

# Gudgeon (*Gobio gobio*)

## Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, April 2011

Revised, April 2018

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## 1 Native Range and Status in the United States

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### Native Range

From Froese and Pauly (2018):

“Europe: Atlantic Ocean, North and Baltic Sea basins, from Loire drainage eastward, eastern Great Britain, Rhône and Volga drainages, upper Danube and middle and upper Dniestr and Dniepr drainages; in Finland, north to about 61°N. [...] Eastern and southern limits unclear [Kottelat and Freyhof 2007]. Occurs as far east as Korea [Robins et al. 1991].”

From Freyhof (2011):

“Austria; Belarus; Belgium; Czech Republic; Denmark; Estonia; Finland; France; Germany; Latvia; Liechtenstein; Lithuania; Luxembourg; Netherlands; Norway; Poland; Russian Federation; Slovakia; Sweden; Switzerland; Ukraine; United Kingdom”

## Status in the United States

This species has not been reported as introduced or established in the United States. No documentation was found to suggest trade of this species occurs in the United States.

## Means of Introduction into the United States

This species has not been reported as introduced or established in the United States.

## Remarks

From Freyhof (2011):

“Usually considered to be a morphologically variable species, with different morphologies reflecting adaptations to different habitats. Kottelat and Freyhof's [*sic*; 2007] morphological and molecular data indicate that in fact several species are confused under the name *G. gobio* in the Black and Caspian Sea basins.”

From DAISIE (2018):

“Synonyms

*Bungia nigrescens* Keyserling, 1861  
*Cobitis fundulus* Wulff, 1765  
*Cyprinus gobio* Linnaeus, 1758  
*Gobio gobio acutipinnatus* (non Menschikov, 1939)  
*Gobio gobio albanicus* Oliva, 1961  
*Gobio gobio bulgarica* Drensky, 1926  
*Gobio gobio carpathicus krymensis* Delyamure, 1937  
*Gobio gobio carpathicus sarmaticus* Slastenenko, 1934  
*Gobio gobio carpathicus* Vladykov, 1925  
*Gobio gobio feraeensis* Stephanidis, 1973  
*Gobio gobio gymnostethus* Ladiges, 1960  
*Gobio gobio holurus* Fowler, 1976  
*Gobio gobio insuyanus* Ladiges, 1960  
*Gobio gobio intermedius* Battalgi, 1944  
*Gobio gobio kovatchevi* Chichkoff, 1937  
*Gobio gobio krymensis* Banarescu & Nalbant, 1973  
*Gobio gobio lepidolaemus holurus* Berg, 1914  
*Gobio gobio lepidolaemus lindbergi* Turdakov & Piskarev, 1955  
*Gobio gobio lepidolaemus skadarensis* Karaman, 1937  
*Gobio gobio longicirris* Berg, 1914  
*Gobio gobio magnicapitata* Gundrizer, 1967

*Gobio gobio microlepidotus* Battalgi, 1942  
*Gobio gobio muresia* Jaszfalusi, 1951  
*Gobio gobio nikolskyi* Turdakov & Piskarev, 1955  
*Gobio gobio ohridana* Karaman, 1924  
*Gobio gobio ohridanus* Karaman, 1924  
*Gobio gobio prosopyga* Berg, 1914  
*Gobio gobio saramaticus* Berg, 1949  
*Gobio gobio sarmaticus* Berg, 1949  
*Gobio gobio sibiricus* Nikolsky, 1936  
*Gobio fluviatilis* Cuvier, 1842  
*Gobio fluviatilis cynocephalus* (non Dybowski, 1869)  
*Gobio fluviatilis lepidolaemus* Kessler, 1872  
*Gobio gobio*  
*Gobio gobio balcanicus* Dimovski & Grupche, 1977  
*Gobio gobio brevicirris* Berg, 1914  
*Gobio gobio gobio* (Linnaeus, 1758)  
*Gobio gobio katopyga* Berg, 1914  
*Gobio gobio lepidolaemus* Kessler, 1872  
*Gobio latus* Anikin, 1905  
*Gobio lepidolaemus causacica* Kamensky, 1901  
*Gobio lepidolaemus* Kessler, 1872  
*Gobio obtusirostris* Valenciennes, 1842  
*Gobio phoxinoides* De la Pylaie, 1835  
*Gobio saxatilis* Koch, 1840  
*Gobio vulgaris* Heckel, 1836  
*Leuciscus gobio* (Linnaeus, 1758)”

