

Grayling (*Thymallus thymallus*)

Ecological Risk Screening Summary

U.S. Fish & Wildlife Service, February 2015
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1 Native Range and Status in the United States

Native Range

From Froese and Pauly (2014):

“Europe: Barent Sea basin west of Urals, Caspian, Black, Baltic, White and North Sea basins, Atlantic westward to Loire drainage; Rhône drainage; northern Adriatic basin east to Soca drainage.”

From Freyhof (2013):

“Barents Sea basin west of River Ob, White, Caspian, Black, Baltic, White and North Sea basins, Atlantic westward to Loire drainage; Rhône drainage.”

Status in the United States

No records of *Thymallus thymallus* in the United States were found.

Means of Introductions in the United States

No records of *Thymallus thymallus* in the United States were found.

Remarks

Thymallus thymallus is a carrier for multiple OIE reportable diseases (Wizigmann et al. 1980; Hansen et al. 2003), see Diseases below.

According to Froese and Pauly (2014), *T. thymallus* is protected under Appendix III of the Bern Convention: “the wild fauna species of Appendix III are protected but their “exploitation” can be regulated in accordance with the Convention.” (Council of Europe 2007).

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2015):

“Kingdom Animalia
Subkingdom Bilateria
Infrakingdom Deuterostomia
Phylum Chordata
Subphylum Vertebrata
Infraphylum Gnathostomata
Superclass Osteichthyes
Class Actinopterygii
Subclass Neopterygii
Infraclass Teleostei
Superorder Protacanthopterygii
Order Salmoniformes
Family Salmonidae
Subfamily Thymallinae
Genus *Thymallus*
Species *Thymallus thymallus* (Linnaeus, 1758)”

“Taxonomic Status:
Current Standing: valid”

Size, Weight, and Age Range

From Froese and Pauly (2014):

“Max length: 60.0 cm TL male/unsexed; [Muus and Dahlström 1968]; common length: 30.0 cm TL male/unsexed; [Muus and Dahlström 1968]; max. published weight: 6.7 kg [Liedes 1961]; max. reported age: 14 years [Muus and Dahlström 1968]”

Environment

From Froese and Pauly (2014):

“Freshwater; brackish; benthopelagic; pH range: 7.0 - 7.5; dH range: 20 - ?; non-migratory; depth range 15 - ? m [Billard 1997]. [...]; 6°C - 18°C [assumed to be recommended aquarium temperature] [Baensch and Riehl 1991]; [...]”

“Inhabits submontane reaches of rivers with a hard sand or stone bottom and well oxygenated, cold and fast-flowing water [Kottelat and Freyhof 2007]. Prefers running, well-oxygenated waters of rivers [Billard 1997].”

Climate/Range

From Froese and Pauly (2014):

“Temperate; [...]; 70°N - 42°N, 6°W - 66°E”

Distribution Outside the United States

Native

From Froese and Pauly (2014):

“Europe: Barent Sea basin west of Urals, Caspian, Black, Baltic, White and North Sea basins, Atlantic westward to Loire drainage; Rhône drainage; northern Adriatic basin east to Soca drainage.”

From Freyhof (2013):

“Barents Sea basin west of River Ob, White, Caspian, Black, Baltic, White and North Sea basins, Atlantic westward to Loire drainage; Rhône drainage.”

Introduced

Reliable sources list *Thymallus thymallus* as both native and introduced to France, the United Kingdom, Italy, and The Netherlands. Listed below are those introduction records that are not contradicted elsewhere in the literature.

From Froese and Pauly (2014):

“Introduced to Morocco.”

“Introduced over most of southern and central Finland.”

From Freyhof (2013):

“Introduced in Po and Soca drainages, and over most of southern and central Finland.”

From Bailly (2008):

“This species has been introduced or released in Dutch waters.”

Means of Introduction Outside the United States

From Winfield et al. (2011):

“In addition, Winfield & Durie (2004) reviewed the history of fish species introductions in Windermere and nearby lakes, to which individuals of a total of 12 native (brown trout (*Salmo trutta*), European minnow (*Phoxinus phoxinus*), perch, pike) and nonnative (common bream, crucian carp, dace, grayling (*Thymallus thymallus*), rainbow trout (*Oncorhynchus mykiss*), roach, rudd and tench (*Tinca tinca*)) fish species are known to have been brought for the purpose of live-baiting.”

