U.S. Fish & Wildlife Service

Caucasian Dwarf Goby (*Knipowitschia caucasica*)

Ecological Risk Screening Summary

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1 Native Range and Status in the United States

Native Range

From Froese and Pauly (2016):

"Eurasia: along the coasts of Black, Azov, Caspian and Aegean seas west to Aliakmon drainage (Greece). Identity of the population along the eastern shore of Adriatic is questionable."

From Kottelat and Freyhof (2007):

"Has been recorded from freshwater lakes and lowland rivers more than 100 km from coast."

Status in the United States

From Baker et al. (2015):

"Status: Not established in North America, including the Great Lakes"

Means of Introductions in the United States

From Baker et al. (2015):

"Status: Not established in North America, including the Great Lakes"

Remarks

From Baker et al. (2015):

"Due to its euryhaline nature, *Knipowitschia caucasica* may be able to survive ballast water management practices."

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

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 Gobioidei
Family Gobiidae
Genus *Knipowitschia*
Species *Knipowitschia caucasica* (Berg, 1916)"

From Kottelat and Freyhof (2007):

"*Knipowitschia* is sometimes considered a synonym of *Pomatoschistus*. This is based on the study of *K. caucasica* only and awaiting the study of other species, we retain the genus as distinct. The variability (morphological and ecological) reported for *K. caucasica* suggests that this is a complex of several species."

From Eschmeyer et al. (2017):

"***caucasicus, Pomatoschistus*** Berg [L. S.] (ex Kavraisky) 1916:409 [Les Poissons des eaux douces de la Russie] Swamp near Batum and Inkit Lake near Pitzunda, Georgia (Eurasia). Syntypes: BMNH 1896.3.28.26-28 [ex Tiflis Mus.] (3) Lake Temirgorje, Georgia, Eurasia. Appeared first as *Gobius caucasicus* Kavraiskii [Kawrajsky] in Radde 1899, not available. Syntypes in BMNH are from a locality mentioned under *Gobius caucasicus* Kavraiskii in Radde 1899. Name usually seen as Kravraisky. •Valid as *Pomatoschistus caucasicus* Berg 1916 -- (Berg 1949:1065). •Valid as *Knipowitschia caucasica* (Berg 1916) -- (Miller 1973:497, Miller in Whitehead et al. 1986:1047, Economidis & Miller 1990:152, Coad 1995:30, Ahnelt et al. 1995:49, Bianco et al. 1996:53, Kottelat 1997:177, McKay & Miller 1997:1464, Reshetnikov et al. 1997:754, Vasil'eva 1998:135, Coad 1998:103, Vasil'eva & Kuga 2001:159, Gabrielyan 2001:28, Bogutskaya et al. 2001:47, Bilecenoglu et al. 2002:133, Kovačić & Pallaoro 2003:131, Vasil'eva 2003:S47, Miller et al. in Miller 2004:343, Bogutskaya & Naseka 2004:224, Vassilev & Pehlivanov 2005:182, Kovačić 2005:278, Fricke et al. 2007:104, Kottelat & Freyhof 2007:569, Vasil'eva 2007:158, Ninua & Japoshvili 2008:172, Miller 2009:1505, Esmaeili et al. 2010:377, Ahnelt 2011:26, Kovačić & Patzner 2011:186, Freyhof 2011:283, Halasi-Kovács et al. 2011:257, Parin et al. 2014:489, Jouladeh-Roudbar et al. 2015:898, Barbieri et al. 2015:107, Çiçek et al. 2015:152, Vukić et al. 2016:368, Ahnelt 2016:9195). **Current status:** Valid as *Knipowitschia caucasica* (Berg 1916). Gobiidae: Gobionellinae."

Size, Weight, and Age Range

From Froese and Pauly (2016):

"Maturity: Lm ?, range 2 - 2.3 cm
Max length: 5.0 cm TL male/unsexed; [Miller 1986]"

"Lives less than 2 years."

From Baker et al. (2015):

"Size: 12.8 - 41.1 mm total length"

Environment

From Froese and Pauly (2016):

"Marine; freshwater; brackish; demersal; amphidromous [McDowall 1997]; depth range 0 - 2 m [Miller 1990]."

"Inhabit fresh to hyper-saline waters (to 55 ppt) of lakes, estuaries and lagoons, in shallow areas with much weed."

