

Calico crayfish (*Orconectes immunis*)

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, June 2015



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1 Native Range, and Status in the United States

Native Range

From Benson (2015):

“Great Lakes, lower Ohio, and upper Mississippi drainages. Massachusetts to Wyoming and Alabama to Ontario, Canada (Hobbs, 1974).”

Status in the United States

From Benson (2015):

“Native Range: Great Lakes, lower Ohio, and upper Mississippi drainages. Massachusetts to Wyoming and Alabama to Ontario, Canada (Hobbs, 1974).”

“Nonindigenous Occurrences: Unspecified locations in Pennsylvania; Hudson River in New York; all New England states except Maine.”

Means of Introductions in the United States

From Benson (2015):

“Probable bait bucket introduction.”

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2015):

“Kingdom Animalia
Subkingdom Bilateria
Infrakingdom Protostomia
Superphylum Ecdysozoa
Phylum Arthropoda
Subphylum Crustacea
Class Malacostraca
Subclass Eumalacostraca
Superorder Eucarida
Order Decapoda
Suborder Pleocyemata
Infraorder Astacidea
Superfamily Astacoidea
Family Cambaridae
Subfamily Cambarinae
Genus *Orconectes*
Subgenus *Orconectes* (*Gremicambarus*)
Species *Orconectes immunis* (Hagen, 1870)”

“Taxonomic Status: valid”

Size, Weight, and Age Range

From Benson (2015):

“1.7 - 3.5 inches total length (Pflieger, 1987)”

Environment

From Adams et al. (2010):

“This is a generalist species often found in roadside ditches, as well as ponds, flood plains, drainage ditches and small sluggish streams. It also occurs in higher gradient gravel bedded streams (Pflieger 1996, Williams 1954). ... Although this species has a broad ecological niche it is unable to colonize fast flowing streams of more than 26 cms-1 which restricts its distribution (Taylor et al. 2005).”

Climate/Range

From Adams et al. (2010):

“This is a widespread crayfish species found from Maine and Connecticut in the east to eastern Colorado and Wyoming in the west, and from Kentucky in the south to southern Manitoba, Ontario, and Quebec in the north.”

“Unlike other crayfish, it has a better tolerance to pollution and low oxygen levels (Taylor et al. 2005).”

Distribution Outside the United States

Native

From Adams et al. (2010):

“Canada (Manitoba, Ontario, Québec); United States”

Introduced

From Adams et al. (2010):

“Germany”

Means of Introduction Outside the United States

From Schrimpf et al. (2013):

“The pathway of introduction of *O. immunis* is unclear; both an introduction from the pet trade and as fishing bait by Canadian soldiers had been suggested (Dehus et al. 1999; Gelmar et al. 2006). However, since the calico crayfish was not known in the German pet trade prior to its establishment in the Upper Rhine plain and because this species is popular as fishing bait in North America, an introduction as fishing bait seems more likely (see Gelmar et al. 2006; Chucholl 2013).”

Short description

From Smith (2013):

“The calico crayfish, or paper shell crayfish, is a plain, grey-green color species characterized by a pale zone in the middle of the carapace and abdomen. Chelipeds, or pincers, have orange tips. Male chelipeds usually display a purple tint and are generally larger than female chelipeds.”

Biology

From Benson (2015):

“Found in shallow ditches and sloughs of medium to large rivers with plenty of aquatic plants and plant debris for cover; mud bottoms with stagnant water; can tolerate high turbidity; a

burrower that will move from pond to pond. Breeding occurs in late summer in New York and eggs are laid in the spring.”

From Adams et al. (2010):

“The substrate in the habitats of this species is generally soft mud or clay with abundant aquatic vegetation (Crocker and Barr 1968, Berrill 1978). This species is also not an obligate burrower and so can also travel across dry ground, especially in wet weather and is thus able to move from pond to pond (Crocker and Barr 1968). This species is found to occur with other crayfish species such as *Cambarus bartonii*, *Fallicambarus fodiens*, *Orconectes propinquus*, *Orconectes rusticus rusticus*, *Orconectes virilis* and *Orconectes obscurus* (Berrill 1978, David et al. 1996, Hamr unpublished data).”