Short Description

From Froese and Pauly (2014):

“Dorsal spines (total): 5 - 8; Dorsal soft rays (total): 12-17; Anal spines: 3-4; Anal soft rays: 9 - 10; Vertebrae: 57 - 61. Distinguished from *Thymallus arcticus* by the following unique characters: maxillary usually reaching anterior margin of eye; pelvic fin grey, lacking red stripes; body without red spots; dorsal fin greyish, with parallel rows of round dark spots; gill rakers 19-30, averaging about 24-26 [Kottelat and Freyhof 2007]. Caudal fin with 19 to 21 rays [Spillman 1961].”

Biology

From Froese and Pauly (2014):

“Gregarious, forms schools [Spillman 1961]. Feeds mainly on insects [Vostradovsky 1973], nymphs, small worms and crustaceans [Billard 1997]. Breeds in shallow stretches, usually 20-40 cm deep, or riffles, with moderate current of about 0.5 m/s and clean gravel bottom [Kottelat and Freyhof 2007]. Can be captured with natural bait (insect larvae) or with artificial fly. Very sensitive to pollution [Billard 1997].”

“In Scandinavia, it occurs in clear lakes and freshened part of northern Baltic basin. Usually lives in hollows behind boulders and shaded water under overhanging vegetation [Kottelat and Freyhof 2007].”

From Freyhof (2013):

“Spawns for the first time at 2-3 years, females usually one year later than males, in northern Europe later than in central Europe. Spawns in early spring, usually in March-April, later in north, when temperatures reach 4-8°C, with a peak at full moon. Adults make short spawning migrations. Lacustrine populations often spawn in lake tributaries. Males start to defend small territories at spawning site in late morning and spawning usually starts in early afternoon at highest daily temperature. Females deposit eggs into substrate. Eggs hatch usually in 10-40 days. Alevins remain in gravel until yolk sack is absorbed (4-10 days). Feeding larvae live 3-4 weeks in open water below surface. Juveniles are benthic, in fast-flowing waters. Feeds predominantly on drifting invertebrates and terrestrial insects.”

Human Uses

From Froese and Pauly (2014):

“Fisheries: commercial; aquaculture: commercial; gamefish: yes; aquarium: public aquariums”

From Freyhof (2013):

“It is harvested for human consumption, and for sport fishing.”

Diseases

***Gyrodactylus salaris* and viral hemorrhagic septicemia virus are OIE reportable diseases as of 2017.**

From Hansen et al. (2003):

Gyrodactylus spp. are present in *Thymallus thymallus* in Norway.

From Wizigmann et al. (1980):

“Pike and grayling can now be included among the natural hosts of this virus [viral hemorrhagic septicemia virus].”

From Bailly (2008):

“Host of *Ergasilus sieboldi* Nordmann, 1832 (parasitic: ectoparasitic)
Lernaea esocina (Burmeister, 1835) (parasitic: ectoparasitic)
Lernaeopoda clavigera Olsson, 1872 [via synonym] (parasitic: ectoparasitic)
Salmincola salmoneus (Linnaeus, 1758) (parasitic: ectoparasitic)
Salmincola thymalli (Kessler, 1868) (parasitic: ectoparasitic)
Triaenophorus crassus Forel, 1868 (parasite)”

Threat to Humans

From Froese and Pauly (2014):

“Harmless”

3 Impacts of Introductions

Records of introductions found were not conclusive as to the actual classification of *Thymallus thymallus* as native or introduced. No records on possible or actual impacts of introductions of *Thymallus thymallus* were found.

