

Yabby (*Cherax destructor*)

Ecological Risk Screening Summary

Web Version – September 2014



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1 Native Range, and Status in the United States

Native Range

From Arkive (2010):

“The yabbie crayfish is widely distributed throughout Australia, being present in most of Victoria and New South Wales, as well as southern Queensland, South Australia and parts of the Northern Territory.”

Status in the United States

No documentation has been found indicating that this species has been introduced into the United States.

Means of Introductions in the United States

No documentation has been found indicating that this species has been introduced into the United States.

2 Biology and Ecology

Taxonomic Hierarchy

From CABI (2012):

Domain: Eukaryota

Kingdom: Metazoa

Phylum: Arthropoda

Subphylum: Crustacea

Class: Malacostraca

Subclass: Eumalacostraca

Order: Decapoda

Suborder: Reptantia

Superfamily: Parastacoidea

Family: Parastacidae

Genus: *Cherax*

Species: *Cherax destructor*

Taxonomic Standing

From CABI (2012):

“The taxonomic status of *Cherax destructor* is under debate (Souty-Grosset et al. 2006). Riek (1969) identified four species in the ‘*C. destructor*’ species-group: *C. albidus*, *C. destructor*, *C. esculus*, and *C. davisii*. Today there is consensus that *C. esculus* and *C. davisii* do not deserve recognition at the species level and that *C. albidus* and *C. destructor* are separate taxa (Sokol, 1988; Campbell et al., 1994; Austin, 1996). However, there is some disagreement concerning at what level the latter two taxa should be recognized and even if they should be distinguished at all (Austin et al., 2003). Using morphological and morphometric data, Sokol (1988) considered *C. albidus* as a distinct species. On the contrary, basing their view on genetic evidence, Campbell et al. (1994) and Austin (1996) interpreted the taxon as a subspecies of *C. destructor*. Austin et al. (2003) even stated that *C. albidus* and *C. destructor* are synonyms. The majority of zoologists (e.g. Munasinghe et al., 2004; Nguyen et al., 2004) use the species epithet *destructor*, but, for essentially commercial reasons, Western Australian Fisheries personnel use the epithet *albidus* (e.g. Morrissy and Cassells, 1992; Lawrence and Jones, 2002).”

“Austin et al. (2003) also recommended that *C. setosus* - formally referred to as *C. destructor rotundus* by Austin (1996) - should be recognized at the species level and that *C. rotundus* is a distinct species. The analysis of samples within the larger systematic context of eastern Australia

confirms these designations and indicates that *C. destructor*, *C. rotundus* and *C. setosus* form a monophyletic group (Munasinghe et al., 2004). Allozyme data support the close relationships among these three species and their status as distinct taxa.”

“Austin (1985) reported little allozyme diversity from *C. destructor* in Western Australia, but recent studies now indicate considerable variation in yabby populations. This perhaps reflects the expansion of yabby aquaculture since the 1990s, with farmers introducing multiple strains from eastern Australia (Lynas et al., 2007).”

“The existence of three geographically correlated clades in *C. destructor* was revealed by Nguyen et al. (2004), with a high degree of genetic divergence between clades (8–15 bp) and relatively limited haplotype diversity within clades (1–3 bp). Historical processes, including fragmentation on a larger geographical scale and more recent range expansion on a local scale, appear to be responsible for such patterns of genetic variation within *C. destructor*.

“Except for *C. albidus sensu* Austin et al. (2003), there are no formal synonyms.”

“The common name, yabby, is an ambiguous term since it is also used to describe other Australian *Cherax* species (other than the smooth marron, *Cherax cainii*, and the hairy marron, *Cherax tenuimanus*) and *Engaeus* spp., and is also applied to some marine Decapoda (e.g. mud shrimp, infraorder Thalassinidea, such as the bass yabby, *Trypaea australiensis* Dana, 1852, a common species in southeastern Australia that is used as bait). The term yabby seems to derive from the word *yabij* in the aboriginal language, which was used by wandering tribes to describe the native crayfish from central Australia. The generic name *Cherax* is thought to be a misspelling of the Greek word '*charax*', meaning a pointed stake.”

