

# Viperine Water Snake (*Natrix maura*)

## Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, January 2022  
Revised, February 2022  
Web Version, 6/14/2023

Organism Type: Reptile  
Overall Risk Assessment Category: High



Photo: Bernard DuPont. Licensed under Creative Commons Attribution-Share Alike 2.0 Generic. Available:[https://commons.wikimedia.org/wiki/File:Viperine\\_Snake\\_\(Natrix\\_maura\)\\_\(1419876\\_9323\).jpg](https://commons.wikimedia.org/wiki/File:Viperine_Snake_(Natrix_maura)_(1419876_9323).jpg) (February 2022).

## 1 Native Range and Status in the United States

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### Native Range

From Fuentes and Escoriza (2015):

“The viperine snake *Natrix maura* is native to southwestern Europe and north-western Africa (Sindaco et al., 2013)”

From Mazza et al. (2011):

“Only one population [of *Natrix maura*] is presently living on the shores of Lake Geneva [Switzerland], mainly located between St-Saphorin and Treytorrens (Canton Vaud [Centre for the coordination of the protection of amphibians and reptiles of Switzerland]).”

From Moore et al. (2004):

“In Europe, this species ranges from Portugal and Spain through much of France, to extreme southwestern Switzerland and northwestern Italy. In North Africa it is present in most of Morocco, northern Algeria, northern and central Tunisia and northwestern Libya. This species is also present (probably allochthonous [sic]) on the Mediterranean islands of Sardinia (Italy), Corsica (one single record) [not mapped]; natural populations are present on Iles d'Hyères (France) and La Galite (Tunisia). [...]”

## Status in the United States

No records of *Natrix maura* in trade or in the wild in the United States were found.

## Means of Introductions in the United States

No records of *Natrix maura* in the wild in the United States were found.

## Remarks

No additional remarks.

# 2 Biology and Ecology

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## Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2022):

“Current Standing: valid”

Kingdom Animalia  
Subkingdom Bilateria  
Infrakingdom Deuterostomia  
Phylum Chordata  
Subphylum Vertebrata  
Infraphylum Gnathostomata  
Superclass Tetrapoda  
Class Reptilia  
Order Squamata  
Suborder Serpentes  
Infraorder Alethinophidia  
Family Colubridae  
Subfamily Natricinae  
Genus *Natrix*

Species *Natrix maura* (Linnaeus, 1758)

## Size, Weight, and Age Range

From Lemaire et al. (2018):

“[...] relatively small-sized species (up to ~80 cm total length) [...]”

From Hailey and Davies (1986):

“[...] *N. maura* is one of the smallest snakes studied so far, with a maximum size of about 200 g, most individuals being < 100 g.”

## Environment

From Fuentes and Escoriza (2015):

“This species typically inhabits lentic and lotic freshwater habitats, but also tolerates waters with high salt concentration, in marshes and coastal pools (Steward, 1971; Schleich et al., 1996). However its presence in marine habitats is exceptional and has only been reported in a few cases, in Italy (Lanza, 1983), in southern Spain (Cabo [*sic*] & Olea, 1978) and in the Cies islands (western Spain; Galán, 2012). The populations of the Cies islands are adapted to the marine environment, feeding exclusively on marine fishes (e.g. *Lipophrys pholis*; Galán, 2012).”

From Pantoja Cuadros (2016):

“Habits of *N. maura* are mainly aquatic, establishing their populations around reservoirs [...], inland waters and karstic canyons [...]”

From Scali et al. (2011):

“In contrast, the habitat use of the viperine snake relates to littoral zones with less steep slopes, but abundant vegetation.”

From Moore et al. (2004):

“The species can be found from sea level up to 2,600 m asl.”

## Climate

From Santos et al. (2005):

“The viperine snake is a very common species in the Mediterranean region (Santos et al., 2002), where climatic seasonality implies summer dry periods, great annual variation in the level of water bodies, and, consequently, seasonal changes in aquatic prey availability.”