4 Global Distribution

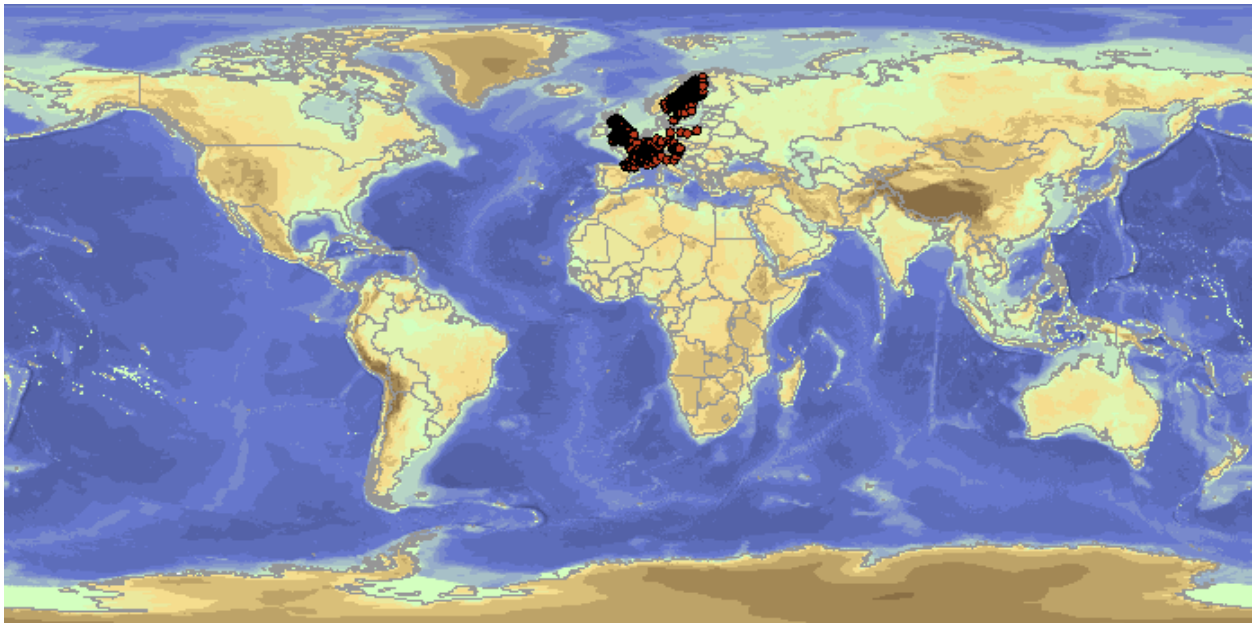


Figure 1. Known global distribution of *Thymallus thymallus*. Locations are all in Europe. Map from Froese and Pauly (2014).