Size, Weight, Age

From Arkive (2010):

“Length: 20 cm (2); Maximum weight: 320 g (3); Egg length: 2 mm (3); Weight upon hatching: 0.02 g (3).”

Habitat

From CABI (2012):

“*C. destructor* is found in a wide variety of habitats, such as desert mound springs, alpine streams, subtropical creeks, rivers, billabongs, ephemeral lakes, swamps, farm dams, and irrigation channels (Sokol, 1988; Horwitz and Knott, 1995; Austin et al., 2003; Souty-Grosset et al., 2006). The majority of the range of *C. destructor* is characterized by high summer temperatures and low annual rainfall producing an environment conducive to frequent stagnation and desiccation. The ability to undergo multiple spawnings undoubtedly aids the ability of *C. destructor* to occupy temporary habitats and to colonize rapidly a range of new aquatic environments (Beatty et al., 2005a).”

Environment

From CABI (2012):

“*C. destructor* is adapted to a wide range of water temperatures, between 1°C and 35°C. It does not grow at water temperatures below 15°C and falls into a state of partial hibernation (i.e. metabolism and feeding cease) when water temperature drops below 16°C (Withnall, 2000). Growth ceases at 34°C and mortalities start to occur at 36°C (Mills, 1983; Morrissy et al., 1990; Merrick and Lambert 1991; Morrissy and Cassells, 1992). The ideal temperature range for optimum growth is 20-25°C (Withnall, 2000).”

“It tolerates high salinities, with growth ceasing at 8 ppt (approximately equal to 25% seawater) and mortalities starting to occur at 16 ppt (Mills and Geddes, 1980). It tolerates oxygen concentration <1 mg L⁻¹, being able to survive for a short time at 0 mg L⁻¹ oxygen (Mills, 1983; Morrissy and Cassells, 1992).”

“Waters with a pH between 7.5 and 8.5 are preferred; however, yabbies can tolerate a pH of 7.0 and 9.0; a pH of below 7.0 increases the toxicity of dissolved metals within the water column and makes the exoskeleton softer, and a pH of above 9.0 greatly increases the toxicity of ammonia (PIRSA, 2011).”

“Alkalinity and hardness levels of 50-300 mg-1 provide a good buffering effect to pH swings associated with the respiration of aquatic flora and fauna; a lack of calcium in the water results in soft-shelled yabbies (PIRSA, 2011).”

“Yabbies are commonly found on muddy or silted bottoms and are rarely found in clear water habitats; they seem to prefer water with moderate levels of turbidity. Possibly, muddy waters afford some protection from predators such as fish and birds, giving the yabby a better chance of survival (Withnall, 2000). Secchi depths of 20-60 cm are recommended for the optimal management of farm ponds (PIRSA, 2011).”

Climate/Range

From Arkive (2010):

“Widely distributed throughout Australia.”

“Water temperatures of around 20 to 25 degrees Celsius are ideal, but the yabby crayfish can tolerate temperatures down to 1 degree Celsius and as high as 35 degree Celsius by entering partial hibernation (Withnall 2000).”

Distribution Outside the United States

NATIVE (From CABI 2012):

“*C. destructor* ranges over 2 million km² in its native range from South Australia and the southern parts of the Northern Territory in the west, to the Great Dividing Range in the east (Riek, 1967; Sokol, 1988). “

INTRODUCED (From CABI 2012):

“*C. destructor* has also been translocated (for aquaculture and the aquarium trade, possibly also by recreational fishers) to drainages in New South Wales east of the Great Dividing Range, where it has become invasive and in some cases has the potential to displace other crayfish, such as *Euastacus* spp. (S Ahyong, Australian Museum, personal communication, 2011). This wide range in distribution is probably partly due to translocation by aboriginal Australians (Horwitz and Knott, 1995), as the species is used as a subsistence food for some tribes (Horwitz and Knott, 1995). It appears that yabbies were largely restricted to lower altitude habitats in inland areas of southeastern Australia including the Murray-Darling Basin before European settlement, with the *Euastacus* spp. found in higher altitude habitats and the coastal river systems. High altitude yabby populations in Lakes Eucumbene and Jindabyne, which are on the upper reaches of the coastal Snowy River system, are unusual and may be the result of translocation.”

