Australian Redclaw *(Cherax quadricarinatus)*
Ecological Risk Screening Summary

Web Version – 8/21/2012

Photo: © Keith A. Crandall From EOL (2014)

1 Native Range, and Status in the United States

Native Range
From McCormack (2010):

"North coast of Northern Territory and Cape York, Queensland, Australia. This species is native to freshwater creeks and water bodies in tropical Queensland, the Northern Territory and south-eastern Papua New Guinea."

Status in the United States
USGS (2010) lists multiple established locations in Puerto Rico.

Means of Introductions in the United States

From Medley et al. (1994):

"Red claw have been grown successfully in ponds in the southern U.S. on a research scale for the last four years. In addition, many private companies have been aggressively engaged in the development of red claw production in the U.S. and abroad for several years."

2 Biology and Ecology

From ITIS (2011):

Taxonomic Hierarchy and Taxonomic Standing

"Kingdom Animalia
Phylum Arthropoda
Subphylum Crustacea
Class Malacostroca
Subclass Eumalacostra
Superorder Eucarida
Order Decapoda
Suborder Pleocyemata
Infraorder Astacidea
Superfamily Parastaciodae
Family Parastacidae
Genus Cherax Erichson, 1846 Swainson, 1839
Species *Cherax quadricarinatus* von Martens, 1868

Taxonomic current standing: valid"

Size, Weight, Age

From Ahyong and Yeo (2007):

"The Redclaw may reach a total length of about 250 mm and weigh up to 600 grams."

Environment

From Austin et al. (2009):

"This is a non-burrowing species that is tolerant of a wide variety of habitats."

Climate/Range

From Austin et al. (2009):

"Found in tropical regions throughout the world, including its native range of Northern Australia and Papua New Guinea, as well as introductions in Jamaica, parts of South America, and Puerto Rico, thrives in temperatures between 15 and 30 degrees Celsius."

Distribution Outside of the United States

From Fetzner (2011):

"Translocated widely in eastern Queensland for aquaculture and food."

From Austin et al. (2009):

"This species is tolerant of a wide variety of habitats and is considered an invasive species in certain parts of Australia and in many other countries. Feral populations have been established in South Africa, Mexico, Jamaica, Singapore and Puerto Rico (Ahyong and Yeo, 2007)"

Short description

From Ahyong and Yeo (2007):

"The body is conspicuously coloured with red and maroon highlights on a bluegreen to green body. In addition, mature male Red-Claws have a bright red pulvinus on the outer surface of the major chelae, hence the common name."

Biology

From Austin et al. (2009):

"This species can be found in coastal streams and freshwater environments, with a preference for the slower moving upper reaches of rivers as well as lakes and lagoons (Wingfield 2002). The distribution of this species is restricted to tropical and subtropical climates as the species cannot survive prolonged exposure to water temperatures below 10^{o}C (Semple *et al.* 1995). The hardiness and conspicuous colouration of this species has also made it popular in the aquarium trade worldwide (Ahyong and Yeo, 2007)."

"This is a species with considerable potential for commercial culture. High growth rates and tolerance to wide variations in water quality make the species suitable for cultivation (Anson and Rouse 1994). In areas where this species has been introduced, it may impact native fauna through direct competition, predation or habitat modification, or spreading previously unknown parasites into native populations (Ahyong and Yeo, 2007)."

"This species has life history traits which are typical of an invasive species; that is, this species is *r*-selected."

Human uses

From Fetzner (2011):

"…aquaculture and food."

From McCormack (personal correspondence):

"…live bait, aquarium pets…"

Diseases

From Austin et al. (2009):

"This species has been reported to be a carrier of a number of pathogens, including viruses, bacteria, fungi, protozoan and metazoan parasites (Edgerton 1999, Edgerton *et al*. 2000, Hauck *et al*. 2001, Bowater *et al*. 2002, Romero and Jimenez 2002 [references cited by Austin et al. 2009, but not accessed for this report])."

From Australian Blue Yabby Aquaculture (2010):

"Diseases such as the European Crayfish Plague (Aphanomyces) have devastated European stocks and reached British native stocks in 1986. Australia is the only continent to be Crayfish Plague free."

"Porcelain disease (or White Tail disease) can also occur in the yabby, caused by a single celled microscopic animal, the microsporidian Thelophania. The disease can easily be detected in its late stages, when the underside of the tail turns white and the walking legs often become rigid and splayed. It is invariably fatal and seems to be transmitted by cannibalism of dead or dying yabbies that have the disease. This disease is not harmful to humans, and is present in possibly 5% of natural crayfish populations."

"Themnocephalid flatworms are 1 to 110mm long leech-like animals, and their eggs are laid on the soft under surfaces of the crayfish. These worms are not true parasites but commensals because they feed upon particles of food scattered in the water while the crayfish is eating. They are not actively harmful to the crayfish."

Threat to humans

No data or information available.

