**Orconectes virilis**

**Common name**: northern crayfish (English), virile crayfish (English)

**Synonym**: *Orconectes immunis*, *Astacidea*, *Orconectes limosus*, *Orconectes punctimanus*

**Similar species**: *Orconectes virilis*

**Summary**: *Orconectes virilis* is a crayfish native to the Missouri, Mississippi, Ohio, and Great Lakes drainages of the United States. It has become introduced to locations throughout the United States through live pet and bait trade and has also established in a few locations in Europe. Its important impacts to introduced systems include competition with and displacement of native fish and crayfish and the reduction of snail, macroinvertebrate, and macrophyte abundance and biodiversity.

**Lifecycle Stages**

The maximum lifespan of *Orconectes virilis* is 3 years. They undergo several molts in their first few months. *O. virilis* typically reaches a length of 23-56 mm in first year and a length of 58-84 mm by the second. They reach maturity during their second summer usually around 24mm. *O. virilis* undergoes form alternation between the sexually mature Form I during the mating season and the sexually immature Form II outside of the mating season (Matthews et al., 2008).

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Uses
*Orconectes virilis* is a popularly consumed food in the United States and increasingly more so in Europe (Collicut, undated). *O. virilis* a commonly used fish bait and is sold as such in bait shops. It is also sold commercially in the pet trade as pets or prey for predaceous aquarium fishes (Hunner, 1997). Beginning in approximately 1950 *O. virilis* was stocked as a biological control in the Colorado River watershed of western New Mexico and northeastern Arizona, primarily for vegetation control (Johnson, 1986).

Habitat Description
*Orconectes virilis* may inhabit rivers, streams, lakes, marshes and ponds that are permanent and well oxygenated (Collicut, 1998). They prefer warm waters of moderate turbidity with cobble or rocky substrates and abundant logs, rocks, vegetation, and other debris to use as cover. They are also known to dig pits in river banks and under rocks when water levels are low (ANSIS, 2007; Benson, 2010). *O. virilis* can survive a temperature range of 0-32°C and has a preferred temperature range of 24-25°C. Its movement is halted at temperatures below 10°C. It is unable to withstand acidic conditions and prefers locations with a pH of over 5.37. *O. virilis* is also intolerant of poor water quality and high salinity (ANSIS, 2007).

Reproduction
Breeding of *Orconectes virilis* begins in the fall to early spring and extends until the adults retreat to deep water and become inactive. Breeding sometimes occurs for a brief period in the spring when the water begins warming (Collicut, 1998; ANSIS, 2007). Females store sperm for up to months and fertilize their eggs in the spring. Eggs are attached to swimmerets in a large ball resembling a raspberry. The eggs hatch one to two months after they are laid. Young hatchlings look like miniature adults and can probably grow to about 2-3cm long by the fall. (Collicut, 1998).

Nutrition
*Orconectes virilis* is omnivorous and consumes a variety of live and dead animal and plant material (ANSIS, 2007). It is known to consume macroinvertebrates such as snails and insects, as well as, small fish, fish eggs, tadpoles, and macrophytes. *O. virilis* is believed to obtain most of its nutrition by scavenging dead animals (Collicut, 1998).
General Impacts

*Orconectes virilis* may have a variety of impacts on introduced ecosystems that include direct and indirect impacts on habitat, competition with and displacement of native species, and other ecological interactions.