Short Description

From Arkive (2010):

“The smooth-shelled yabbie crayfish (*Cherax destructor*) usually varies in colour from olive-green to brown, but can also be blue, yellow, red or black depending on the habitat, location and individual (Withnall 2000). The head and internal organs of all crayfish are protected by the carapace and the six segments of the abdomen are individually encased with a flexible membrane between them to allow movement. Crayfish have a pair of large claws at the front end, followed by four pairs of walking legs and then four pairs of small swimming legs called swimmerets. These swimmerets are covered with fine hairs to which the female attaches her eggs. A central tail flap is surrounded by four other flaps that are used to move the crayfish rapidly through the water, as well as curling up to form a brood chamber. There are two eyes on the end of eyestalks, but the senses of touch and taste are far more important, and are perceived using a pair of large feelers (or antennae) and a pair of small, fine, centrally located feelers (or antennules) (Withnall 2000).”

Biology

From Arkive (2010):

“Reproduction in the yabbie crayfish is brought about by increases in day-length and in water temperature, with mating begins in the spring once the water temperature has risen above 15 °C. Females will spawn twice or more each season, producing up to 1000 eggs per spawning when

fully grown. The male yabbie positions a spermatophore between the female's fourth and fifth pairs of walking legs, and the female breaks this open and fertilizes her eggs with the contents. The small, green, oval eggs are then attached to the swimming legs where they take 19 – 40 days to hatch, depending on the water temperature (Withnall 2000)."

"The hatchlings grow through three larval stages, molting between each. Young yabbies molt every few days, pumping water under the new, soft shell to make room for growth. Once fully grown, the yabbies molt just once or twice a year. Freshly molted crayfish are exhausted and vulnerable to predation due to the lack of protective covering (Withnall 2000). They may also lose legs during the molt - these are usually regenerated."

"The yabbie crayfish is omnivorous, feeding primarily on rotting vegetation, but is somewhat opportunistic, eating anything it comes across, including, on occasions, other yabbie crayfish. Cannibalism is not a normal state, however, occurring usually when there is insufficient natural food or when there are overcrowded conditions. They are nocturnal, being most active just after dusk and just before dawn. Predators include cormorants, herons, ibises, Murray cod, and Gallop. Small, larval crayfish are also vulnerable to attack from other invertebrates (Withnall 2000)."

Human uses

It has a relatively high commercial value, being a culinary delicacy ('baby lobster') and bait for sport fishing (Western Australia Fisheries, 1999; Nguyen, 2005), but it is also used as an aquarium species and in research.

Diseases

Potential crayfish plague vector (Unestam 1976).
Thelohania parastaci (Moodie et al. 2003)

Threat to humans

None reported.

3 Impacts of Introductions

From Withnall (2000):

"The burrowing behaviour of *C. destructor* is a cause for concern for farmers. Yabbies are capable of digging very deep burrows which can be 50 cm to two meters deep depending on the species. Burrows are connected by access shafts to the water. In the event of the water drying up, the yabby is able to survive over summer in the burrows. Unfortunately, this behaviour may also destroy the integrity of dam walls causing problems for farmers."

From Beatty et al. (2005):

“*Cherax destructor* has become established in many wild aquatic systems in Western Australia in the past decade. The ability of *C. destructor* to withstand relatively extreme physicochemical conditions would help to facilitate this establishment. Life history traits described for *C. destructor* in the Hutt River are typical of an invasive, r-strategist crayfish species, i.e., an extended breeding period with multiple spawning events, a high spawning frequency, a rapid growth rate and the attainment of maturity at the end of its first year of life. These traits are likely to have facilitated the proliferation of this species in the Hutt River and also aided its establishment in other Western Australian systems. Furthermore, the comparison of life-history traits of *C. destructor* determined in the present study with those recently described for the endemic congeners *C. cainii* and *C. quinquecarinatus*, suggests that it has the potential to become the most abundant species of crayfish once established in an aquatic system that houses these endemics. Given the uniqueness of the freshwater crayfish fauna of the Southwest Coast Drainage Division of Western Australia, the recent spread of *C. destructor* into wild aquatic systems in the region is of serious concern.”

