Eurasian Dace (*Leuciscus leuciscus*)

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, May 2019
Revised, September 2019
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Photo: A. Harka. Licensed under CC BY 3.0. Available: https://commons.wikimedia.org/wiki/File:Leuciscus_leuciscus_Hungary.jpg. (May 2019).

1 Native Range and Status in the United States

Native Range

From Froese and Pauly (2019):

"Europe and Asia: North, Baltic, White and Barents Sea basins; Caspian basin, in Volga and Ural drainages; Black Sea basin, from Danube to Dniepr drainages; Atlantic basin, in Seine drainage; Mediterranean basin from Rhône to Arch drainages (France). Only very localized in Danube main river in Romania, in Scandinavia north of 69°N and most of cenral [*sic*] Finland."

Status in the United States

This species has not been reported in the United States. This species does not appear to be in trade in the United States.

Means of Introductions in the United States

This species has not been reported in the United States.

Remarks

A previous version of this ERSS was published in 2014.

From Froese and Pauly (2019):

"Populations from Siberia and East Asia usually referred to *Leuciscus leuciscus* are distinct species, *Leuciscus baicalensis* and *Leuciscus dzungaricus* [Kottelat and Freyhof 2007]."

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2019):

"Kingdom Animalia
Phylum Chordata
Subphylum Vertebrata
Superclass Osteichthyes
Class Actinopterygii
Subclass Neopterygii
Infraclass Teleostei
Superorder Ostariophysi
Order Cypriniformes
Superfamily Cyprinoidea
Family Cyprinidae
Genus *Leuciscus*
Species *Leuciscus leuciscus* (Linnaeus, 1758)"

From Fricke et al. (2019):

"Current status: Valid as *Leuciscus leuciscus* (Linnaeus 1758). Leuciscidae: Leuciscinae."

Size, Weight, and Age Range

From Froese and Pauly (2019):

"Maturity: Lm 17.9 range ? - ? cm
Max length : 40.0 cm TL male/unsexed; [Billard 1997]; common length : 15.0 cm TL male/unsexed; [Muus and Dahlström 1968]; max. published weight: 1.0 kg [Billard 1997]; max. reported age: 16 years [Wüstemann and Kammerad 1995]"

Environment

From Froese and Pauly (2019):

"Freshwater; brackish; benthopelagic; pH range: 6.0 - 8.0; potamodromous [Riede 2004]; depth range 1 - ? m. […] 4°C - 22°C [Wüstemann and Kammerad 1995];"

Climate/Range

From Froese and Pauly (2019):

"Temperate; […] 72°N - 41°N, 10°W - 155°E"

Distribution Outside the United States

Native

From Froese and Pauly (2019):

"Europe and Asia: North, Baltic, White and Barents Sea basins; Caspian basin, in Volga and Ural drainages; Black Sea basin, from Danube to Dniepr drainages; Atlantic basin, in Seine drainage; Mediterranean basin from Rhône to Arch drainages (France). Only very localized in Danube main river in Romania, in Scandinavia north of 69°N and most of cenral [*sic*] Finland."

Introduced

From Froese and Pauly (2019):

"Has become widespread in Europe […]."

Froese and Pauly (2019) report established introduced populations of *Leuciscus leuciscus* in France, Ireland, and "several lakes in central Italy."

From Caffrey et al. (2008):

"Dace (*Leuciscus leuciscus* L.) […] was introduced to the Munster Blackwater [river in Ireland] from Britain in 1889. Until the early 1980s dace were, more or less, restricted to this catchment (Caffrey et al. 2007). The species has since been recorded in Doon Lake and in a number of major river catchments in the south of Ireland. Dace was first recorded from the lower reaches of the River Shannon in 1994. In these catchments dace have established large sustainable populations and compete directly with resident fish for food, habitat and spawning substrates (Caffrey et al. 2007). Dace are not considered to be naturalised in Ireland as there are many catchments in which they have not yet been recorded.