3 Impacts of Introductions

From McCormack (personal correspondence):

"Only 27 species of Cherax are endemic to Australia…all of these species have the potential to be invasive under the right circumstances as they are all highly fecund and fast growing. In Australia we have only 3 species that are establishing populations outside their natural distributions: *Cherax destructor*, *Cherax albidus,* and *Cherax quadricarinatus*…All are used by recreational fishers as live bait, aquarium pets, and eating, leading to deliberate stocking by people in dams and creeks outside their natural distribution."

From Jones (2005):

"Summary of Invasiveness
C. quadricarinatus is a reasonably non-aggressive, non-territorial freshwater crayfish species that does not compete well with other species occupying similar niches. Although there is no definitive research to support this notion, circumstantial evidence from areas to which C. quadricarinatus has been translocated, is compelling. C. quadricarinatus has been widely translocated outside its natural range in northeastern Australia. It has developed abundant, self-sustaining populations in many large, man-made reservoirs and has been stocked to aquaculture developments within many catchments in which it is not native. Despite the opportunity for it to establish itself in the rivers and streams adjacent to the reservoirs or farms, there are no reports of it having done so. It would appear, that it is easily predated and/or competitively excluded to the extent that it is not able to colonise these areas. From that perspective, it can be considered a non-invasive species."

"Impact: Economic
Despite keen interest in the development of C. quadricarinatus aquaculture in many countries to which it has been translocated,it has yet to have made any substantial economic impact. Outside of Australia, C. quadricarinatus has been most prominently promoted in Ecuador during the late 1990s. It was considered a suitable substitute for penaeid shrimp culture which had been severely curtailed due to Taura Syndrome. Significant infrastructure was established, including two prominent hatchery producers, supplying juveniles for the establishment of growout operations. The projected yields and market price were not achieved, and production quickly rose then fell to insignificant levels, at which they have stayed. The economic impact has been negligible (Romero and Jimenez, 2002 [cited by Jones 2005, but not accessed for this report])."

"More realistic and subtle development of C. quadricarinatus has occurred in other countries, which may in time become significant. At this stage however, the economic impact of this species has been small."

"Impact: Environmental
Not researched formally, but would appear to be negligible."

"Impact: Biodiversity
Not researched formally, but would appear to be negligible."

"Impact: Social
Not researched formally, but would appear to be negligible."

From Pattillo (2010):

We found that although redclaws did have a significant, short-term impact on the average size of our model native species, there were also several factors that reduce the potential impact of redclaws on native crayfish populations.

Juvenile redclaws were immobilized at water temperatures ≤ 14 °C, which would render them susceptible to starvation and predation in the wild. Adult redclaws in the outdoor mesocosms suffered 100% mortality by mid-December when average daily temperatures were still above 14 °C. The mechanisms behind the die-off are unclear, but may be related to suppression of the immune system at temperatures below 20 °C.

The inability to overwinter suggests that the primary impacts of redclaw escapement will be short term, within the course of a single growing season. Average size of P. acutissimus did decrease with increasing redclaw biomass from week 12 onwards. However, although average size of P. acutissimus also decreased with increasing total (native + redclaw) biomass, average size of redclaws did not decrease with increasing total crayfish biomass. This suggested that redclaw were either superior competitors for food, or were better able to assimilate the combination of commercial feed and natural food production in the mesocosms. Because P. acutissimus females produced broods during this time period, a concern is that egg production, and thus recruitment, of P. acutissimus were reduced under food-limiting conditions. However, when we examined male and female P. acutissimus separately, we found that only the average size of males declined with increasing redclaw abundance. Thus, although we did not directly measure fecundity, it is not likely that redclaws reduced fecundity of female P. acutissimus via competition for food.

4 Global Distribution

Figure 1. Global distribution of *C. quadricarinatus*. Map from GBIF (2010).

5 Distribution within the United States

Figure 2. Distribution within the United States (populations established in Puerto Rico). Map from USGS (2011).

6 CLIMATCH

Summary of Climate Matching Analysis

The climate match (Australian Bureau of Rural Sciences 2010, 16 climate variables; Euclidean Distance) was lowest in the northwestern US, and gets higher towards the southern and southeastern regions of the country. The highest climate matches are found in Florida and Texas. 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, climate match of *Cherax quadricarinatus* is medium at 0.082.