## **Distribution Outside the United States**

### **Native**

From Fuentes and Escoriza (2015):

“The viperine snake *Natrix maura* is native to southwestern Europe and north-western Africa (Sindaco et al., 2013)”

From Mazza et al. (2011):

“Only one population [of *Natrix maura*] is presently living on the shores of Lake Geneva [Switzerland], mainly located between St-Saphorin and Treytorrens (Canton Vaud [Centre for the coordination of the protection of amphibians and reptiles of Switzerland]).”

From Moore et al. (2004):

“In Europe, this species ranges from Portugal and Spain through much of France, to extreme southwestern Switzerland and northwestern Italy. In North Africa it is present in most of Morocco, northern Algeria, northern and central Tunisia and northwestern Libya. This species is also present (probably allochthonous [sic]) on the Mediterranean islands of Sardinia (Italy), Corsica (one single record) [not mapped]; natural populations are present on Iles d'Hyères (France) and La Galite (Tunisia). [...]”

### **Introduced**

From Moore et al. (2004):

“It has been introduced to the islands of Menorca and Mallorca in the Balearic Islands of Spain.”

Desmet et al. (2021) report that *Natrix maura* has been introduced to Belgium and describe its status as “casual.”

## **Means of Introduction Outside the United States**

From Pantoja Cuadros (2016):

“In Mallorca, *N. maura* was introduced in Roman times from south east France (Guicking et al., 2006).”

According to Desmet et al. (2021), *Natrix maura* has entered Belgium via contaminated timber.

## **Short Description**

From Lemaire et al. (2018):

“This relatively small-sized species [...]”

From The Reptile Database (2022):

“The dorsal zigzag band is often more pronounced in juveniles than in adults and the top of the head may have a pattern that is not visible anymore in adults (after Gruber 2009 [...])”

From Animalia (2022):

“It is gray, brown, or reddish dorsally, with a black zigzag vertebral stripe, and lateral series of black ocelli with yellow centers. The labials are yellow with black sutures. It has a diagonal dark band on each temple, and another behind it on each side of the neck. Ventrally, it is yellow or red, checkered with black, or all black.”

## **Biology**

From Lemaire et al. (2018):

“The viperine snake (*Natrix maura*) is a semi-aquatic freshwater natricine [...]. This relatively small-sized species [...] typically forages for fish and amphibians in aquatic environments such as streams, rivers, marshes, and lakes (Miras et al., 2015; Santos and Llorente, 2009).”

“A skin-shedding occurs in *N. maura* at the onset of the activity period in early spring, while another shedding cycle is later associated with ovulation shortly before oviposition in females (June–July).”

From Pantoja Cuadros (2016):

“[...] this species feeds on fish, adults amphibians and tadpoles as well as their clutches (Meijide & Salas, 1989; Valverde, 1967; Martinez-Solano, 2000).”

From Scali et al. (2011):

“Both species [*Natrix maura* and *N. tessellata*] can be active during the entire day [...] while *N. maura* is more nocturnal.”

From Santos and Llorente (2001):

“Viperine snakes emerged from hibernation in March and mating occurred from April to June [...].”

“In contrast to other snake species, variation in food availability did not affect the proportion of reproductive females or clutch size.”

“These data suggest that the onset of activity after hibernation is correlated with weather conditions (e.g., temperature), because in the warmest area (Andalucía, South Spain) viperine snakes are active two months earlier than in the coldest area (Galicia, North West Spain). In Mediterranean [populations], onset of activity is intermediate with respect to Northern and Southern populations.”

From Miras et al. (2009):

“The species lays between three and 20 eggs.”

## Human Uses

From Miras et al. (2009):

“In Tunisia, desiccated specimens are sold as souvenirs to tourists (Juan M Pleguezuelos pers. comm., October 2008).”