From Beatty (2006):

“As *C. destructor* has the ability to switch trophic positions, when an otherwise abundant, high protein food sources (i.e. fish) becomes limited (as was the case in winter in the Hutt River), it was able to co-exist with *C. cainii*. Furthermore, the ability of *C. destructor* to switch from a diet of fish in summer to a predominantly herbaceous/detrital diet in winter suggests that it may compete for food resources with the other smaller native freshwater crayfishes (such as *C. quinquecarinatus*) in the small unproductive lotic and lentic systems common to south-western Australia, which often lack fish during summer.”

“The recently described *Thelohania parastaci* was identified in *C. destructor* in the Hutt River and *Varvia parastacida*, previously recorded from *C. cainii* and *C. quinquecarinatus* population elsewhere in the region, appeared to be infecting *C. cainii*. Although not confirmed to have infected *C. cainii*, the presence of *T. parastaci* in the sympatric *C. destructor* is of serious concern as there is the potential that the disease may be able to be transmitted to the native congeners of the region, particularly as *C. destructor* establishes itself in other natural waterbodies.”

4 Global Distribution

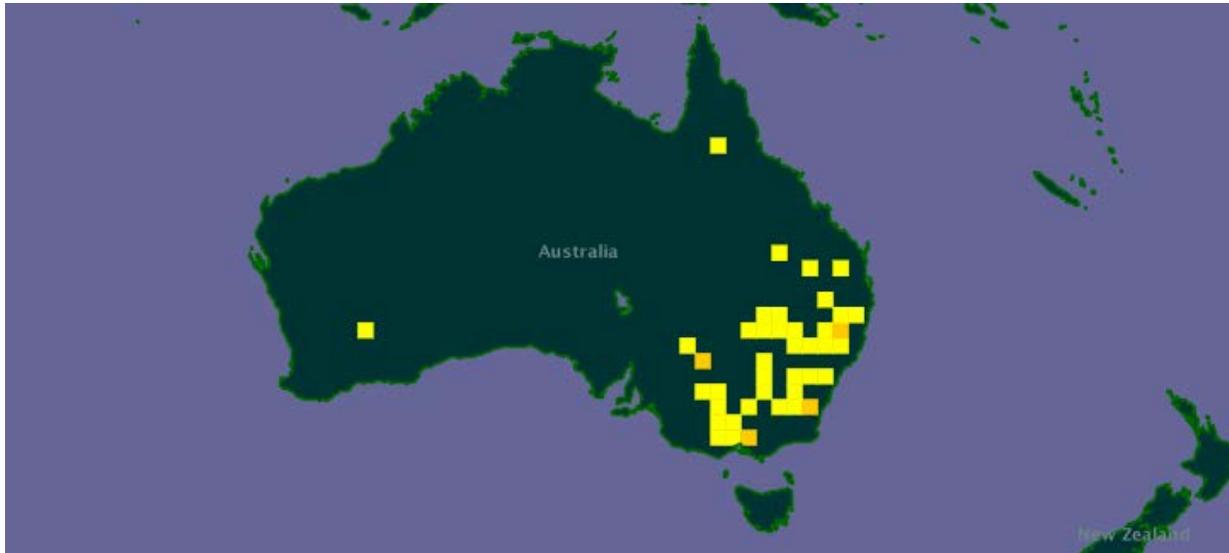


Figure 1 (above). Global distribution of *C. destructor*. Map from GBIF (2010).

5 Distribution within the United States

No reported locations for this species in the United States.

6 CLIMATCH

Summary of Climate Matching Analysis

The climate match (Australian Bureau of Rural Sciences 2010; 16 climate variables; Euclidean Distance) was high throughout the East, Texas, and parts of the Northwest. Medium matches covered most of the rest of the United States, with low matches in the Northern Plains. Climate 6 match indicated that the United States has a high climate match. The range for a high climate match is 0.103 and greater, climate match of *C. destructor* is 0.388.

