

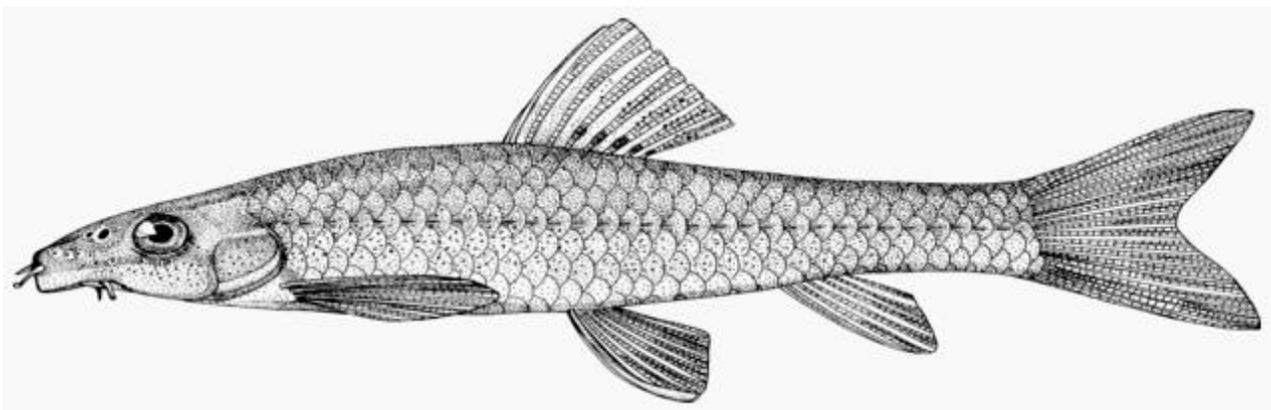
# Red Garra/Doctor Fish/Spa Fish (*Garra rufa*)

## Ecological Risk Screening Summary

Web Version – 10/17/2012



Photo: © Dances From EOL (2014)



Drawing of a *Garra rufa* (copyright: Brian W. Coad, Canadian Museum of Natural History; Coad 2010).

## 1 Native Range and Status in the United States

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### Native Range

From Jarvis (2011):

“*G. rufa* is a sub-tropical species, native to a variety of habitats including rivers, small muddy streams, small ponds and lakes in Eurasia (Froese and Pauly 2010). Its native range includes the Ceyhan, Jordan, Orontes (=Asi), Quwayq and Tigris-Euphrates river basins and coastal drainages of the eastern Mediterranean as well as much of southern Iran (Coad 2010). The global distribution and known collection sites for this species can be viewed in Figures 2 and 3. *G. rufa* is considered a common species across its native range (Coad 2010), for example, it is one of the most widespread species and the most common benthic grazer in the Asi River system (Yalçin-Özdilek and Ekmekçi 2006; Yalçin-Özdilek 2007; Okur and Yalçin-Özdilek 2008) and was the most common fish collected from a system in Southwest Iran (Esmaili et al. 2006). Genetic evidence points toward a genetic divergence among populations from drainages of the Mediterranean and the Persian Gulf (Durna et al. 2010).”

### Status in the United States

No occurrences found within the United States.

### Means of Introductions in the United States

No documentation was found to suggest that *Garra rufa* has been introduced into the United States.

### Remarks

Used in spas for pedicures (Garra Rufa Fish 2012, Jarvis 2011, Coad 2010)

Florida banned the use of *Garra rufa* in spas. Unofficial name is Doctor Fish. This name is used for several species. Health concerns have been raised, but mostly associated with the environment and the inability to clean the “tank” between pedicure treatments (Spavelous 2012):

## 2 Biology and Ecology

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### Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2011):

Kingdom Animalia  
Phylum Chordata  
Subphylum Vertebrata  
Superclass Osteichthyes  
Class Actinopterygii

Subclass Neopterygii  
  Infraclass Teleostei  
    Superorder Ostariophysi  
      Order Cypriniformes  
        Superfamily Cyprinoidea  
          Family Cyprinidae  
            Genus *Garra*  
              Species *Garra rufa*

Taxonomic Status: Valid

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

From Froese and Pauly (2011):

“Max length : 14.0 cm TL male/unsexed; (Goren 1974).”