From Tingle and Slimani (2017):

“Snake charmers throughout North Africa, the Middle East, and the Indian subcontinent have been documented to possess less venomous or non-venomous species (Corkill 1939; Dutt 2004). With these snakes, they can perform feats too perilous to perform with dangerous species. They can also allow spectators to handle the snakes or have their picture taken with one draped around their shoulders. We observed several such species in use on Jmaa el Fna [Morocco]: the impressively large Montpellier Snake (*M. monspessulanus*; [...]); the smaller, beautifully patterned Horseshoe Whip Snake (*Hemorrhoids hippocrepis*; [...]); and the Viperine Snake (*Natrix maura*; [...]), whose triangular head and foul temper sometimes causes it to be mistaken for a venomous viper.”

## Diseases

**No records of OIE-reportable diseases (OIE 2022) were found for *Natrix maura*.**

From von Essen et al. (2020):

“[...] we did record high ranavirus prevalence in the related *N. maura* (70%), extending previous observations of disease and mortality in this species [...].”

From Price et al. (2014):

“[...] an isolate with 99.96% sequence identity to viruses isolated from amphibians in Galicia, and closely related to CMTV [ranavirus common midwife toad virus], was generated from esophageal tissue taken from a viperine snake (*Natrix maura*) found dead in the process of ingesting diseased amphibians [...] and with ulcerating lesions along its gullet [...].”

From Santoro et al. (2011):

“*Ratzia parva* (Syn. *Brachymetra parva*) has been previously reported in Africa and Europe from France, Spain and Croatia in snakes (*Natrix maura* [...] Lluich et al. 1985).”

According to WoRMS (2021), *Natrix maura* can be the host to the following parasites: *Astiotrema monticellii*, *Telorchis assula*, and *T. ercolanii*.

In addition to the parasites and pathogens listed above, Poelen et al. (2014) lists *Natrix maura* as the potential host to the following parasites: *Diplopylidium acanthotetra*, *Dracunculus oesophagea*, and *Spirocerca lupi*.

## Threat to Humans

No information available on threats to humans for *Natrix maura*.

## 3 Impacts of Introductions

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From Guicking et al. (2006):

“The Mallorcan midwife toad [...] remains listed as ‘vulnerable’ in the recent IUCN Global Amphibian Assessment (Stuart et al. 2004) [...] There is little doubt that *N. maura* is one of the main predators of the toad and may be excluding the latter from a large part of the island (Hemmer and Alcover 1984; Tonge 1986; Román and Mayol 1995; Griffiths et al. 1998). As part of the management programme for the toad, snakes are usually removed from toad breeding sites whenever they are encountered.”

“[...] the cryptic lifestyle of *N. maura* makes it a difficult species to control at the population level simply by the physical removal of snakes from toad breeding pools when they happened to be encountered. The recovery programme of the Mallorcan midwife toad has been very successful in establishing new populations using reintroductions into areas that are snake-free (Buley and Garcia 1997) [...]”

From Pantoja Cuadros (2016):

“Presence of *N. maura* could have caused population extinctions of *A. muletensis* in Mallorca. Actually only remaining isolated populations of midwife toad in Tramuntana mountain range where *N. maura* has a relative or a total difficulty to access in some *A. muletensis* populations (Guicking et al., 2006).”

“A first phase, where density of *N. maura* reached its highest in 1992, exceeding 15 individuals and consequently the lowest record of *A. muletensis* tadpoles in 1994 with less than 10000 individuals. A big amount of snakes were removed in this phase.”

“A second phase, where density of *N. maura* fluctuated never exceeding 10 individuals a year since 1995. In this phase *A. muletensis* tadpole population presented a progressive growth until year 2002.”

“Finally a third phase that started in 2003, where *A. muletensis* tadpole populations began to grow drastically reaching maximum record in 2009 that matched with one of the lowest record of *N. maura*. In this phase snakes slightly surpassed 5 individuals, while tadpoles never fell from 20000 individuals.”