From Baker et al. (2015):

"*Knipowitschia caucasica* is a goby fish that is widespread in the Ponto-Caspian basin and prefers habitats with sandy bottoms and shallower waters (Daoulas et al. 1993). It can live in

fresh and hypersaline waters, but has a preference for mesohaline to hyperhaline shallow waters in coastal lakes and lagoons (Gheorghiev 1964, Kevrekidis et al. 1990). *Knipowitschia caucasica* is found in the freshwater Lake Trichonis of Greece, and the Evros delta that has 24-36‰ salinity (Daoulas et al. 1993, Kevrekidis et al. 1993). This species occurs in waters with temperatures of 1.6-26.9°C and oxygen levels of 5.3-8.96 ppm (Gülle et al. 2008, Kevrekidis et al. 1993). During the winter, it migrates to deeper waters (Baimov 1963) and occurs in waters that have ice cover in the winter (Reid and Orlova 2002)."

Climate/Range

From Froese and Pauly (2016):

"Temperate; 47°N - 38°N, 12°E - 61°E"

Distribution Outside the United States

Native

From Froese and Pauly (2016):

"Eurasia: along the coasts of Black, Azov, Caspian and Aegean seas west to Aliakmon drainage (Greece). Identity of the population along the eastern shore of Adriatic is questionable."

From Kottelat and Freyhof (2007):

"Has been recorded from freshwater lakes and lowland rivers more than 100 km from coast."

Introduced

From Froese and Pauly (2016):

"Introduced in the Aral Sea and is now extirpated."

From FAO (2016):

"*Knipowitschia caucasica* introduced to Uzbekistan from"
"Date of introduction:"
"Status of the introduced species in the wild: Established"

"*Knipowitschia caucasica* introduced to Kazakhstan from"
"Date of introduction:"
"Status of the introduced species in the wild: Probably established"

From Baker et al. (2015):

"*Knipowitschia caucasica* has been introduced to the Aral Sea (Baimov 1963). It has been introduced to reservoirs in the Metsamor River and Ararat Valley reservoirs of Armenia (Gabrielyan 2001). It has been recorded in the Morinj Bay, Kaštela Bay, Prokljan Lake, Karišnica River, the mouth of the Pantan River, and Cetina River in Croatia (Kovacic and

Pallaoro 2003). It has been accidentally introduced to Lake Trichonis, and has been recorded in the Aliakmon and Itamos Rivers in Greece (Daoulas et al. 1993, Economidis et al. 1981, Economidis and Miller 1990). A *Knipowitschia caucasica* female has been collected in a freshwater Szamos River in the Carpathian basin, Hungary, and it is thought to be accidentally introduced (Halasi-Kovács et al. 2011). It has been reported to occur in Lake Manyas, Lake Sapanca, Sea of Marmora, Lake Eber, Lake Egirdir, and Demirköprü Barrier Lake in Turkey (Economidis and Miller 1990, Gheorghiev 1964, Van Neer et al. 1999)."

From Antal et al. (2015):

"More recently, a new sand goby species, the Caucasian dwarf goby (*Knipowitschia caucasica*) has been found in the Tisza River basin (Halasi-Kovács et al., 2011; Harka et al., 2013, 2015a, 2015b)."

Means of Introduction Outside the United States

From FAO (2016):

"Reasons of Introduction: 1) accidental"

From Baker et al. (2015):

"This species occurs in Lake Egirdir, Lake Eber, and Demirköprü, and is speculated to have been introduced by anthropogenic means due to this fish's inability to cross hydroelectric dams to migrate up strong currents from the Asku River (Van Neer et al. 1999). No specimens of *Knipowitschia caucasica* were found in these lakes prior to 1992, but were abundant in Lake Egirdir by 1996, and were found in Lake Eber in 1997 and Demirköprü Dam Lake in 1998. There is a possibility that *Knipowitschia caucasica* was unintentionally introduced in these lakes with the stocking of common carp fry from Ipsala/Edirne hatcheries, which are located in the same region where this species is common."

Short Description

From Froese and Pauly (2016):

"Dorsal spines (total): 7; Dorsal soft rays (total): 7-8; Anal spines: 1; Anal soft rays: 7 - 9; Vertebrae: 31 - 32. Anterior oculoscapular, preopercular, and sometimes posterior oculoscapular, canals present; body squamation complete on caudal peduncle and along at least lateral midline to axil. Males with 4-5 major vertical bars."

From Kottelat and Freyhof (2007):

"Distinguished from other species of *Knipowitschia* in Europe by: body with 4-8 dark bars in breeding males / back naked in front of origin of second dorsal / anterior extremity of anterior oculoscapular canal in front of middle of eye (pore λ) (Fig. 92B[in source material]) / posterior oculoscapular canal present / females with yellow belly in life / 31-38 total scales in midlateral series."