From Winfield and Durie (2004):

"In Bassenthwaite Lake [English Lake District, U.K.], […] great expansions in the ruffe and a dace, *Leuciscus leuciscus* (L.), population first recorded in 1996 (Winfield et al. [2002]) were observed."

Means of Introduction Outside the United States

From Froese and Pauly (2019):

"Has become widespread in Europe and gained access to Ireland as a bait fish."

From Caffrey et al. (2007):

"In 1889 British anglers river fishing on the Munster Blackwater accidentally released a number of dace and roach (*Rutilus rutilus* L.), which were being held as live baits. This was the first introduction of both species to the country."

"While natural migration plays a large part in the spread of dace, the unregulated movement of fish by anglers may be more important. The initial introduction of dace to Ireland was carried out by British pike anglers and, more recently, coarse anglers have been known to move fish around the country. As dace feed all year round and reside in large shoals, they are highly prized by coarse anglers. Anglers often transfer fish in the hope of improving their local angling amenity. While this was not the intention of the initial introduction, it probably best explains the more recent movement of dace from one catchment to another."

Short Description

From Froese and Pauly (2019):

"Dorsal spines (total): 2 - 3; Dorsal soft rays (total): 7 - 9; Anal spines: 3; Anal soft rays: 8 - 9; Vertebrae: 42 - 46. Diagnosed from congeners in Europe by the following characters: subinferior or subterminal mouth; subequal jaw, upper jaw slightly longer; upper lip tip about level with center of eye; not projecting snout; articulation of lower jaw distinctly behind anterior margin of eye; horizontal branch of preoperculum shorter than vertical branch; and 40-50 + 1-2 scales on lateral line [Welcomme 1988]. Rarely longer than 30 cm TL; normally 47-52 scales in lateral line; anal fin concave; caudal fin forked with 19 rays [Wüstemann and Kammerad 1995]."

From Caffrey et al. (2007):

"The dace has a dorso-ventrally flattened symmetry, which makes it suited to fast flowing water. The mouth is inferior and the tail is deeply forked. The flanks are silver, darkening to a bluish green along the back. The eye is yellow."

Biology

From Froese and Pauly (2019):

"Gregarious fish which swims near the surface [Billard 1997]. Inhabits moderate to fast-flowing large streams to large rivers with rock or gravel bottom. Adults aggregate in dense swarms in winter in the lower reaches of rivers or backwaters and often migrate to spawning streams in autumn and overwinter there. Juveniles spend winter in cavities along the shores. Early juveniles occur in very shallow shoreline habitats and when they grow, they leave the shores for faster-

flowing waters. Feeding larvae thrive along shores. Prey on small invertebrates. Spawns in fast-flowing water on shallow gravel beds, often in small tributaries [Welcomme 1988]. Breeds in March and April [Billard 1997]. Pale yellow eggs are found attached to gravel and stones in shallow, flowing water [Pinder 2001]."

From Caffrey et al. (2007):

"Dace primarily inhabits fast flowing water systems, although it is also found in lowland rivers and lakes (Millere and Jones, 1997). It feeds all year round, with a peak in feeding activity during the summer. Feeding slows considerably during the winter as water temperatures decrease, although there is no winter fast (Hartley, 1947). Dace is omnivorous, with a highly varied diet (Cowx, 2001). Prey selection is seasonal. During the summer, insects, such as ephemeroptera and chironomid larvae, are common prey with algae also making up a large proportion of the diet. In winter, the algal content of the diet is much lower and detritus becomes more important, with trichopterans and molluscs being the most common animal prey (Mann, 1974; Hellawell, 1974). The dace feeds low down in the water column during winter months, but during the summer it feeds extensively off the surface. Like most small fish species, the dace resides in large, often dense, shoals and, when present in large numbers, it can seriously reduce the amount of food available to other fish species (Kennedy and McCarthy, 1965)."