Human uses

From Adams et al. (2010):

“This species is widely used as bait in the United States and Canada (Taylor et al. 2005). Roughly 175 metric tonnes of crayfish are cultivated for the bait industry annually (Taylor et al. 2005). This species is not only cultivated but also harvested from the wild (Taylor et al. 2005). This species is not thought to be commercially viable, however Taylor et al. (2005) have noted that it does grow to a suitable size.”

Diseases

From Schrimpf et al. (2013):

“Using the currently most reliable molecular detection method for the agent of crayfish plague (Vrålstad et al. 2009; Tuffs and Oidtmann 2011), we have shown for the first time an *A. astaci* infection in calico crayfish. ... Moreover, we confirmed the infection in spiny-cheek crayfish co-existing with calico crayfish.”

Crayfish plague is an OIE-reportable disease.

Threat to humans

None reported.

3 Impacts of Introductions

From Chucholl et al. (2008):

“*Orconectes immunis* was strongly aggressively dominant over *O. limosus* when size-matched form I males or females were combined. Even 4 mm smaller *O. immunis* (carapace length) were still dominant over larger *O. limosus* and males of *O. limosus* were not dominant over similar-sized females of *O. immunis*. *Orconectes immunis* was also highly superior in competition for shelter. Shelter occupancy was approximately 6 times higher in *O. immunis* than in *O. limosus*. We conclude that one of the reasons for the observed decline of *O. limosus* coincidental with the arrival of *O. immunis* in some stretches of the Rhine catchment may be the inferiority of the

former in aggressive contests. Inferiority in aggressive interactions may force *O. limosus* to leave refuges, making them vulnerable to predators.”

From Chucholl (2012):

“To date, *O. immunis* has not come into contact with [indigenous crayfish species] ICS [in Europe] because ICS stocks have largely vanished from the upper Rhine plain during the last two centuries, as a result of habitat degradation, water pollution, crayfish plague and the invasion by *O. limosus* (Souty-Grosset et al., 2006; Chucholl and Dehus, 2011). However, based on the observed displacement of *O. limosus*, the author anticipates that *O. immunis* has the potential to out-compete ICS. Any contact of *O. immunis* with ICS stocks will therefore most likely result in the loss of the latter. On the basis of its omnivorous feeding habits, extensive burrowing behaviour, and high abundance in many habitats, it is likely that *O. immunis* also has a pronounced ecological effect on indigenous biota and ecosystems. For instance, the decline of macrophyte species in LB coincided with the first observations of *O. immunis* in LB, suggesting that *O. immunis* might negatively affect macrophyte biomass, as was experimentally shown by Letson and Makarewicz (1994). However, explicit evidence for the ecological impact of *O. immunis* is currently lacking, and should be targeted in future research.”

4 Global Distribution



Figure 1. Distribution of *Orconectes immunis*. Map from GBIF (2015).