*O. virilis* is known to alter and reduce macrophyte biomass and diversity (Chambers *et al.*, 1990; Davidson *et al.*, 2010; Olden *et al.*, 2009). It may displace native crayfish as in the case of the endangered *Pacifastacus nigrescens* in California (Light *et al.*, 1995); *Orconectes obscurus* and *Cambarus bartoni* in North Carolina (Cooper *et al.*, 1998); and *Orconectes limosus* and *Cambarus bartoni bartoni* in Maryland (USA) (Schwartz *et al.*, 1963). Field and laboratory observations indicate that it may compete with and/or cause the decline of native fish species such as juvenile desert suckers (*Catostomus clarkii*), the Sonora sucker (*Catostomus insignis*), and the federally threatened Little Colorado spinedace (*Lepidomeda vittata*) in Arizona (Davidson *et al.*, 2010; Bryan *et al.*, 2002); the flannelmouth sucker (*Catostomus latipinnis*) in Colorado (Carpenter, 2005); and the White Sands pupfish (*Cyprinodon tularosa*) in New Mexico (Rogowski & Stockwell, 2006). It has been reported to contribute to the decline of the Chiricahua leopard frog (*Rana chiricahuensis*) in Arizona (Davidson *et al.*, 2010). *O. virilis* is also known to cause the decline of native snails (ANSIS, 2007), as in the case of three forks spring snail (*Pyrgulopsis trivialis*) in Arizona (Davidson *et al.*, 2010) and Canadian native snails *Stagnicola elodes* and *Physa gyrina* in laboratory studies (Hanson *et al.*, 1990).

Additional impacts associated with *O. virilis* include the reduction of insects and other macroinvertebrates (Davidson *et al.*, 2010; Hanson *et al.*, 1990), the alteration of the structure and composition of littoral zones (Chambers *et al.*, 1990), the increase in turbidity of waters (Davidson *et al.*, 2010), and impacts to irrigation networks and levees as a result of their burrowing near head gates and weir boxes (Godfrey, 2002).

Management Info

**Preventative measures:** Education of the public, especially, pet traders, anglers, and bait shop owners, of the negative impacts of *Orconectes virilis* and the dangers associated with releasing nonnative crayfish may help reduce their introductions to new locations (ANSIS, 2007). To minimize effects to irrigation systems in rice fields, the fields may be drained temporarily to drive crayfish in to their burrows so rice seedlings may establish (Godfrey, 2002).

**Biological control:** The protection of sport fish and regulations that reduce their harvest in order to increase predation on *Orconectes virilis* is one potential means of reducing its populations (ANSIS, 2007). A bacteria and the White Spot Syndrome Virus were examined for their effectiveness as potential biological controls for *Orconectes virilis*. The bacteria *Spiroplama penaeiled* led to 100% mortality when injected but body parts injected with *S. penaeiled* and fed to *O. virilis* did not induce mortality indicating that transmission via cannibalistic feeding is not viable. The White Spot Syndrome Virus yielded 100% mortality when injected or fed to all sizes of *O. virilis* indicating that it may be spread through cannibalistic feeding. WSSV did not infect non-target invertebrates but further research into this virus as well as other potential biological control agents for *O. virilis* is required before a viable one is found (Davidson *et al.*, 2010).
Pathway

*Orconectes virilis* is commonly used as fishing bait and commonly sold in bait shops. Many of their introductions have been attributed to their use as such. *Orconectes virilis* may be introduced to new locations via aquarium trade (Filipova *et al* 2009).

Principal source: Aquatic Nusiance Species Information System (ANSIS), 2007. Species Profiles: - Northern Crayfish


*Biology of Northern Crayfish* (Collicut, 1998)

Compiler: National Biological Information Infrastructure (NBII) & IUCN/SSC Invasive Species Specialist Group (ISSG)

Review: Dr. Brian Hazlett. Department of Ecology and Evolutionary Biology, University of Michigan, Ann Arbor. USA

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ALIEN RANGE

[22] UNITED STATES

Red List assessed species 9: CR = 1; EN = 1; VU = 4; DD = 1; LC = 2;

*Austropotamobius pallipes* EN

*Cambarus elkensis* VU

*Catostomus clarkii* LC

*Catostomus insignis* LC

*Cyprinodon tularosa* VU

*Lithobates chiricahuensis* VU

*Orconectes wrighti* VU

*Pacifastacus fortis* CR

*Pyrgulopsis trivialis* DD

BIBLIOGRAPHY

31 references found for *Orconectes virilis*

Management information

Aquatic Nusiance Species Information System (ANSIS), 2007. Species Profiles: - Northern Crayfish