From Baker et al. (2015):

"This is a small goby fish. Females are pale fawn, and their backs are finely stippled to the end of D2. The males have vertical dark bars that are thickest at the D1 and D2 origins. The body squamation is complete on the caudal peduncle and along the lateral midline to axilla (Economidis and Miller 1990). It is identified by an anterior oculoscapular with a single pore κ and paired pores λ (Halasi-Kovács et al. 2011). The posterior oculoscapular canal is presented as a furrow. This species lacks a perianal organ. The caudal fin is symmetrical. It possesses 33 scales in lateral series. Its head is small with a short postorbital distance of about 3 mm."

Biology

From Froese and Pauly (2016):

"Feed on small crustaceans and chironomid larvae [Miller 1990]; larvae of the mussel *Dreissena polymorpha* [Kottelat and Freyhof 2007]. […] Spawns after first winter. Eggs are attached to the roof of a cavity under stones, plant material or shells and are defended by male. Postlarvae are pelagic. [Kottelat and Freyhof 2007]."

From Kottelat and Freyhof (2007):

"Spawns in March – July, up to 4 portions of eggs."

From Baker et al. (2015):

"This fish is a bottom feeder and preys on benthic amphipods, polychaetes, chironomid larvae, copepods, cladocerans, and planktonic organisms (Kevrekidis et al. 1990). In Lake Trichonas, *Knipowitschia caucasica* feeds primarily on copepods and *Dreissena polymorpha* larvae (Daoulas et al. 1993). The exact composition of its diet varies with its location. In the Aral Sea, it is one of the most abundant fish and is not a very important component of the diets of piscivorous fish (Baimov 1963)."

"*Knipowitschia caucasica* exhibits short generation time and early maturation (Kevrekidis et al. 1990). Eggs are found attached to gravel, dead bivalve shells, and dead roots of reeds (Baimov 1963). After hatching, the fish grows rapidly in its first summer and continues through the fall, reaching maturity after its first winter. This species reproduces from the end of April to the end of July in water temperatures of 15-27°C. Fecundity in the North Aegean Sea was 60-217 eggs, with an average of 109.8 eggs, while it was 97-343 in the Aral Sea. The highest reported fecundity was 1389 eggs in the Black Sea (Gheorghiev 1964)."

Human Uses

No information on human uses of *Knipowitschia caucasica* was found.

Diseases

No records of OIE reportable diseases were found.

Antal et al. (2015) lists the following parasites as found in *Knipowitschia caucasica*: *Cryptobia branchialis* Nie (in Chen, 1956), *Apiosoma* sp., *Trichodina mutabilis* Kazubski & Migala, 1968, *Hemiophrys branchiarum* (Weinrich, 1924), *Chilodonella cyprinid* Moroff, 1902, *Ichthyophthirius multifiliis* Fouquet, 1876, *Proteocephalus* sp. (l), *Nicolla skrjabini* (Iwanitzky, 1928), *Echinochasmus* sp. (l), *Apatemon gracilis* (Rudolphi, 1819), and *Camallanus truncatus* (Rudolphi, 1814).

From Baker et al. (2015):

"*Knipowitschia caucasica* is a host to parasites *Aphalloides coelomicola*, *Cryptocotyle* spp., *Paratimonia gobii*, *Timoniella imbutiforme*, and *Dichelyne minutus* (Krasnoyd et al. 2012);"

Threat to Humans

From Froese and Pauly (2016):

"Harmless"

From Baker et al. (2015):

"It has not been reported that *Knipowitschia caucasica* 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

From Baker et al. (2015):

"There are no reports on how it affects or interacts with other species. There is insufficient information available to determine whether *Knipowitschia caucasica* reduces water quality. It is unknown whether this species alters the physical components of the ecosystem."

4 Global Distribution

Figure 1. Known global distribution of *Knipowitschia caucasica*. Map from GBIF (2013).

5 Distribution Within the United States

No records of *Knipowitschia caucasica* in the United States were found.

6 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Knipowitschia caucasica* was high in the Great Lakes, parts of the New England coast, and the west coast. It was low along the southern Atlantic, Gulf, and Pacific Northwest coasts, the extreme southwest, and parts of the mid-west and Great Plains. The match was medium everywhere else. The Climate 6 score (Sanders et al. 2014; 16 climate variables; Euclidean distance) for the Continental U.S. was 0.218, high, and high in Arizona, California, Colorado, Connecticut, Georgia, Idaho, Illinois, Indiana, Maine, Massachusetts, Michigan, Nevada, New Mexico, New York, Ohio, Oregon, Pennsylvania, Rhode Island, Utah, Washington, West Virginia, and Wisconsin.