From Tonge (1986):

“The second reason for the current rarity of the toad, and doubtless the reason for its extinction in lowland areas of Mallorca, is the introduction of the viperine snake. This is a semi-aquatic species, which feeds largely on frogs. The Mallorcan mid-wife toad is a classic island species, in that it has evolved without predators and consequently has a lower reproductive rate than its congeners on the mainland. It simply could not cope with such a voracious predator [...]”

“However, the effect of even one snake accidentally washed into a breeding pond could be catastrophic for a small isolated toad population.”

From Griffiths et al. (1998):

“The activity levels of Mallorcan midwife toad tadpoles, *Alytes muletensis*, were compared in two natural torrent pools which differed in their use by predatory viperine snakes, *Natrix maura*. Activity levels were lower in a pool regularly used by snakes than they were in a snake-free pool, but were reduced in both pools when snakes were experimentally introduced in nylon bags. In the presence of snakes, however, activity was more suppressed in the pool that was usually snake-free. Corresponding reductions in activity were also observed when tadpoles were treated with chemical cues from Mallorcan *N. maura* in a gravitational flow-through system.”

From Moore et al. (2004):

“The endemic midwife toad of Mallorca (*Alytes muletensis*) is restricted to a small number of breeding populations in the mountainous northwest of the island. The decline of the species has been attributed to the impacts of introduced species such as the viperine snake (*Natrix maura*) [...] toads may be surviving only in areas that are suboptimal for these predators.”

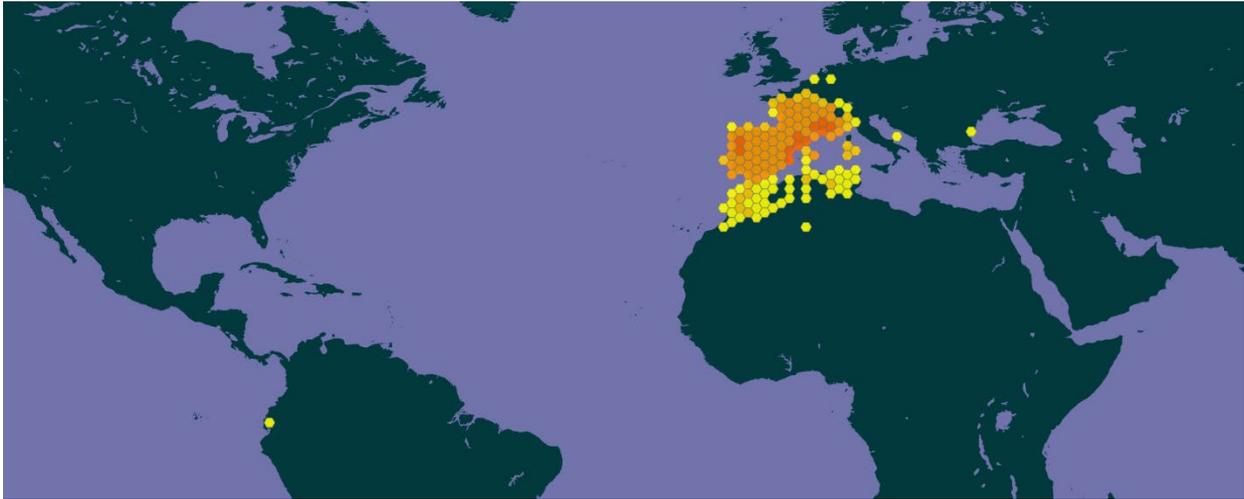
## 4 History of Invasiveness

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*Natrix maura* is an invasive snake on the islands of Mallorca and Menorca, islands off the eastern coast of Spain. It is also listed as introduced to Belgium. There is evidence that *N. maura* was introduced to Mallorca Island over 2,000 years ago by the Romans. *N. maura* is now established on the island and is a documented predator of the Mallorcan midwife toad (*Alytes muletensis*), which is now listed as endangered on the IUCN Red List. There are scientifically credible sources showing the negative impacts of the *N. maura* introduction on the survival of *A. muletensis*. Multiple statements are available indicating that *N. maura* is responsible for extirpations of *A. muletensis* populations. Experimental evidence showed a direct negative correlation between *N. maura* abundance and *A. muletensis* tadpole abundance. The History of Invasiveness for this species is classified as High.