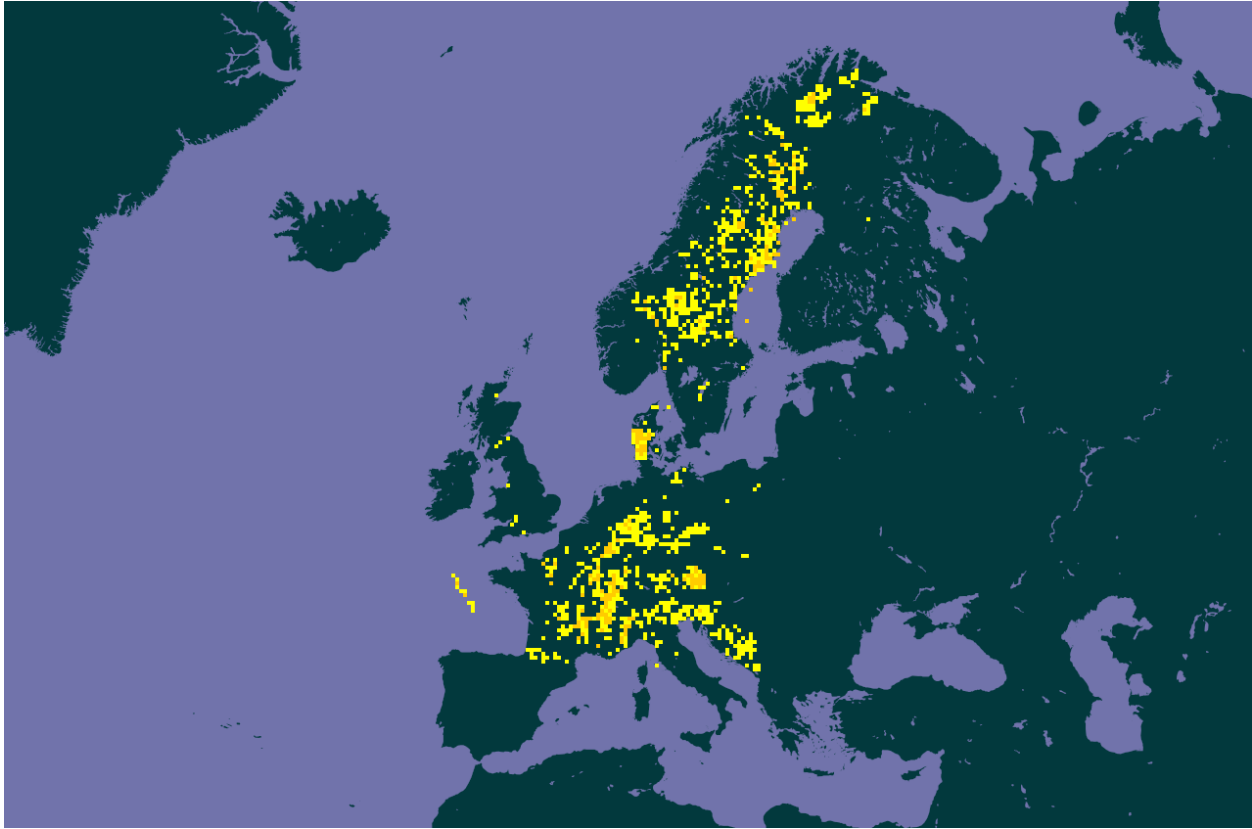


Figure 2. Known global distribution of *Thymallus thymallus* in Europe. Map from GBIF Secretariat (2017).

5 Distribution Within the United States

No records of *Thymallus thymallus* in the United States were found.

6 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Thymallus thymallus* was high in the northeast, along the Appalachian Mountains, and just east of the Rocky Mountains. It was low in Florida, the southwest, and the Pacific coast. The match was medium everywhere else. The Climate 6 score (Sanders et al. 2014; 16 climate variables; Euclidean Distance) for the contiguous United States was 0.248, high. The following states had individually high climate scores: Arizona, Arkansas, Colorado, Connecticut, Delaware, Georgia, Illinois, Indiana, Kentucky, Maine, Maryland, Massachusetts, Michigan, Missouri, Montana, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Rhode Island, Tennessee, Utah, Vermont, Virginia, West Virginia, Wisconsin, and Wyoming.