### **Environment**

From Froese and Pauly (2011): “Freshwater; benthopelagic; non-migratory”

From Jarvis (2011):

“*G. rufa* is a bottom dweller that can be found in different freshwater habitats such as rivers, small muddy streams, small ponds and lakes hiding under and among stones and vegetation (Krupp and Schneider 1989). Goren and Ortal (1999) comment that this species depends upon rocky habitats in Lake Kinneret, Israel.”

### **Climate/Range**

From Froese and Pauly (2011): “Subtropical; 15°C - 28°C (Baensch and Riehl 1991).”

From Jarvis (2011):

“There is a broad range of climatic conditions within the native range of *G. rufa*, as it inhabits a band from approximately 29 to 40°N. The continental climate within this band ranges from a minimum January air temperature of -10°C at its northern limit to a maximum of 36°C in July at the southern extreme (data generated from IPCC 2010).”

### **Distribution Outside the United States**

Afghanistan, Iran, Iraq, Israel, Jordan, Lebanon, Syria, Turkey (Froese and Pauly 2011)

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

No documentation was found to suggest that *Garra rufa* has been introduced into the United States or outside of its range.

## Description

From Jarvis (2011):

“*G. rufa* (Figure 1) is one of the smallest members of the family Cyprinidae, and is one of about 73 members of the genus *Garra* (Coad 2010; Esmaili et al. 2009). No subspecies are recognized. Although many species, both native and exotic, from the family Cyprinidae are found in Canada, no *Garra* species are known. According to Zhang (2005), *Garra* is one of four currently recognized cyprinid genera of the disc-bearing group (also *Discocheilus*, *Discogobio* and *Placocheilus* genera). This grouping is based on a lower lip modified to form a mental adhesive disc, the posterior margin of which is not continuous with the mental region. The morphology of the mental adhesive disc of the *Garra* genera is characterized by a crescentic antromedian fold that is derived from the anterior margin of the mental adhesive disc, with additional generic definition of the presence of three rows of pharyngeal teeth (Zhang 2005).”

A description of *G. rufa* morphology has been compiled by Coad (2010). Briefly, a scaleless head, two pairs of barbels, a well-developed adhesive disc with a free anterior margin and a crescent-shaped ventral mouth characterize *G. rufa*. The typical body shape is a relatively thin and long cylindrical structure that is generally rounded in cross section with a complete lateral line, extending along the middle of the depth of the tail. Scales are cycloid and moderate to large (typically 29-36 lateral count). Dorsal fin origin is just anterior to the pelvic fin origin. The number of fin rays varies but typically encountered numbers for the dorsal, pectoral, pelvic, anal and caudal fins are 8, 12-14, 7-8, 5 and 17, respectively. The short gill rakers range from 12-26, while the pharyngeal tooth formula is 2,4,5-5,4,2 or 2,4,4-4,4,2 and the teeth are hooked at the tip (Kara and Alp 2005; Coad 2010).”

“Considerable colour variation is known to exist in *G. rufa*, as some individuals are pale while others are very dark. Typically, overall color is brownish-olive to dark green with darkly mottled flanks and a yellowish to whitish belly. A dark or bluish-green band runs along the whole flank ending in a spot on the caudal fin base. There is a black, greenish-blue, lime-green or dusky-blue spot behind the upper corner of the gill opening, sometimes extending as a bar to the pectoral fin base. Fins can be yellowish with darker margins, there is a black spot at the caudal fin base, and the upper caudal lobe may have a few dark grey spots. There is usually a dark spot at the bases of each of the middle four to five dorsal fin rays (Coad 2010).”