## 5 Global Distribution

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**Figure 1.** Known global distribution of *Natrrix maura*. Observations are reported from Europe, Northern Africa, and Ecuador. Map from GBIF Secretariat (2022).

Points from southern Algeria, Bulgaria, Ecuador, and southeastern Italy were not used in the climate match analysis as no corroborating evidence of introduction and establishment could be found in the available literature. Points in central and eastern Switzerland were not used to select source points as the species is only currently present in the southwestern portion around Lake Geneva (Moore et al. 2004; Mazza et al. 2011).

*Natrrix maura* is listed as native to Libya (Moore et al. 2004), however, no georeferenced observations were found for the species in Libya.

## 6 Distribution Within the United States

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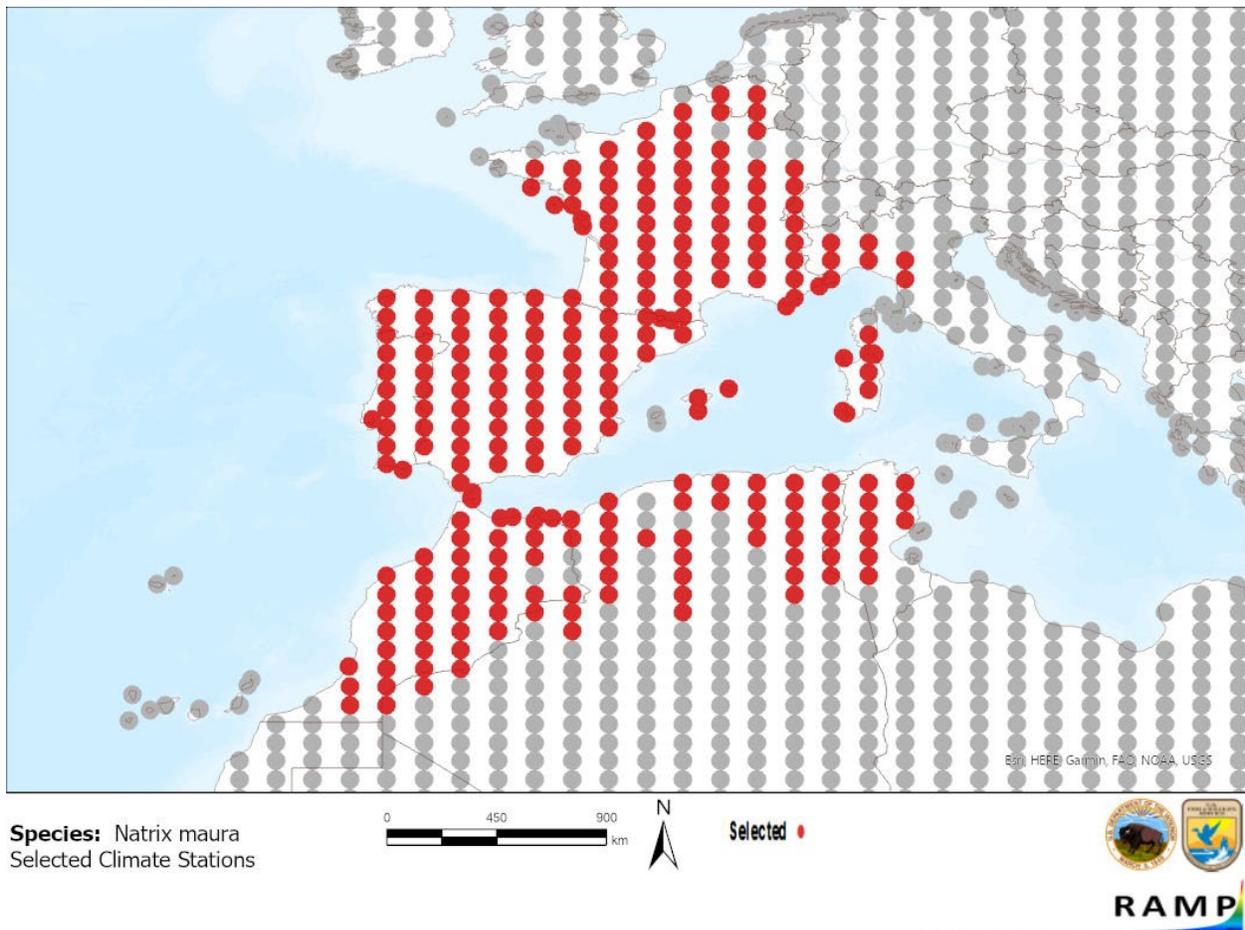
No records of *Natrrix maura* in the wild or in trade in the United States were found.