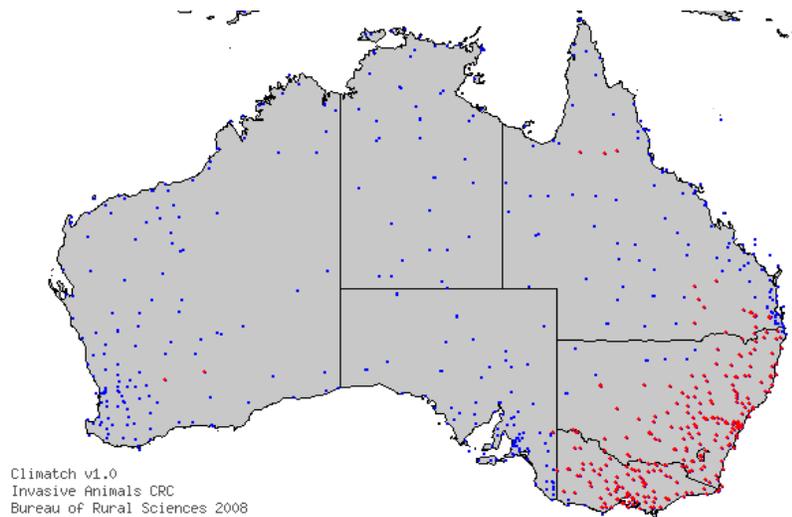


Figure 2 (above). CLIMATCH (Australian Bureau of Rural Sciences 2010) source map showing weather stations selected as source locations (red) and non-source locations (blue) for *C. destructor* climate matching. Source locations from GBIF (2010).

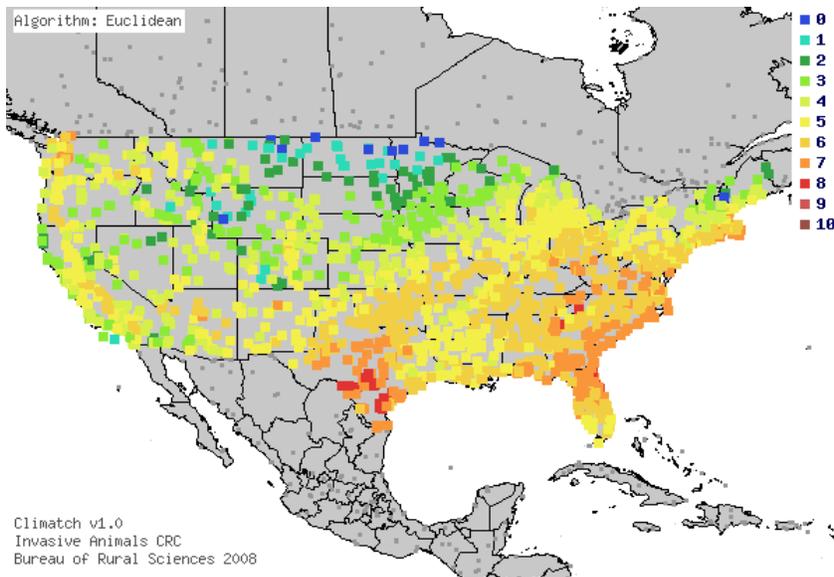


Figure 3 (above). Map of CLIMATCH (Australian Bureau of Rural Sciences 2010) climate matches for *C. destructor* in the continental United States based on source locations reported by GBIF (2010). 0= Lowest match, 10=Highest match.

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	11	35	74	194	345	530	507	218	28	0	0
Climate 6 Proportion =			0.388 (High)								

7 Certainty of Assessment

Information on the biology and impacts of this species is readily available. Certainty of assessment for this species is high.

8 Risk Assessment

Summary of Risk to the Continental United States

C. destructor has established itself in Western Australia, where it is considered an invasive species. It has significant potential to impact native crayfish species there. This species is common in aquaculture and is gaining popularity as an aquarium species. There are no reported introductions of this species in the United States. This species is not immune to the crayfish plague as are many native U.S. crayfishes, this reduces the potential of this species to be able to successfully invade U.S. waters. However, it could still be a potential vector of crayfish plague and has also shown to be a vector of *Thelohania parastaci*.

Assessment Elements

- **History of Invasiveness:** High
- **Climate Match:** High
- **Certainty of Assessment:** High
- **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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10 References Quoted But Not Accessed

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