## 2 Biology and Ecology

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### Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2018):

“Kingdom Animalia  
   Subkingdom Bilateria  
     Infrakingdom Deuterostomia  
       Phylum Chordata  
         Subphylum Vertebrata  
           Infraphylum Gnathostomata  
             Superclass Actinopterygii  
               Class Teleostei  
                 Superorder Ostariophysii  
                   Order Cypriniformes  
                     Superfamily Cyprinoidea  
                       Family Cyprinidae  
                         Genus *Gobio*  
                           Species *Gobio gobio* (Linnaeus, 1758)”

“Current Standing: valid”

## **Size, Weight, and Age Range**

From Froese and Pauly (2018):

“Maturity:  $L_m$  9.3 range ? - ? cm

Max length : 21.0 cm TL male/unsexed; [Verreycken et al. 2011]; common length : 12.0 cm TL male/unsexed; [Maitland and Campbell 1992]; max. published weight: 220.00 g [Maitland and Campbell 1992]; max. reported age: 8 years [Maitland and Campbell 1992]”

## **Environment**

From Froese and Pauly (2018):

“Freshwater; brackish; benthopelagic; pH range: 7.0 - 7.5; dH range: 10 - 20; potamodromous.”

“[...] 2°C - 18°C [Riehl and Baensch 1991; assumed to be recommended aquarium water temperatures]”

## **Climate/Range**

From Froese and Pauly (2018):

“Temperate; [...] 67°N - 36°N, 10°W - 142°E”

## **Distribution Outside the United States**

Native

From Froese and Pauly (2018):

“Europe: Atlantic Ocean, North and Baltic Sea basins, from Loire drainage eastward, eastern Great Britain, Rhône and Volga drainages, upper Danube and middle and upper Dniestr and Dniepr drainages; in Finland, north to about 61°N. [...] Eastern and southern limits unclear [Kottelat and Freyhof 2007]. Occurs as far east as Korea [Robins et al. 1991].”

From Freyhof (2011):

“Austria; Belarus; Belgium; Czech Republic; Denmark; Estonia; Finland; France; Germany; Latvia; Liechtenstein; Lithuania; Luxembourg; Netherlands; Norway; Poland; Russian Federation; Slovakia; Sweden; Switzerland; Ukraine; United Kingdom”

Introduced

Froese and Pauly (2018) report that *Gobio gobio* has been introduced and become established in Ireland, Italy, Norway, Spain, Portugal, and Morocco.

From McDowall (2008):

“Gudgeon became established in [an] Auckland [New Zealand] pond. Once discovered, attempts were made to exterminate them, and as far as is known, there are now no gudgeon in New Zealand.”

## Means of Introduction Outside the United States

Froese and Pauly (2018) report the following reasons for introduction: accidental (Ireland), unknown (Italy, Portugal), bait (Norway), fisheries (Spain), and forage (Morocco).

From McDowall (2008):

[...] gudgeon (*Gobio gobio*) were introduced illegally [to New Zealand] with a view to establishing populations for anglers.”

## Short Description

From Froese and Pauly (2018):

“Dorsal spines (total): 2 - 3; Dorsal soft rays (total): 5-7; Anal spines: 2-3; Anal soft rays: 6 - 8; Vertebrae: 39 - 41. Diagnosed from other congeners in Europe by the possession of the following characters: barbel reaching beyond anterior eye margin, usually to middle of eye; snout length greater than postorbital distance; head length 26-30% SL; eye diameter 5-7% SL; 1.0-1.4 times in interorbital distance in over about 6 cm SL specimens (less in smaller ones), 2.4-2.8 times in head depth; head depth 15-17% SL at nape, 43-51% HL at eye; body depth 19-23% SL; head width 14-16% SL, 49-57% HL; caudal peduncle depth 30-34% HL; breast naked between pectorals; scales between anus and anal origin 4-5; scales on lateral line usually 39-42 + 2; and scales around caudal peduncle usually 12-14 [Kottelat and Freyhof 2007]. Caudal fin with 19 rays [Spillman 1961]. Scalar formula: 38-45 [Keith and Allardi 2001].”