5 Distribution within the United States

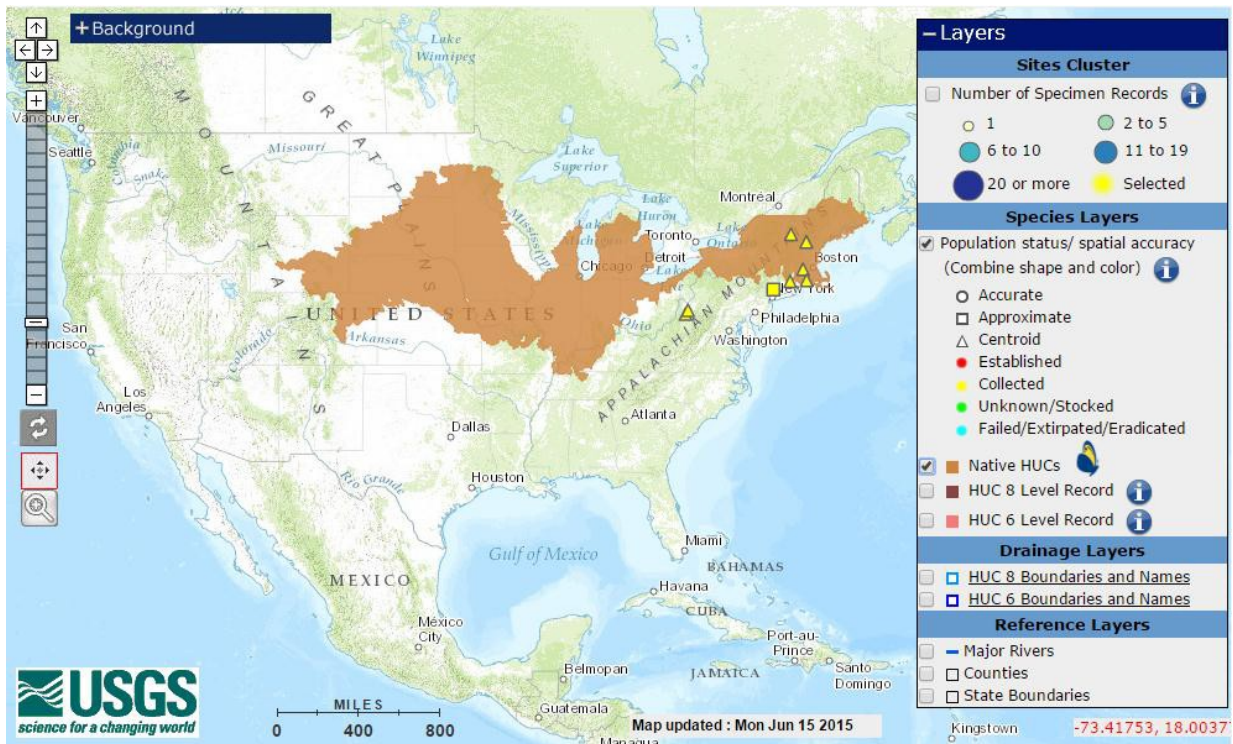


Figure 2. Distribution of *O. immunis*. Map from Benson (2015).

6 Climate Matching

Summary of Climate Matching Analysis

The climate match (Sanders et al. 2014; 16 climate variables; Euclidean Distance) was high in the Northeast, Great Lakes, and Plains states. The climate match was low for the West, the Southeast along the coasts, and through most of Texas. Climate 6 proportion indicated that the contiguous U.S. has a high climate match. The range for a high climate match is 0.103 and greater; the climate match of *O. immunis* is 0.606.

Crayfishes have been observed to establish populations in climates different from that found within their native range (M. Hoff, U.S. Fish and Wildlife Service, personal communication). The climate match shown here may be an underestimate of climate suitability for the establishment of *O. immunis*.