"Bourgeois (1963) reported dace hybridisation with chub (*Leuciscus cephalus* L.) in mainland Europe and hybridisation with bleak (*Alburnus alburnus* L.) has also been recorded (Kennedy and McCarthy, 1965)."

Human Uses

From Caffrey et al. (2007):

"Where present in Ireland, dace populations have become an important recreational angling species. Catches in excess of 15kg, often consisting of 50 to 100 fish, are commonplace in these waters."

From Froese and Pauly (2019):

"Fisheries: of no interest; gamefish: yes; bait: usually."

From CABI (2019):

"The dace is considered a valuable species in aquaculture and as a bait fish species in recreational fishing. […] It is not of interest to the aquarium trade."

Diseases

Poelen et al. (2014) report the following as parasites of *Leuciscus leuciscus*: *Dactylogyrus folkmanovae, Anguillicoloides crassus, Rhipidocotyle illense, Diplostomulum clavatum, Diplostomum mergi, Phyllodistomum macrocotyle, Triaenophorus nodulosus, Philometra ovata, Biacetabulum appendiculatum, Caryophyllaeides ergensi, Caryophyllaeus fimbriceps, Dactylogyrus fallax, Dactylogyrus crucifer, Dactylogyrus sphyrna, Dactylogyrus similis,*

Gyrodactylus elegans, Diplozoon paradoxum, Discocotyle sagittata, Dactylogyrus haplogonus, Dactylogyrus cordus, Dactylogyrus cornu, Dactylogyrus alatus, Pellucidhaptor rogersi, Dactylogyrus suecicus, Dactylogyrus tuba, Dactylogyrus yinwenyingae, Dactylogyrus ramulosus, Dactylogyrus robustus, Dactylogyrus minor, Paradiplozoon leucisci, Paradiplozoon homoion, Gyrodactylus vimbi, Gyrodactylus carassii, Gyrodactylus aphyae, Gyrodactylus leucisci, Gyrodactylus gasterostei, Gyrodactylus prostae, Gyrodactylus laevis, Gyrodactylus osoblahensis, Cucullanus dogieli, Raphidascaris acus, Desmidocercella numidica, Molnaria intestinalis, Bunodera luciopercae, Pseudocapillaria tomentosa, Pseudocapillaria brevispicula, Bucephalus polymorphus, Diplostomum chromatophorum, Diplostomum commutatum, Diplostomum rutili, Posthodiplostomum cuticola, Phyllodistomum folium, Ichthyocotylurus platycephalus, Ichthyocotylurus pileatus, Ichthyocotylurus variegatus, Rhipidocotyle campanula, Rhipidocotyle fennica, Sanguinicola volgensis, Paracoenogonimus ovatus, Cyathocotyle prussica, Palaeorchis incognitus, Phyllodistomum dogieli, Phyllodistomum elongatum, Diplostomum paraspathaceum, Diplostomum volvens, Diplostomum helveticum, Asymphylodora imitans, Allocreadium isoporum, Crowcrocaecum skrjabini, Allocreadium transversale, Cotylurus sp., *Sphaerostomum globiporum, Sphaerostomum bramae, Metagonimus yokogawai, Metorchis bilis, Metorchis albidus, Apophallus muehlingi, Gyrodactylus* sp., Dactylogyrus sp., Cystidicoloides sp., *Philometra rischta, Neoechinorhynchus rutili, Ligula intestinalis, Tetraonchus monenteron, Diplostomum spathaceum, Dactylogyrus vistulae, Opisthorchis felineus, Acanthocephalus clavula, Caryophyllaeides fennica, Philometra abdominalis, Pseudocapillaria tomentosa, Pomphorhynchus laevis, Acanthocephalus anguillae, Rhabdochona denudata, Proteocephalus torulosus, Tylodelphys clavata, Acanthocephalus lucii,* and *Caryophyllaeus laticeps* (Canning et al. 1973, Strona et al. 2013).

