore the certainty of assessment is low.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Alburnus chalcoides, Danube Bleak or Caspian Shemaya, is a cyprinid found in the Caspian, Aral, and Black Sea drainages in eastern Europe and western Asia (Afghanistan, Armenia, Azerbaijan, Georgia, Iran, Kazakhstan, Turkey, Uzbekistan, Austria, Bulgaria, Czech Republic, Germany, Greece, Hungary, Moldova, Romania, Russia, Serbia, Slovakia, Switzerland, and Ukraine). It is harvested commercially in parts of its native range. *A. chalcoides* has been reported as established outside its native range within Turkey, where the government has stocked the species into reservoirs. *A. chalcoides* has also been introduced to China for aquaculture, but no reports were found to suggest that it has become established in the wild in China. There is no information available on impacts or lack thereof from nonnative populations in Turkey. The history of invasiveness is classified as Data Deficient. The climate match for the contiguous United States was high, with the highest matches occurring in the Rocky Mountains, parts of the Southwest, the Great Lakes region, the central Appalachian Mountains, and around Lake Champlain. The certainty of assessment was low due to the limited information regarding this species history of introduction and lack of information regarding impacts. The overall risk for this species 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: *Alburnus chalcoides* can hybridize with other species in the genera *Leuciscus* and *Alburnus*.**
- **Overall Risk Assessment Category: Uncertain**

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