## 7 Climate Matching

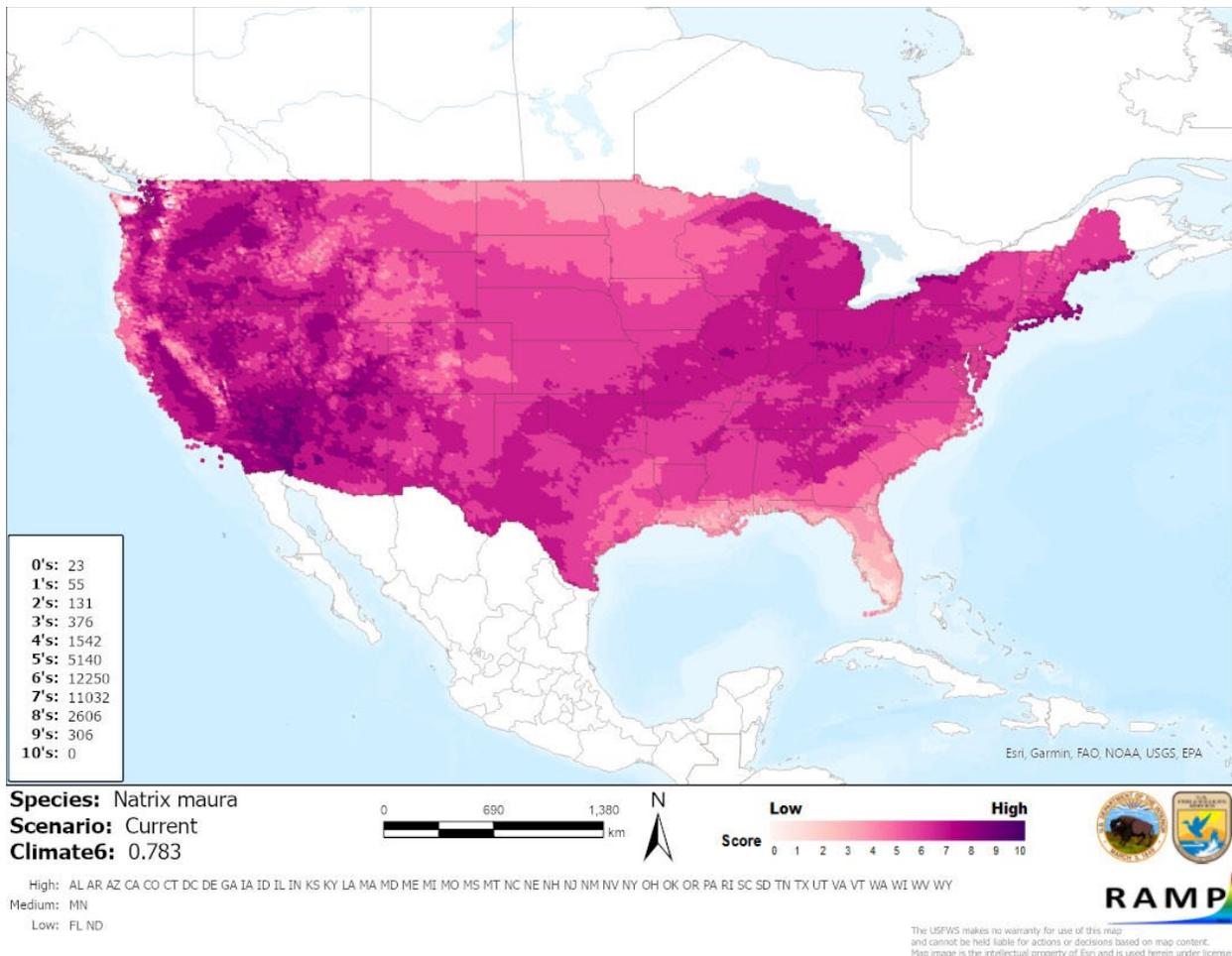
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### Summary of Climate Matching Analysis