## Biology

From Froese and Pauly (2018):

“Occurs in nearly all types of riverine and lacustrine habitats with sand bottom. Found in small mountain streams, large lowland rivers and large lakes [Kottelat and Freyhof 2007]. Inhabits fast flowing rivers with sand or gravel bottom but may also occur in still waters. Forms schools. Feeds on insect larvae, mollusks, and crustaceans. Normally active during the day but if they are disturbed, in particular, by predators, they can defer their activity to periods when light intensity is weak. Capable of emitting squeaking sounds. These vocalizations, which is a means by which fish communicate with each other, vary with the degree of activity and the temperature and are independent of the season of reproduction [Billard 1997]. Breeds in shallow water over stones, sand or plant material. Eggs are released above substrate and drift with current, sinking to bottom and sticking to substrate. Larvae and juveniles occur on the bottom and prefer detritus-rich sandy habitats and low current [Kottelat and Freyhof 2007].”

“Spawns once a year for several years in low productivity streams, but exhibits multiple spawning within a season in high productivity environments [Mann et al. 1984; McEvoy and McEvoy 1992].”

From Freyhof (2011):

“Gregarious. Lives up to five years.”

## Human Uses

From Froese and Pauly (2018):

“Fisheries: commercial; aquarium: commercial; bait: usually”

## Diseases

From Fabian et al. (2013):

“Tissue samples taken from [...] gudgeon, *Gobio gobio* (L.) [and several other species] were found to be positive for KHV [koi herpesvirus] with a large variation in prevalence and a concentration range of 1–180 copies per 1250 ng DNA [...]”

### **Koi herpesvirus disease is OIE-reportable.**

From Ortega et al. (1995):

“Upstream and downstream from rainbow trout farms in which IPN [infectious pancreatic necrosis] virus was detected, we could isolate this pathogen from nase and gudgeon, fish species living in the rivers. This means that these species act as asymptomatic carriers of the virus, as observed in previous studies (Ortega, 1991).”

From Rehulka et al. (2015):

“An outbreak [of *Vibrio cholerae* infection] occurred in wild populations of [several fish species including] gudgeon, *Gobio gobio* (Linnaeus, 1758) [...]”

“Strains of *V. cholerae* non-O1/non-O139 can on rare occasion cause a severe cholera-like disease, but they are usually isolated from patients with mild diarrhoea and extra-intestinal infections, from seafood and from the environment. These strains usually do not produce cholera enterotoxin.”

From Blažek et al. (2008):

“Seasonal changes in occurrence, infracommunity composition and microhabitat distribution of the monogenean parasites of gudgeon *Gobio gobio* (L.) were studied during two years in the River Haná (Czech Republic). Altogether 212 specimens of gudgeon were examined and a total of 6456 specimens of eight monogenean species were recorded: *Dactylogyrus cryptomeris*,

*Gyrodactylus gobiensis*, *Gyrodactylus gobii*, *Gyrodactylus gasterostei*, *Gyrodactylus vimbi*, *Gyrodactylus markakulensis*, *Gyrodactylus sedelnikowi* and *Paradiplozoon homoion*.”

“Monogeneans are common members of fish parasite communities in freshwater and marine habitats.”

## Threat to Humans

From Froese and Pauly (2018):

“Harmless”

## 3 Impacts of Introductions

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From Winfield et al. (2011):

“Introductions of fish species have now occurred in all of the largest lakes of Scotland (Loch Lomond), Northern Ireland (Lough Neagh), Wales (Llyn Tegid) and England (Windermere). [...] Of the 10 introduced (or alien or non-native) species documented above, four of them (common bream, gudgeon, roach and ruffe) have established abundant populations. Although causality has not been demonstrated, two of these species (roach and ruffe) have apparently caused or currently threaten harm, supporting the hypothesis that at least some of these introductions have become invasive.”

From Hesthagen and Sandlund (2007):

“Gudgeon and sunbleak are more recent introductions to Norway and have very restricted distributions. Gudgeon was first observed in the River Numedalslågen (southern Norway) in 1991 and 1992 (Eken & Borgstrøm, 1994). Surveys carried out in 1996 and 1997 demonstrated that the abundance and distribution area of gudgeon had increased quite dramatically in this river system during the past 4–5 years, being found over a river stretch of 58 km (Pethon & Barstad, 1998). In 2004, gudgeon was also recorded in one lake in southernmost Norway. Gillnet catches indicated fairly high densities, representing several age classes (Lura, 2004).”