No OIE-reportable diseases have been documented for this species.

Threat to Humans

From Froese and Pauly (2019):

"Potential pest [FAO 1997]"

3 Impacts of Introductions

The following sources hypothesize about possible impacts of the introduction of *Leuciscus leuciscus* based on its biology, but there are no known sources which detail actual evidence of impacts.

From Froese and Pauly (2019):

"Common in river backwaters [in Ireland] and considered a nuisance because it invades salmonid fisheries [FAO 1997]."

From CABI (2019):

"*L. leuciscus* does not represent a risk for humans but it may cause changes in ecosystems (i.e. altering food web structures and nutrient cycling). In Ireland, it threatens native salmonids

because dace, trout and salmon have similar habitat preferences. In the Munster Blackwater, efforts have been made to improve the spawning grounds for salmonids, but dace have moved into the area in large numbers successfully competing against the salmonids for spawning sites and also for food (Caffrey et al. 2007). Common dace may predate on juveniles of native species and there is a risk of hybridization with closely related fish species, in particular with other members of the *Leuciscus* genus."

From Caffrey et al. (2007):

"The most pressing of the threats posed by dace is the impact on native salmonids. Dace, trout and salmon have similar habitat preferences and all spawn over gravels in fast flowing water. Efforts to create and improve breeding grounds for salmonids in the Munster Blackwater have been hampered by dace moving onto the newly introduced gravels at spawning times (O'Grady M., pers. comm.). This not only limits the breeding grounds available to salmonids but also increases the number of dace present, through successful spawning of the latter. During the summer months the dace feeds heavily on the same aerial insects as juvenile salmon and trout (Weatherley, 1987). Due to the high densities in which dace are found, this can create a substantial drain on the food available to salmonids. Similarly, large shoals of dace will actively compete with the coarse fish already resident in the river."

From Winfield et al. (2010):

"The arrival of roach, and to a much lesser extent ruffe and dace, has had a major positive impact on fisheries activities at Bassenthwaite Lake [English Lake District, U.K.]. Although quantitative data are unavailable, a significant number of anglers visit the lake to fish for these species and thus augment the activities of a more established although small-scale recreational fishery for brown trout, the population of which now seems to be relatively low. Angling for pike is also popular and this predatory species, the numbers of which may be encouraged by the fish introductions, is now the main quarry of boat-based anglers."

"The later arrivals of roach, dace and ruffe in Derwent Water [English Lake District, U.K.] have so far had relatively little effect on local fisheries activities when compared with the situation at Bassenthwaite Lake."