“Total length (TL) of *G. rufa* has been recorded at the following maximal lengths: 13 cm (and a maximum mass of 39 g) for fish collected in Turkey (Kara and Alp 2005) and Iran (Esmaili and Ebrahimi 2006), 24 cm (and a maximum mass of 129 g) for specimens collected from the Tigris River, Iraq (Rahemo 1995) and 14 cm in fish from Israel (Goren 1974). Yalçin-Özdilek and Ekmekçi (2006) measured 208 *G. rufa* and found a range of 3.3 to 14.5 cm maximum fork length of fish collected during April to November in the Asi River and its tributaries (Turkey).”

## Biology

From Froese and Pauly (2011):

“Found in different habitats such as rivers, lakes, small ponds, and small muddy streams. Hides under and among stones and vegetation. Bottom dweller, feeding on aufwuchs [periphyton]. Said to also occur in hot ponds where they feed on the skin scales of bathers, reducing illnesses such as neurodermitis.”

From Jarvis (2011):

“Information gained from aquarium-held specimens indicates that *G. rufa* are broadcast spawners, likely over gravel type substrates of which they are most associated, so nest building and egg guarding do not appear to occur with this species (Baensch and Riehl 2004). Other observations derived from aquarium specimens include; juveniles acting as cleaner fish on ectoparasites of other aquarium specimens; propagation in the aquarium environment appears possible; and *G. rufa* is regarded as a novice species, indicating a low degree of difficulty to maintain (Baensch and Riehl 2004). A limited form of external sexual dimorphism may appear in adults at the onset of maturity with the appearance of more pronounced nuptial tubercles in males and the bases of the pectoral, pelvic and anal fins may differ from those of females in breeding males (Coad 2010).”

## Human uses

From Jarvis (2011):

“Psoriasis Control and Spa Industry

*G. rufa* have been utilized in psoriasis treatment (e.g., Üндar et al. 1990), originally known from the Kangal hot springs in Central Anatolia, Turkey. Increasingly common is the use of this species by the spa industry for pedicures and manicures; operations are opening up in U.S.A and Canada. For both applications, the fish feed on dead skin.”

“Use as Human Food

Garra species may be occasionally fished and consumed (Coad 2010).”

## Diseases

From Breyer (2012):

“Our study identified some of the species of bacteria associated with this fish species, including some that can cause infections in both fish and humans,” lead researcher David Verner-Jeffreys told a wire service. Water, he added, is a fertile breeding ground -- and when partnered with bacteria thriving on fish scales or waste, even the tiniest cut could allow infection to happen readily. In April 2011, a bacterial outbreak among 6,000 doctor fish brought from Indonesia to British beauty venues revealed colonies of *Streptococcus agalactiae*, a group of bacteria that can lead to sepsis, meningitis, or pneumonia.”

From Jarvis (2011):

“Various *Dactylogyrus* spp. monogeneans have been recorded from the gills of *G. rufa* (Jalali and Molnár 1990; Gussev et al. 1993), *Gyrodactylus* spp. have also been noted (Jalali et al. 2005). *Cucullanus* (Nematoda) infection has been recorded in the pericardium of *G. rufa* (Moravec and Rahemo 1993; Rahemo 1995) and small-sized nematode larvae (of the family Cucullanidae) encysted in the pericardium and parasitic nematodes have also been observed in this species (Yalçin-Özdilek and Ekmekçi 2006). Furthermore, Rahemo (1995) recorded a parasitic crustacean (*Pseudolamproglena annulata*) infecting the gills and a digenea (*Pseudochetosoma salmonicola*) infecting the gall bladder of *G. rufa*.”

### **Threat to humans**

From Froese and Pauly (2011): “Harmless.”

## **3 Impacts of Introductions**

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No documentation found on the impacts of introduction for *Garra rufa*.

From Jarvis (2011):

#### **“INTERSPECIFIC INTERACTIONS**

As *G. rufa* is unknown as an exotic species, direct observation or measurement of ecological impact is uncertain. Due to the modest size and largely herbivorous tendency of *G. rufa*, it may be in competition for food resources with resident species that live in compatible habitats and have similar dietary requirements and feeding habits, such as suckers and certain cyprinids (Brian W. Coad, Canadian Museum of Nature, 240 McLeod Street, Ottawa, ON pers. comm. [not cited]).”