From Bianco and Ketmaier (2005):

“Since 1994, when studies on *G[obio] benacensis* were performed (Bianco & Taraborelli 1986, Bianco 1994, Bianco 1994 [*sic*], 1995), all the Italian populations belonged to the endemic *G. benacensis*, which was transplanted also outside its original range. At present, as a result of hidden introductions, among the examined populations, *G. gobio* was found in three basins out of the five investigated: River Meletta in northern Italy, River Assino in central and River Badolato in southern Italy where gudgeon are invasive and tend to occupy the running waters of the *Barbus* zone. Probably this species will also interfere with other rheophilic cyprinids [*sic*] species, such as barbels and the minnow *Telestes muticellus* (Bonaparte, 1837).”

“Still pure populations of *G. benacensis* survive at least in River Tagliamento near the town of San Vito al Tagliamento and in Ombrone river where the Italian gudgeon was introduced probably before the year 1983 and where it forms quite scarce populations.”

From Crivelli (2006):

“The population [of *Romanogobio benacensis*, formerly known as *Gobio benacensis*] is highly fragmented, largely due to alleged competition from the introduced *Gobio gobio*.”

“It has disappeared from several basins where it has been replaced by *Gobio gobio*.”

From Bianco (2009):

“The species was quite common in river drainages of the Padano-Venetian district (Delmastro 1982), but has since disappeared from many localities and been replaced by the introduced Danubian species *Gobio gobio*.”

From Bianco (2014):

“*Gobio benacensis* Pollini, 1816 [is a] Padano-Venetian [Italian] endemic species now relegated to very few habitats, and largely extinct in this district. The cause of its progressive extinction is mainly due to introduction of the European gudgeon, *Gobio gobio*; the two species differentiate by bio/ecological and genetic characters. In addition to reaching larger sizes (14–15 cm SL versus 80–110 in *G. benacensis*), the *G. gobio* is gregarious, forming very large communities in stream environments; *G. benacensis* is less invasive and less numerous.”



## 4 Global Distribution

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**Figure 1.** Reported global distribution of *Gobio gobio*. Map from GBIF Secretariat (2017). Because the eastern and southern limits of the distribution of *G. gobio* are “unclear” according to Froese and Pauly (2018), the above mapped occurrences reported outside of Europe were not included in the climate matching analysis as it remains unknown whether the occurrences represent established populations. The occurrence reported off the coast of France was not included in the climate matching analysis because this species occurs in brackish and freshwater environments, not marine environments (Froese and Pauly 2018).