4 Global Distribution

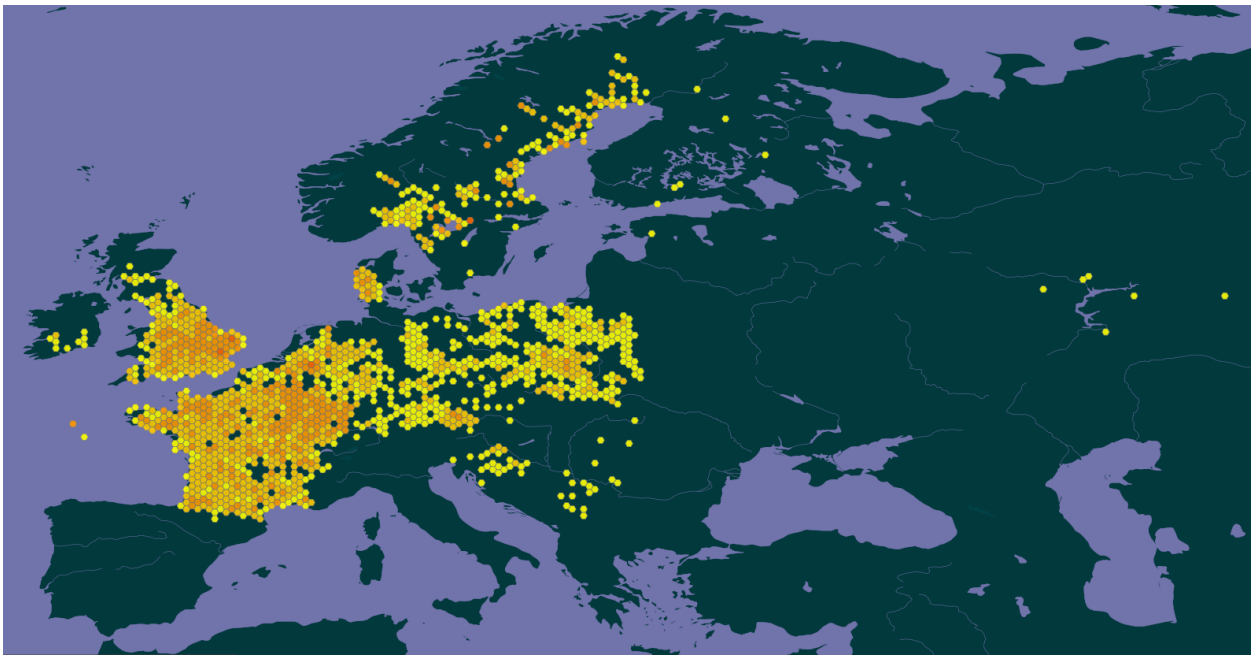

Figure 1. Known global distribution of *Leuciscus leuciscus*. Map from GBIF Secretariat (2019). Locations in Siberia and Kazakhstan were excluded from the extent of this map and from climate matching due to probable incorrect species identification. Locations off the coast of France and Germany were excluded due to incorrect coordinates.

5 Distribution Within the United States

This species has not been reported in the United States.

6 Climate Matching

Summary of Climate Matching Analysis

The Climate 6 score (Sanders et al. 2014; 16 climate variables; Euclidean distance) for the contiguous United States was 0.365, which is a high climate match. A Climate 6 score of 0.103 or greater indicates a high match. The largest area of highest match in the contiguous United States was located in the Great Lakes region, extending towards the East, with smaller high match areas in the west-central United States. The West Coast, Southwest, and Southeast United States had a low climate match. In all other areas, the climate match was generally medium.