## 4 Global Distribution



Figure 1 (above). Known distribution of *Garra rufa*. Map from GBIF (2012).

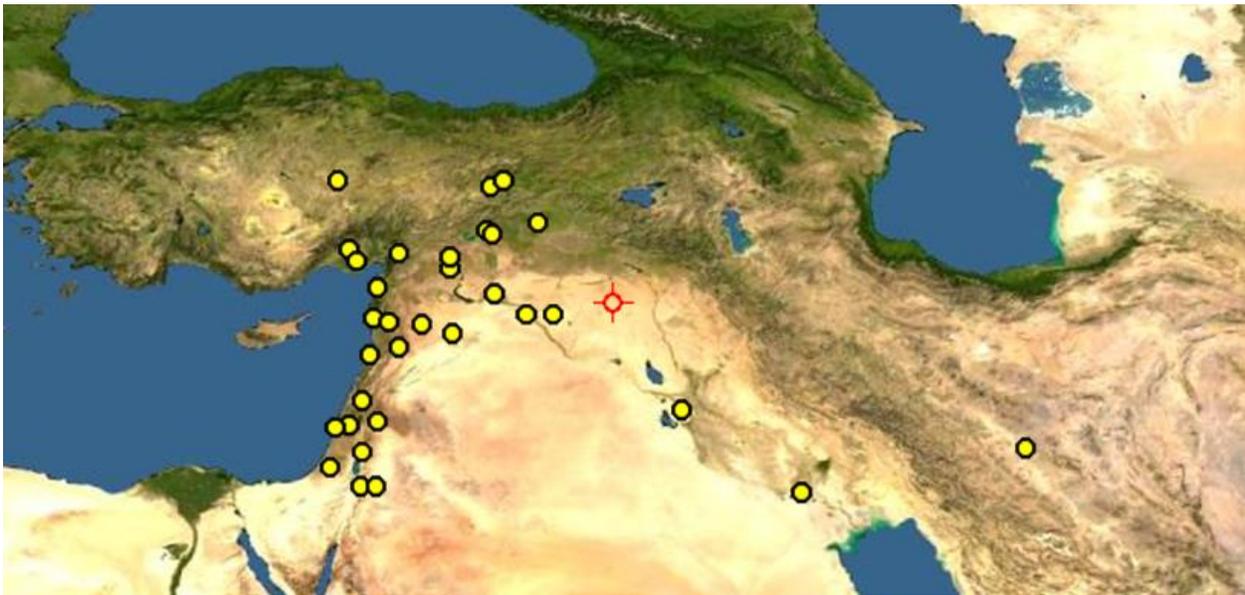


Figure 2 (above). Recorded *Garra rufa* collection sites (Discover Life 2010).