The climate match for *Natrrix maura* was low along the northern portions of Montana, North Dakota, and Minnesota along the Canadian border, as well as along the Gulf Coast and peninsular Florida. There were also a few low patches on and near the Olympic Peninsula, in the Cascade and Sierra Nevada ranges, and the Pacific Coast near the border with Oregon and California. The remainder of the contiguous United States was generally medium to high match. The most concentrated points of high climate match were within the Mojave Desert, and there were scattered patches of high climate match east and west of the Rocky Mountains. The overall Climate 6 score (Sanders et al. 2021; 16 climate variables; Euclidean distance) for the contiguous United States was 0.783, High. (Scores of 0.103 and greater are classified as high.) All States had a High individual Climate 6 score except for Minnesota, which had a Medium individual Climate 6 score, and Florida and North Dakota, which had Low individual Climate 6 scores.



**Figure 2.** RAMP (Sanders et al. 2021) source map showing weather stations in Europe and Africa selected as source locations (red; Andorra, France, Italy, Portugal, Spain, Switzerland, Algeria, Morocco, Tunisia) and non-source locations (gray) for *Natrix maura* climate matching. Source locations from GBIF Secretariat (2022). 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 *Natrix maura* in the contiguous United States based on source locations reported by GBIF Secretariat (2022). 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
$0.000 \leq X \leq 0.005$	Low
$0.005 < X < 0.103$	Medium
$\geq 0.103$	High

## 8 Certainty of Assessment

The Certainty of Assessment is High. There was quality information available about the biology and ecology of *Natrix maura*. Records of introductions and establishment were found and information was available regarding negative impacts of those introductions. The information on impacts was from scientifically credible sources.

## 9 Risk Assessment

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### Summary of Risk to the Contiguous United States

The viperine water snake (*Natrix maura*) is a semi-aquatic freshwater snake species widely distributed across Western Europe and Northern Africa. *N. maura* has been reported outside its native range in the islands of Menorca and Mallorca in the Balearic Islands of Spain and in Belgium. Negative impacts of its introduction have been documented. The reduction and extirpation of populations of the endemic midwife toad (*Alytes muletensis*) of Mallorca from parts of the island is due to *N. maura* predation. There is evidence the species is used by snake charmers in northern Africa but no further evidence of trade was found. The History of Invasiveness is classified as High. The Overall Climate Match for the contiguous United States was High. The largest areas of high match were found in the Desert Southwest and in patches in the Rocky Mountains. The Certainty of Assessment is High due to consistent documentation of *N. maura* having negative impacts on a native species. The Overall Risk Assessment Category is High.

### Assessment Elements

- **History of Invasiveness (Sec. 4): High**
- **Overall Climate Match Category (Sec. 7): High**
- **Certainty of Assessment (Sec. 8): High**
- **Remarks, Important additional information: No additional remarks**
- **Overall Risk Assessment Category: High**

## 10 Literature Cited

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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 11.**

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## 11 Literature Cited in Quoted Material

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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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