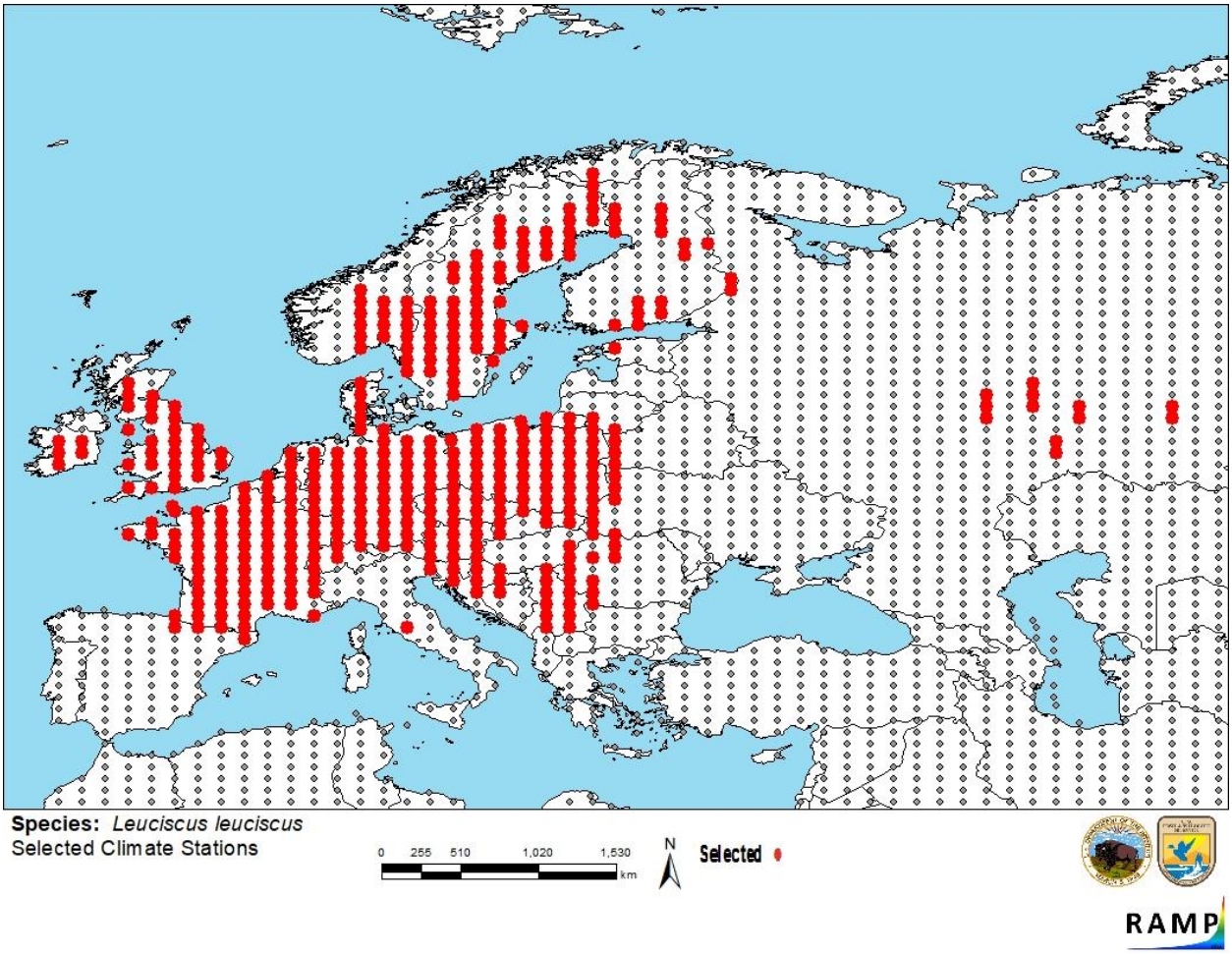

Figure 2. RAMP (Sanders et al. 2014) source map showing weather stations selected as source locations (red) and non-source locations (gray) for *Leuciscus leuciscus* climate matching. Source locations from GBIF Secretariat (2019).