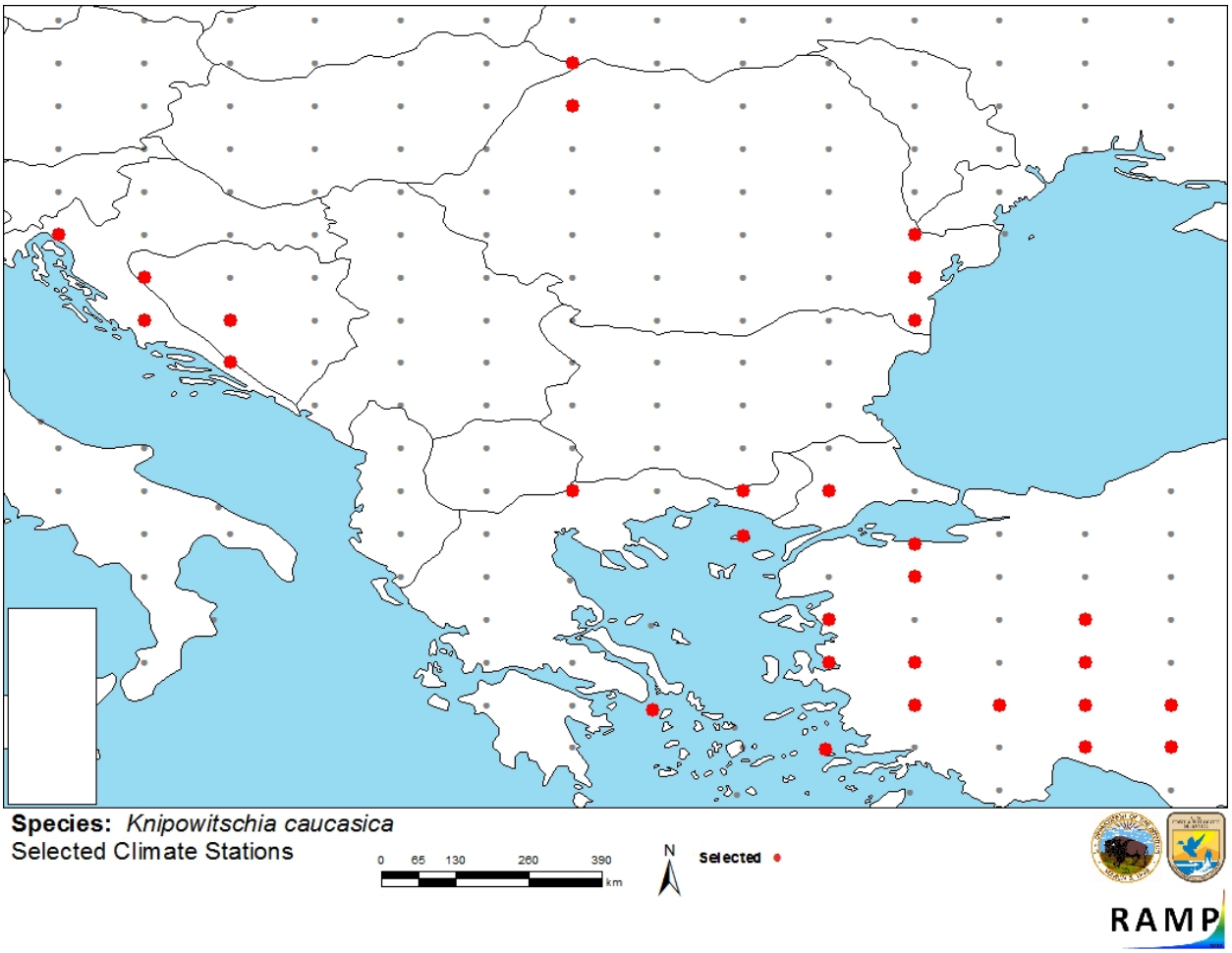

Figure 2. RAMP (Sanders et al. 2014) source map showing weather stations selected as source locations (red) and non-source locations (grey) for *Knipowitschia caucasica* climate matching. Source locations from GBIF (2013).