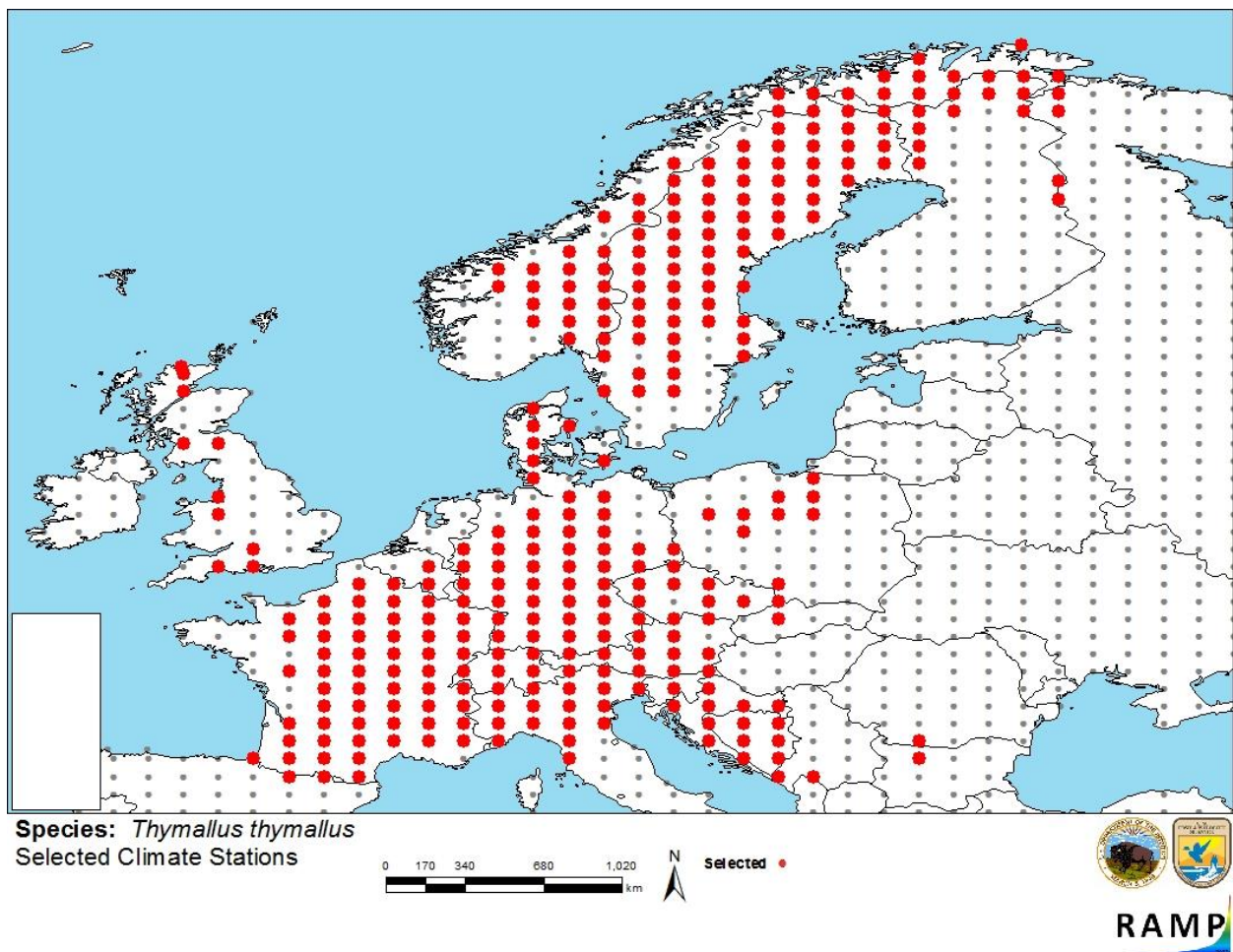


Figure 3. RAMP (Sanders et al. 2014) source map showing weather stations in Europe selected as source locations (red) and non-source locations (grey) for *Thymallus thymallus* climate matching. Source locations from Froese and Pauly (2014) and GBIF Secretariat (2017).