## 5 Distribution within the United States

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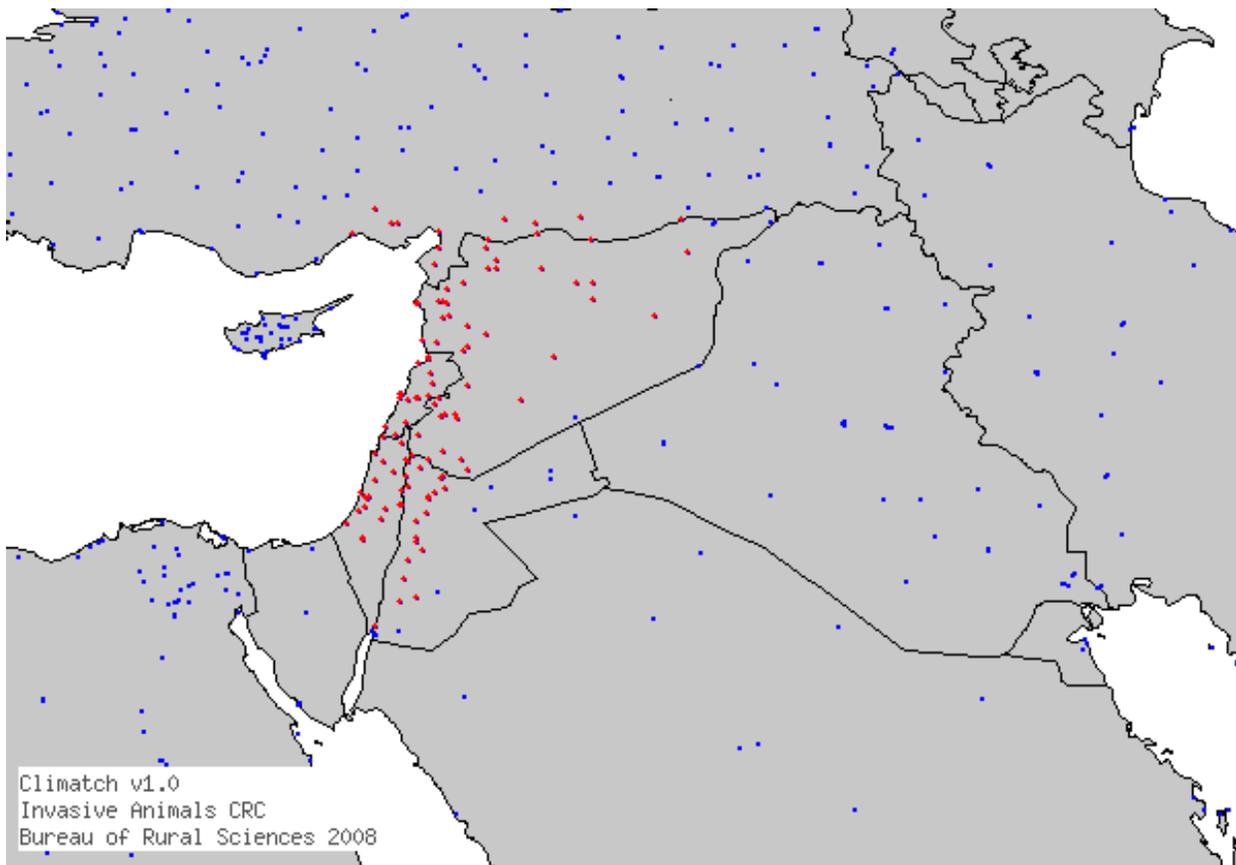
No known locations in the United States.

## 6 CLIMATCH

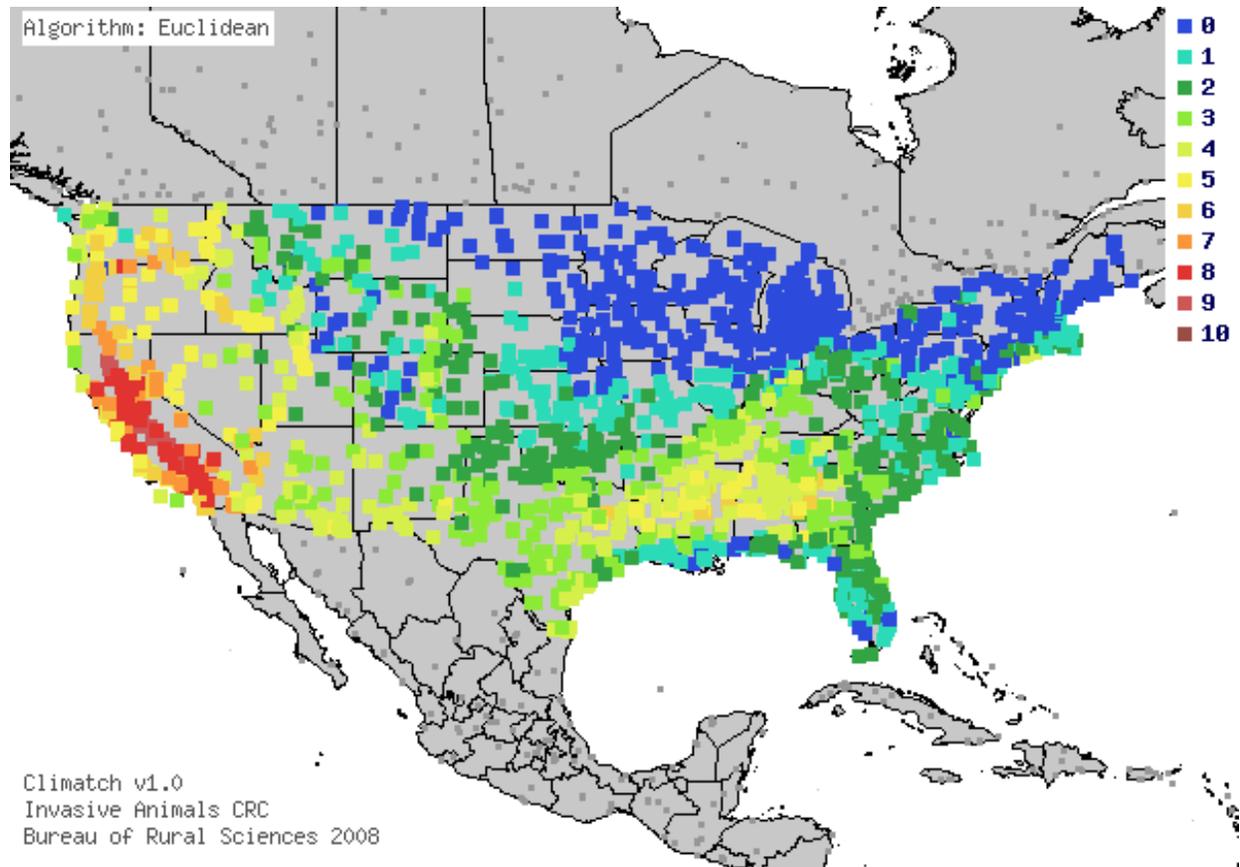
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### Summary of Climate Matching Analysis