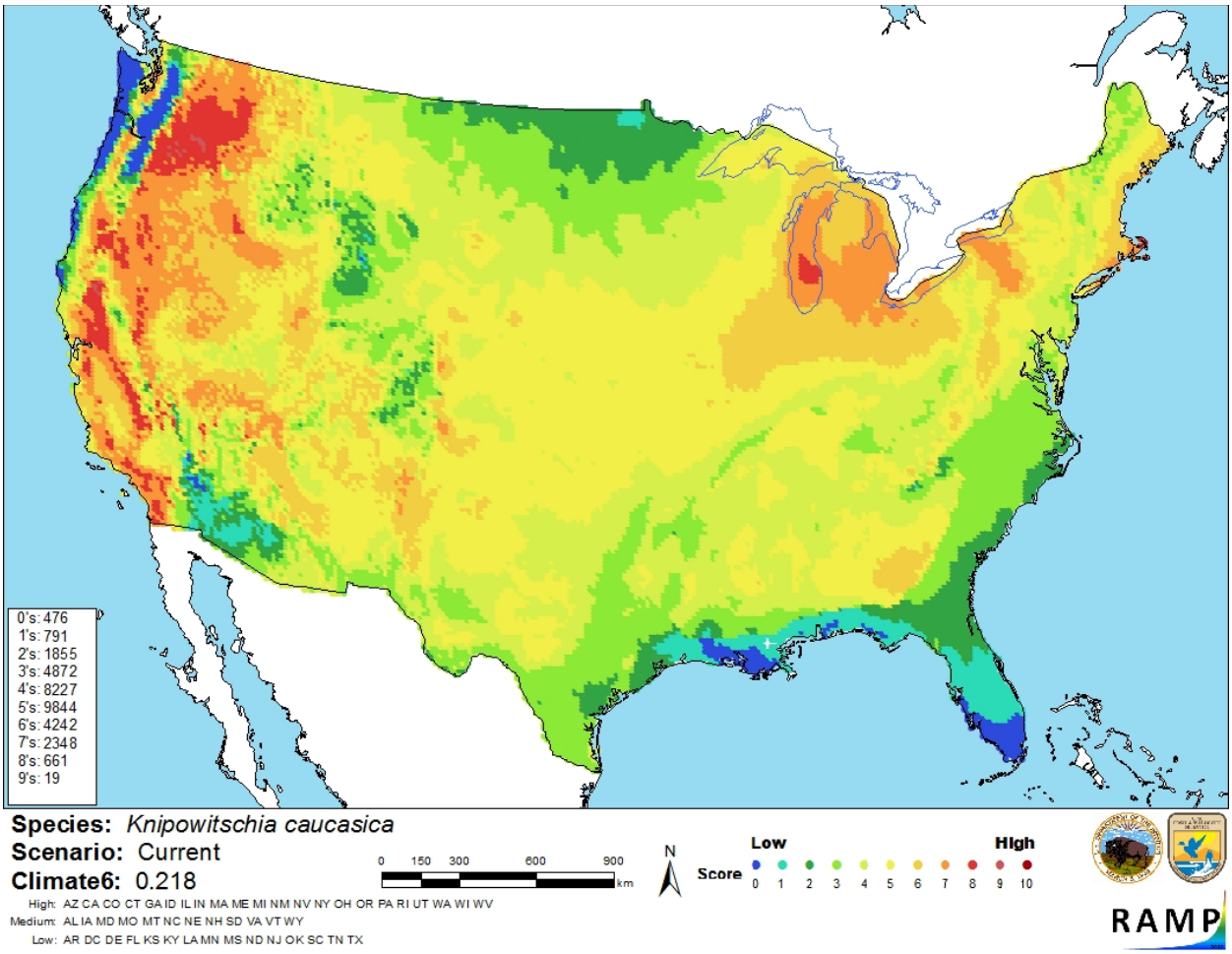

Figure 3. Map of RAMP (Sanders et al. 2014) climate matches for *Knipowitschia caucasica* in the contiguous United States based on source locations reported by GBIF (2013). 0 = Lowest match, 10 = Highest match.

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
$0.000 \leq X \leq 0.005$	Low
$0.005 < X < 0.103$	Medium
≥ 0.103	High

7 Certainty of Assessment

The certainty of assessment for *Knipowitschia caucasica* is medium. There was adequate ecological and biological information available. Records of introductions were found but there was no information available about any impacts from those introductions.

8 Risk Assessment

Summary of Risk to the Contiguous United States

The history of invasiveness is not documented for *Knipowitschia caucasica*. There are records of introductions that resulted in established populations but there was no information found on impacts of those introductions. The climate match is high. It indicates that if this species was introduced, there is appropriate climate for this species to establish in the Great Lakes, New England coast, and in the west. The certainty of the assessment is medium. The overall risk assessment category is uncertain.

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**

9 References

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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