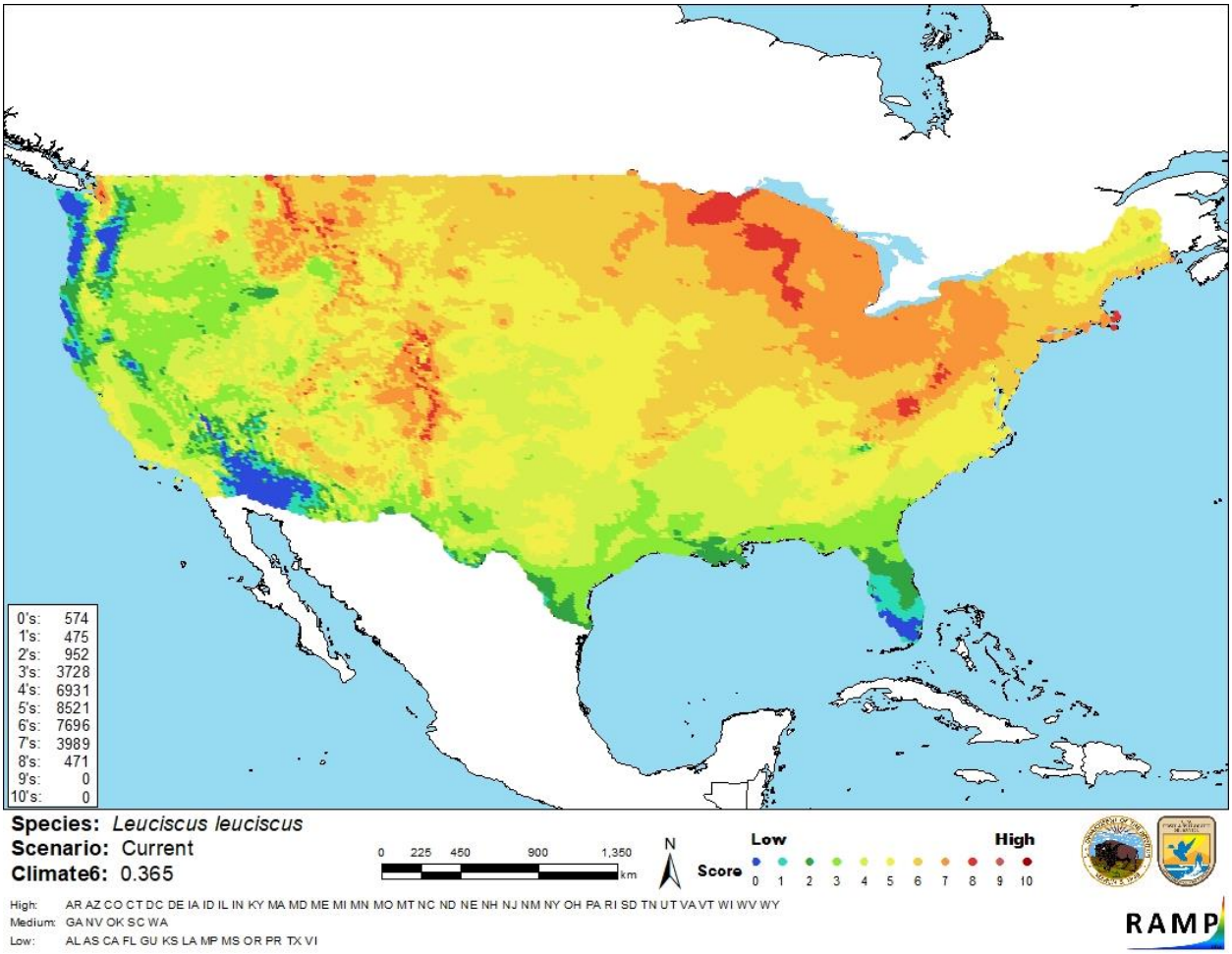

Figure 3. Map of RAMP (Sanders et al. 2014) climate matches for *Leuciscus leuciscus* in the contiguous United States based on source locations reported by GBIF Secretariat (2019). Counts of climate match scores are tabulated on the left. 0= Lowest match, 10=Highest match.

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

Information on the biology of this species is abundant; however, the impacts caused by introduction of this species are still uncertain. All information available about impacts of introduction of *L. leuciscus* is hypothetical. More information on impacts is needed before certainty of this assessment can be anything but low.

8 Risk Assessment

Summary of Risk to the Contiguous United States

Leuciscus leuciscus, the Eurasian Dace, is a freshwater fish native to areas of Europe and Asia. It has been introduced to non-native locations in Italy, Ireland, and France. Multiple sources discuss potential negative impacts of the introduction of *L. leuciscus* outside of its native range, but no negative impacts have been definitively proven. This species may possibly out-compete salmonids for spawning habitat and food. This species has not been reported in the United States. It has an overall high climate match with the contiguous United States. The overall risk for this species is uncertain; further research will be needed to determine the true risk of this species.

Assessment Elements

- **History of Invasiveness (Sec. 3): Uncertain**
- **Climate Match (Sec. 6): High**
- **Certainty of Assessment (Sec. 7): Low**
- **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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10 References Quoted But Not Accessed

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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