The climate match (Australian Bureau of Rural Sciences 2010; 16 climate variables; Euclidean Distance) was high along the Central Valley in California extending into parts of Oregon and Southern Washington. Medium matches were found in parts of the interior West and parts of the Southeast. Low matches elsewhere. Climate 6 match indicated that the Continental U.S. has a medium climate match. The range for a medium climate match is 0.005 - 0.103; the climate match of *G. rufa* is 0.102.



**Figure 3 (above).** CLIMATCH (Australian Bureau of Rural Sciences 2010) source map showing weather stations selected as source locations (red) and non-source locations (blue) for *Garra rufa* climate matching. Points in Germany and Southeastern Iraq were not included in the climate match due to the point in Germany being suspect (e.g., museum specimen), and the point in Iraq being located away from a body of water. Source locations from GBIF (2012).



**Figure 4 (above).** Map of CLIMATCH (Australian Bureau of Rural Sciences 2010) climate matches for *Garra rufa* in the continental United States based on source locations reported by GBIF (2012). 0= Lowest match, 10=Highest match.

**Table 1 (below).** CLIMATCH (Australian Bureau of Rural Sciences 2010) climate match scores.

Climatch Score	0	1	2	3	4	5	6	7	8	9	10
Count	497	295	360	270	238	113	83	40	65	13	0
Climate 6 Proportion=		0.102	(Med.)								

## 7 Certainty of Assessment

Although some biological information on *Garra rufa* is available (Jarvis 2011), there is no existing information on introductions and impacts. Therefore certainty of this assessment is low.

## 8 Risk Assessment

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### Summary of Risk to the Continental United States

*Garra rufa* has no listed impacts from introduction and has not been introduced outside of its native range. The CLIMATCH scores show a medium risk, and certainty of assessment is low due to a lack of information pertaining to its introduction outside its native range. The overall risk for this species is uncertain.

### Assessment Elements

- **History of Invasiveness (Sec. 3):** Low
- **Climate Match (Sec. 6):** Medium
- **Certainty of Assessment (Sec. 7):** Low
- **Overall Risk Assessment Category:** Uncertain

## 9 References

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**Note: References cited within quoted text but not accessed for this ERSS are included in Section 10 below.**

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Photo license available: <http://creativecommons.org/licenses/by-nc/3.0/legalcode>.

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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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