Summary: Available from:


Summary: The electronic tool kits made available on the Cefas page for free download are Crown Copyright (2007-2008). As such, these are freeware and may be freely distributed provided this notice is retained. No warranty, expressed or implied, is made and users should satisfy themselves as to the applicability of the results in any given circumstance. Toolkits available include 1) FISK- Freshwater Fish Invasiveness Scoring Kit (English and Spanish language version); 2) MFISK- Marine Fish Invasiveness Scoring Kit; 3) MI-ISK- Marine invertebrate Invasiveness Scoring Kit; 4) FI-ISK- Freshwater Invertebrate Invasiveness Scoring Kit and AmphISK- Amphibian Invasiveness Scoring Kit. These tool kits were developed by Cefas, with new VisualBasic and computational programming by Lorenzo Vilizzi, David Cooper, Andy South and Gordon H. Copp, based on VisualBasic code in the original Weed Risk Assessment (WRA) tool kit of P.C. Pheloung, P.A. Williams & S.R. Halloy (1999).

The decision support tools are available from:


Summary: A report on the impacts of O. virilis on agriculture.


Summary: This publication aims to first provide decision makers and managers with information on the existing international and regional regulations that address the use of alien species in aquaculture, either directly or indirectly; and three examples of national responses to this issue (New Zealand, Australia and Chile).

General information

Summary: Available from: http://www.aquatincvasions.net/2008/AI_2008_3_1_Ahern_etal.pdf [Accessed 13 July 2010]

Benson, Amy. 2010. Orconectes virilis. USGS Nonindigenous Aquatic Species Database, Gainesville, FL.


Carpenter, Jeanette, 2005. Competition for food between an introduced crayfish and two fishes endemic to the Colorado River basin. Environmental Biology of Fishes. 72(3). MAR 05. 335-342.


Summary: A detailed report on all aspects of O. virilis, including biology and ecology.

Summary: English:
The species list sheet for the Mexican information system on invasive species currently provides information related to Scientific names, family, group and common names, as well as habitat, status of invasion in Mexico, pathways of introduction and links to other specialised websites. Some of the higher risk species already have a direct link to the alert page. It is important to notice that these lists are constantly being updated, please refer to the main page (http://www.conabio.gob.mx/invasores/index.php/Portada), under the section Novedades for information on updates.


Spanish:
La lista de especies del Sistema de informaci?n sobre especies invasoras de M?xico cuenta actualmente con informaci?n sobre un gran ?stremo de especies. Existe una secci?n de especies con alto riesgo que ya tienen una Liga directa a la p?gina de alertas. Es importante recordar que estas listas se encuentran en proceso constante de actualizaci?n, por favor consulte la portada (http://www.conabio.gob.mx/invasores/index.php/Portada), en la secci?n de novedades, para conocer los cambios.


Delivering Alien Invasive Species Inventories for Europe (DAISIE). 2006. Species Factsheet Orconectes virilis


Hanson, John Mark; Patricia A. Chambers; Ellie E. Prepas, 1990. Selective foraging by the crayfish Orconectes virilis and its impact on macroinvertebrates. Freshwater Biology (1990) 24, 69-80


Summary: Available from: http://www.conabio.gob.mx/invasores/index.php/Portada, under the section Novedades for information on updates.

ITIS (Integrated Taxonomic Information System). 2005. Online Database Orconectes virilis (Hagen, 1870)

Summary: An online database that provides taxonomic information, common names, synonyms and geographical jurisdiction of a species. In addition links are provided to retrieve biological records and collection information from the Global Biodiversity Information Facility (GBIF) Data Portal and bioscience articles from BioOne journals. Available from: http://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=97425 [Accessed 13 July 2010]


Light, Theo; Erman, Don C.; Myrick, Chris; Clarke, Jay, 1995. Decline of the Shasta crayfish (Pacifastacus fortis Fortax) of northeastern California. Conservation Biology. 9(6). 1995. 1567-1577