## 5 Distribution within the United States

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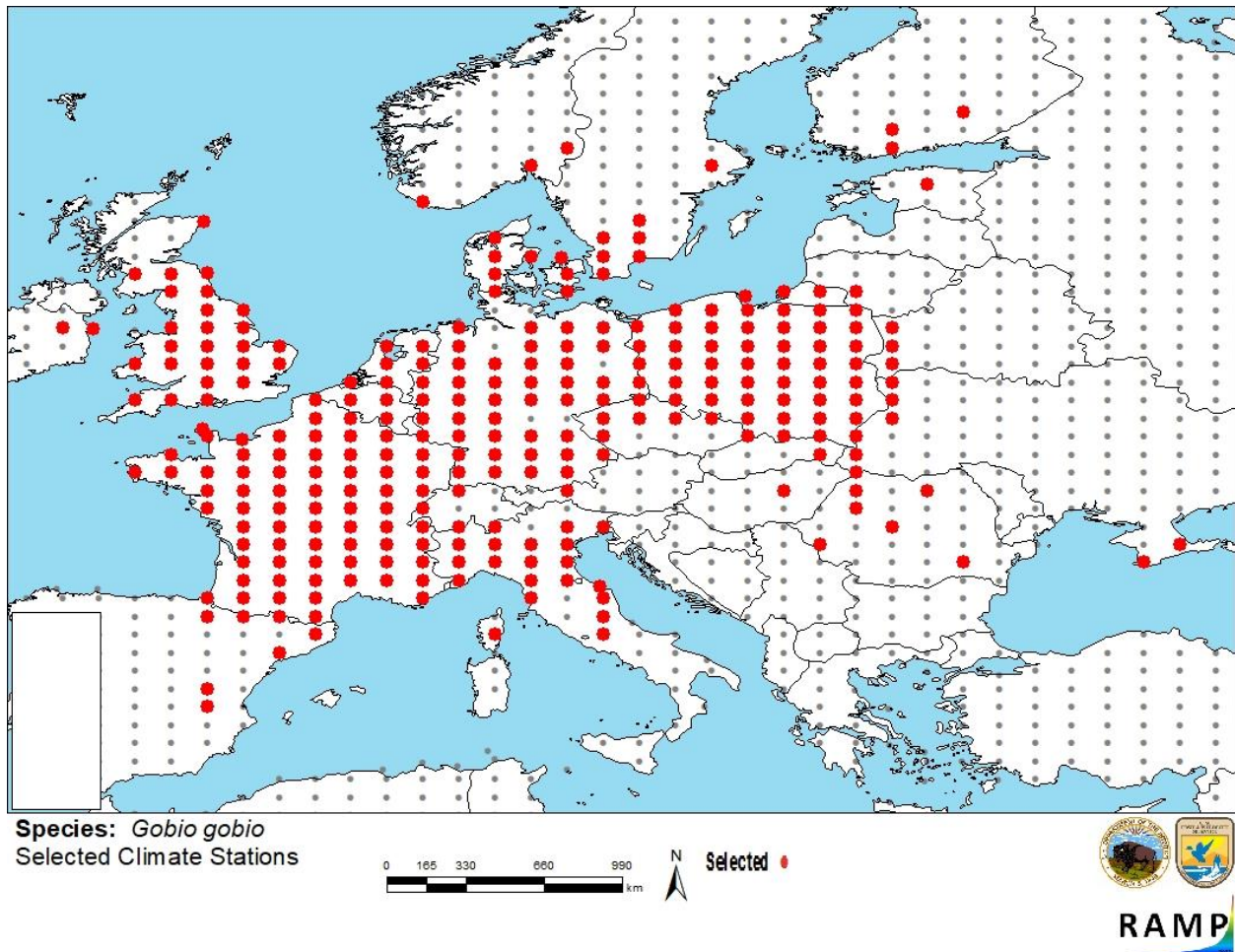
This species has not been reported in the US.

## 6 Climate Matching

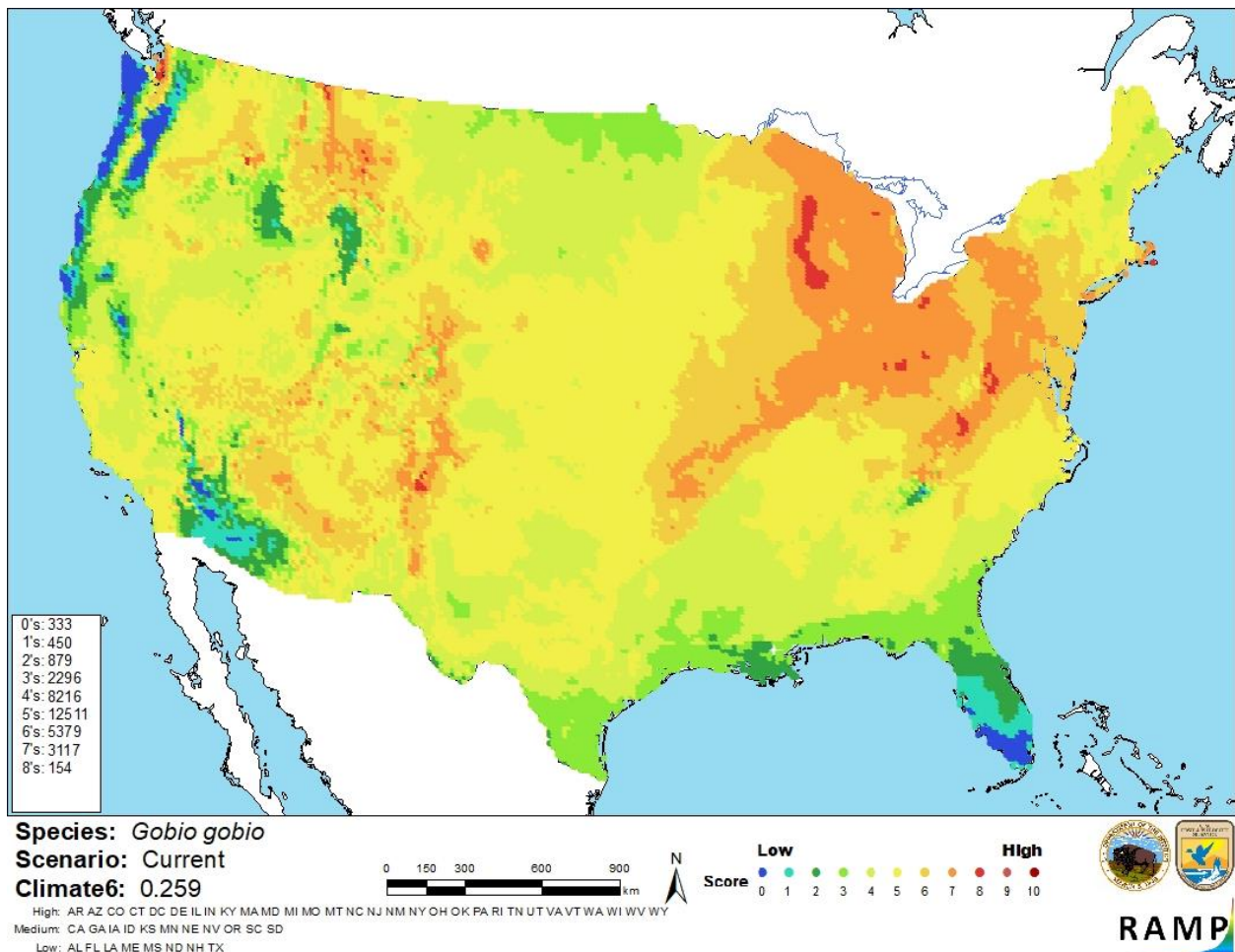
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### Summary of Climate Matching Analysis