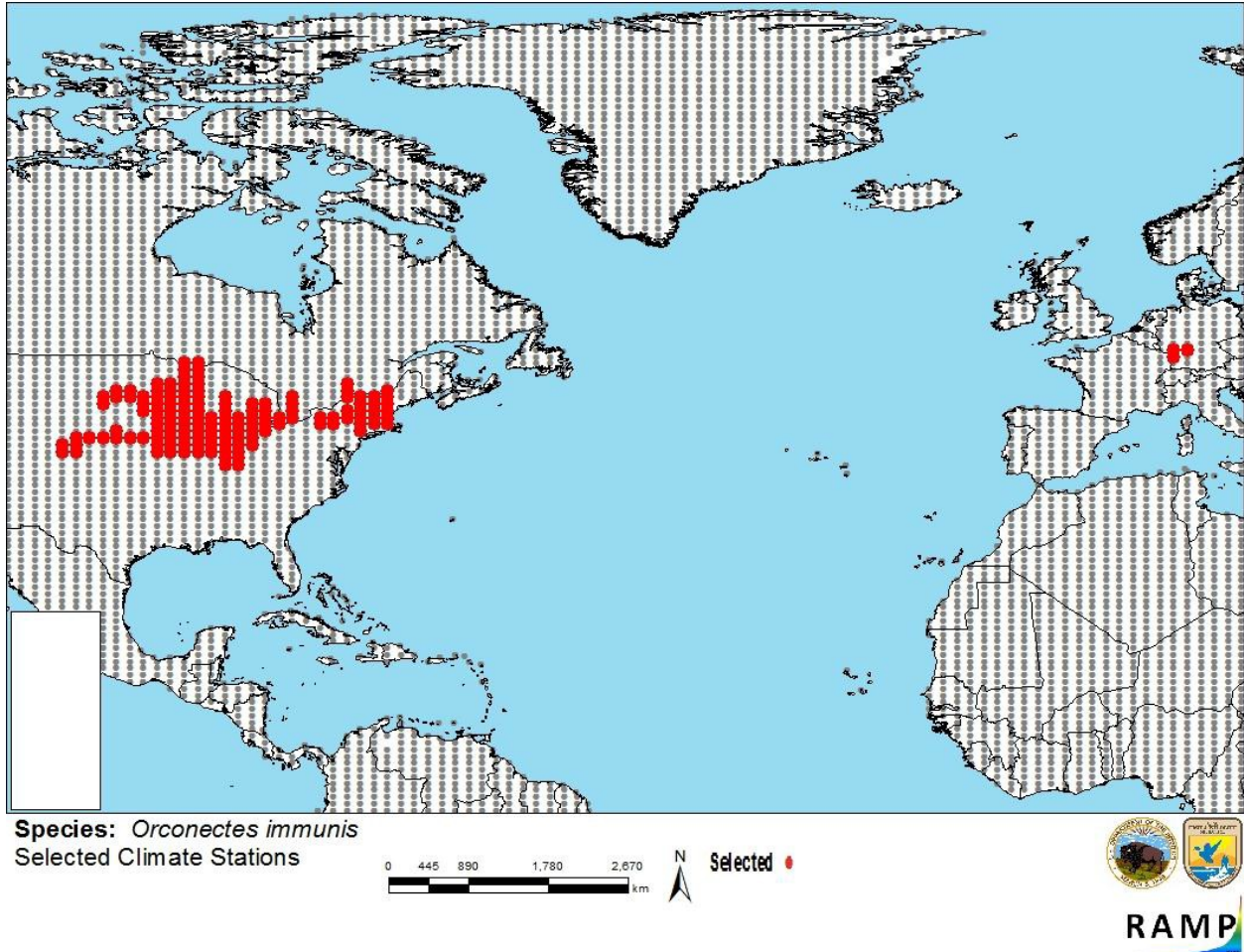


Figure 3. RAMP (Sanders et al. 2014) source map showing weather stations selected as source locations (red) and non-source locations (gray) for *O. immunis* climate matching. Source locations from Hobbs and Jass (1988, in Crandall et al. 2001) and GBIF (2015).