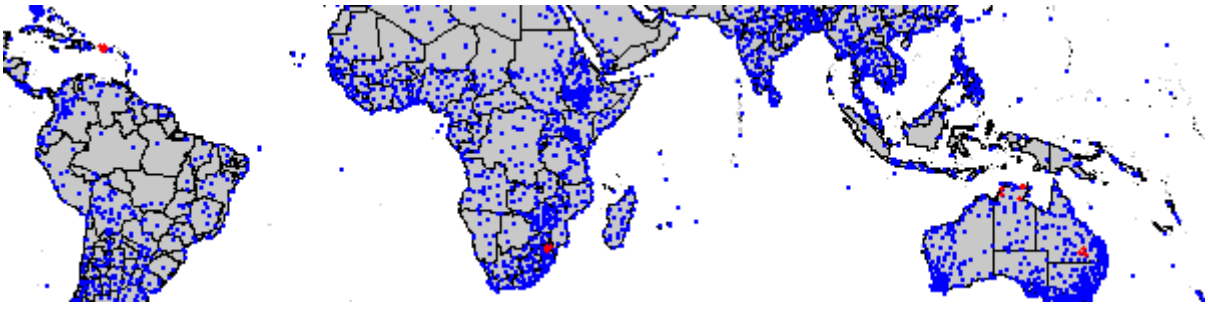

Figure 3. CLIMATCH (Australian Bureau of Rural Sciences 2010) source map showing weather stations selected as source locations (red) and non-source locations (blue) for *Cherax quadricarinatus* climate matching. Source locations from GBIF (2010) and USGS (2011).

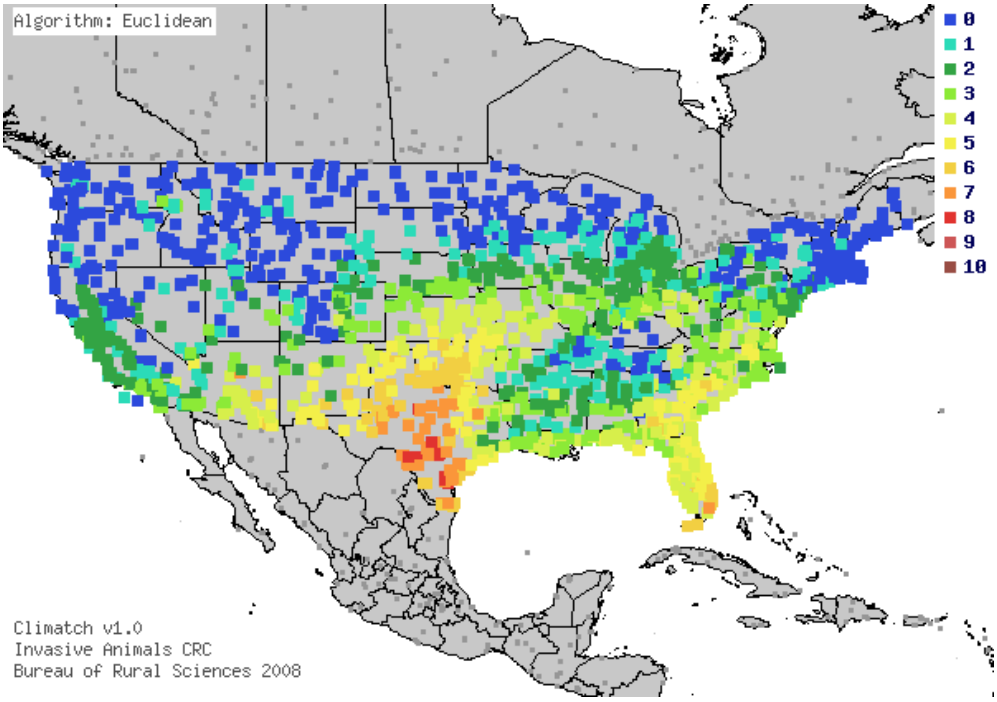

Figure 4. Map of CLIMATCH (Australian Bureau of Rural Sciences 2010) climate matches for *Cherax quadricarinatus* in the continental United States based on source locations reported by GBIF (2010) and USGS (2011). 0= Lowest match, 10=Highest match.

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

CLIMATCH Score	0	1	2	3	4	5	6	7	8	9	10
Count	489	271	366	269	263	154	99	46	17	0	0
Climate 6 Proportion =			0.082								

7 Certainty of Assessment

C. quadricarinatus has established populations outside of its native habitat, but has not caused any specific adverse impacts. This would normally lead to a very uncertain risk for this species, however, this species is also a known vector for the Crayfish Plague making its risk high. A high certainty is ascribed to the risk for this species due to it being a vector for Crayfish Plague.

8 Risk Assessment

Summary of Risk to the Continental United States

Overall risk assessment of *C. quadricarinatus* to the continental United States is high. The climate match indicates a medium match with the continental United States, with high matches in Texas and South Florida. There has been documented establishment of this species in Puerto Rico, Ecuador, South Africa, Mexico, Jamaica, and Singapore, as well as the transport of *C. quadricarinatus* for aquaculture and food purposes worldwide. Thus far, no specific adverse impacts have been reported for this species after introduction, but some researchers have noted

potential impacts from this species. This species is a carrier of the Crayfish Plague, therefore making the overall risk high.

Assessment Elements

- **History of Invasiveness (See Section 3):** Low
- **Climate Match (See Section 6):** Medium
- **Certainty of Assessment (See Section 7):** High
- **Remarks:** Vector for Crayfish Plague
- **Overall Risk Assessment Category: High**

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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http://nas.er.usgs.gov/queries/FactSheet.aspx?SpeciesID=220. Accessed October 2011.

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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