The climate match (Sanders et al. 2014; 16 climate variables; Euclidean Distance) was high in the Great Lakes, Ohio River basin, central Appalachians, near Seattle, and in scattered locations in the Interior West. Medium matches occurred everywhere else except for areas of low match in peninsular Florida, along the Gulf Coast, in the vicinity of the Lower Colorado River in the Southwest, and along the Pacific Coast from northern California to the Olympic Peninsula of Washington. Climate 6 score indicated that the contiguous U.S. has a high climate match overall. Scores of 0.103 and greater are classified as high match; Climate 6 score for *G. gobio* was 0.259.



**Figure 2.** RAMP (Sanders et al. 2014) source map showing weather stations in Europe selected as source locations (red) and non-source locations (gray) for *G. gobio* climate matching. Source locations from GBIF Secretariat (2017).



**Figure 3.** Map of RAMP (Sanders et al. 2014) climate matches for *G. gobio* in the contiguous United States based on source locations reported by GBIF Secretariat (2017). 0=Lowest match, 10=Highest match. Counts of climate match scores are tabulated on the left.

The “High”, “Medium”, and “Low” climate match categories are based on the following table:

| Climate 6: Proportion of<br>(Sum of Climate Scores 6-10) / (Sum of total Climate Scores) | Climate Match<br>Category |
|--|---------------------------|
| $0.000 \leq X \leq 0.005$  | Low                       |
| $0.005 < X < 0.103$  | Medium                    |
| $\geq 0.103$   | High                      |

## 7 Certainty of Assessment

Information is readily available on the biology and ecology of *Gobio gobio*. The southern and eastern limits of the native distribution of *G. gobio* are uncertain, but the distribution within northern and western Europe is well known. Impacts of introduction have been documented but without a lot of detail, so the certainty of this assessment is medium.

## 8 Risk Assessment

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### Summary of Risk to the Contiguous United States

*Gobio gobio* is a cyprinid fish widely distributed across Europe and possibly through Asia. Introduced populations have become established in Norway, Ireland, Italy, Spain, Portugal, and Morocco, mostly for reasons related to angling. No introductions have yet been reported in the United States, but within the contiguous U.S., climate match is high. Introduced populations are often characterized by high abundance; the only negative impact reported is localized extinction of *Romanogobio benacensis* (formerly recognized as *Gobio benacensis*) in Italy. The mechanism of the displacement of *R. benacensis* by *G. gobio* has not been explained. The overall risk assessment category for *G. gobio* is high with medium certainty because of the continuing questions surrounding distribution and impacts of this species.

### Assessment Elements

- **History of Invasiveness: High**
- **Climate Match: High**
- **Certainty of Assessment: Medium**
- **Remarks/Important additional information: Host of the etiologic agent of the OIE-reportable koi herpesvirus disease.**
- **Overall Risk Assessment Category: High**

## 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.**

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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.**

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