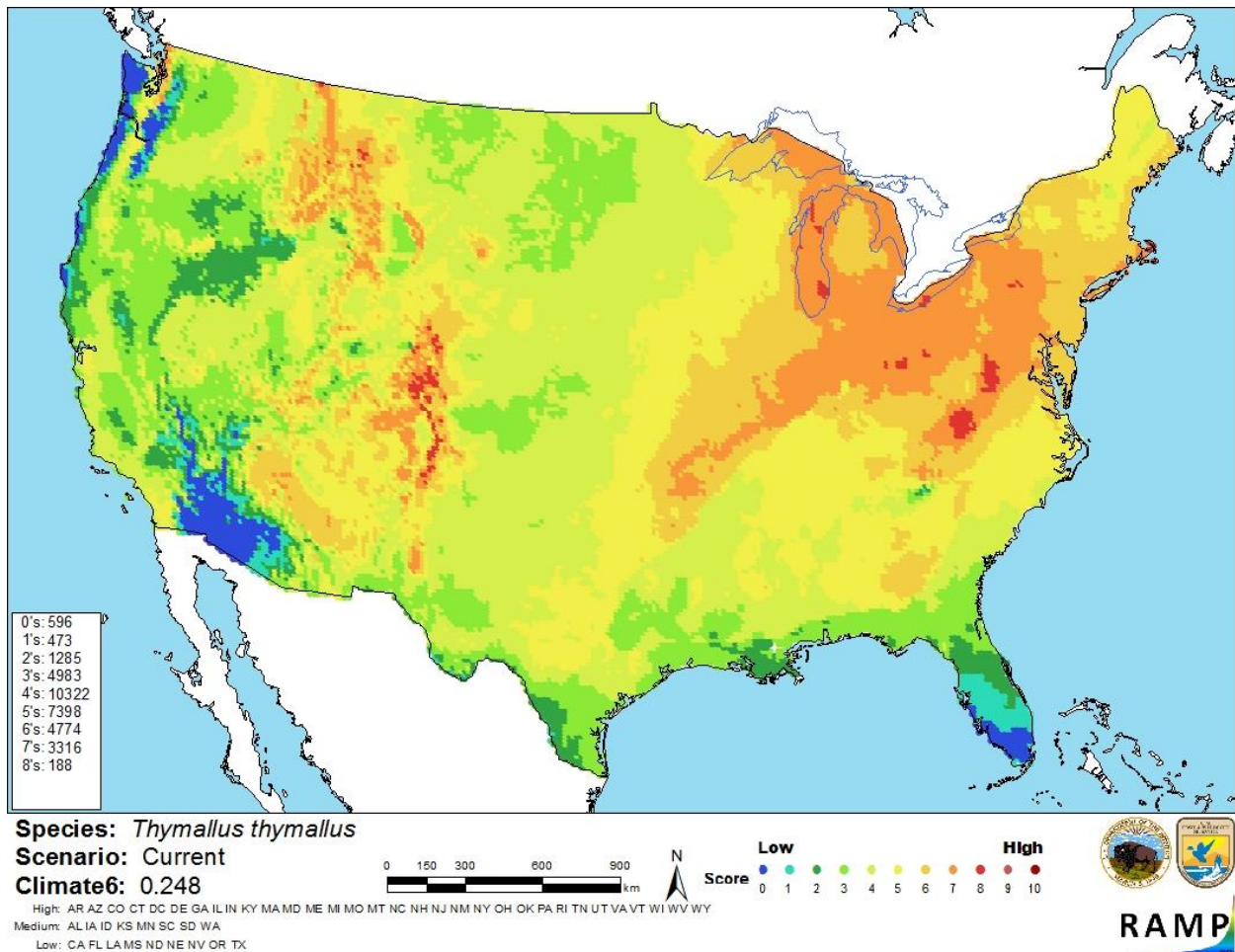


Figure 4. Map from RAMP (Sanders et al. 2014) of a current climate match for *Thymallus thymallus* in the contiguous United States based on source locations reported by Froese and Pauly (2014) and GBIF Secretariat (2017). 0 = Lowest match, 10 = Highest match.

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 this assessment is medium. There was adequate ecological information available for *Thymallus thymallus*. The information available regarding the history of introductions and invasiveness of this species was contradictory in many cases which lowers the confidence in the assessment of the history of invasiveness.

8 Risk Assessment

Summary of Risk to the Contiguous United States

The history of invasiveness is not documented. No records of actual impacts from an introduction were found. Also, many records of introduction were contradicted in other sources that would list *Thymallus thymallus* as native to the area in question. The climate match was high, 0.248. The certainty of the assessment is medium, mainly due to the confusion in the native or invasive status of the species in many countries. The overall risk 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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- Hansen, H., L. Bachmann, and T. A. Bakke. 2003. Mitochondrial DNA variation of *Gyrodactylus* spp. (Monogenea, Gyrodactylidae) populations infecting Atlantic Salmon, Grayling, and Rainbow Trout in Norway and Sweden. *International Journal for Parasitology* 33:1471–1478.

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Winfield, I. J., J. M. Fletcher, and J. B. James. 2011. Invasive fish species in the largest lakes of Scotland, Northern Ireland, Wales and England: the collective UK experience. *Hydrobiologia* 660(1):93–103.

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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.

Baensch, H. A., and R. Riehl. 1991. *Aquarien atlas*. Bd. 3. Melle: Mergus, Verlag für Natur-und Heimtierkunde, Germany.

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