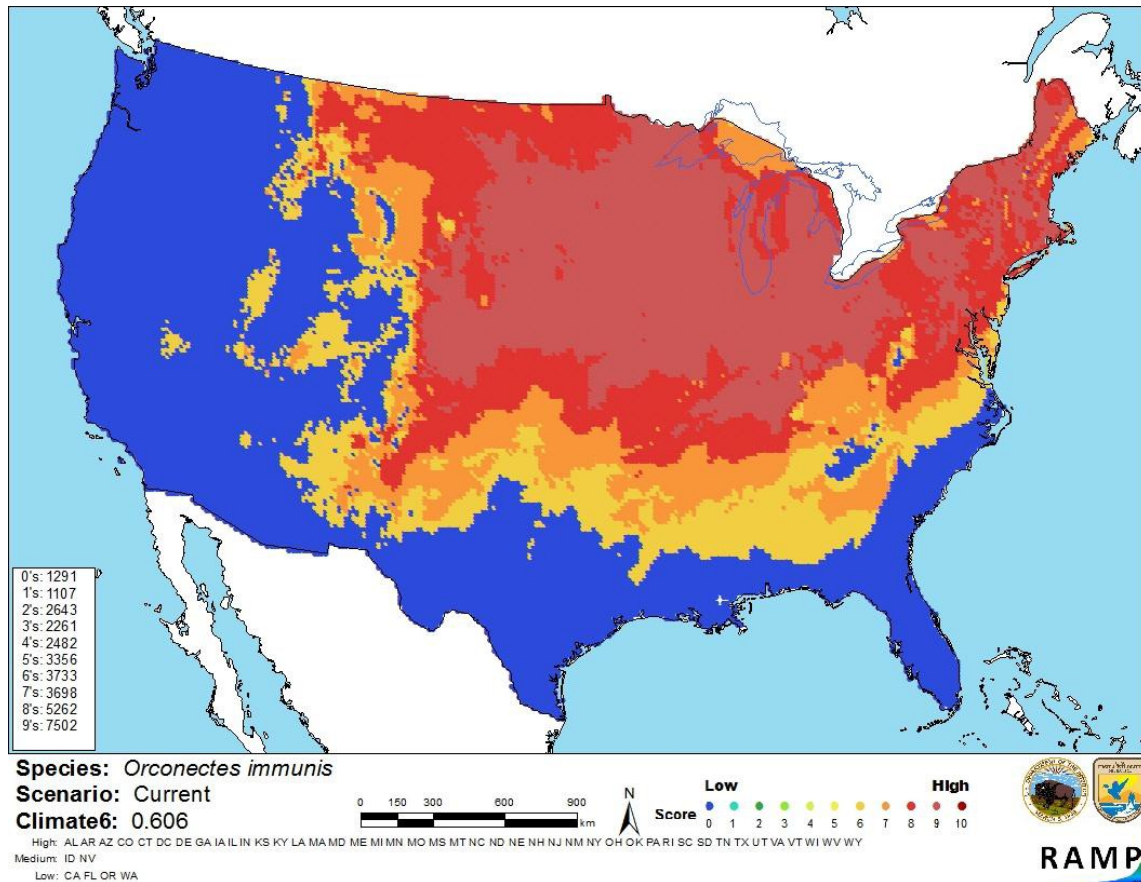


Figure 4. Map of RAMP (Sanders et al. 2014) climate matches for *O. immunis* in the continental United States based on source locations from Hobbs and Jass (1988, in Crandall et al. 2001) and GBIF (2015). 0= Lowest match, 10=Highest match. Counts of climate match scores are tabulated on the left.

7 Certainty of Assessment

The biology and ecology of *O. immunis* have some documentation in the scientific literature. Controlled studies on the ecological impacts of *O. immunis* suggest that introduction of this species outside its native range could have detrimental impacts to native flora and fauna, but the only documented impacts to date have been on another non-native species. Certainty of this assessment is low.

8 Risk Assessment

Summary of Risk to the Continental United States

O. immunis is a crayfish species native to the Midwestern US. Its range has been expanded into the Northeast and also to western Germany, likely as a side effect of its use as fishing bait. In Germany, researchers have observed the decline of a long-established non-native crayfish species where *O. immunis* has established, but effects on native species are still undocumented. *O. immunis* establishment may have an impact on macrophyte communities; it has been shown to have potential use for macrophyte control. *O. immunis* can carry crayfish plague, an OIE-

reportable disease. Climate match of this species to the contiguous US is high. Overall risk for this species is uncertain.

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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