



GLOBAL INVASIVE SPECIES DATABASE

FULL ACCOUNT FOR: *Orconectes virilis*

Orconectes virilis 正體中文

System: Freshwater

Kingdom	Phylum	Class	Order	Family
Animalia	Arthropoda	Malacostraca	Decapoda	Cambaridae

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

Synonym

Similar species *Orconectes immunis*, *Astacidea*, *Orconectes limosus*, *Orconectes punctimanus*

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.



[view this species on IUCN Red List](#)

Species Description

Orconectes virilis is reddish-brown to olive-brown in color. Adults reach about 13 cm long with males typically growing larger than females. It has bumps on the medial side of its carapace and along its chelae. Chelae also often have dark specs and orange or reddish tips. *O. virilis* may also have paired black marks along its abdomen (ANSIS, 2007).

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.(ANSIS, 2007). *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).



GLOBAL INVASIVE SPECIES DATABASE

FULL ACCOUNT FOR: *Orconectes virilis*

Uses

Orconectes virilis is a popularly consumed food in the United States and increasingly more so in Europe (Collicut, undated). *O. virilis* is 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 prefer 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 bartonii* in North Carolina (Cooper *et al*, 1998); and *Orconectes limosus* and *Cambarus bartonii bartonii* 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 *Spiroplasma 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).



GLOBAL INVASIVE SPECIES DATABASE

FULL ACCOUNT FOR: *Orconectes virilis*

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 Nuisance Species Information System \(ANSIS\), 2007. Species](#)

[Profiles: - Northern Crayfish](#)

[Davidson, Elizabeth W.; Jennifer Snyder; Donald Lightner; Gregory Ruthig; Julie Lucas; Joel Gilley, 2010. Exploration of potential microbial control agents for the invasive crayfish, *Orconectes virilis*. Biocontrol Science and Technology, 1360-0478, Volume 20, Issue 3, 2010, Pages 297 – 310](#)

[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

Publication date: 2010-07-21

ALIEN RANGE

[1] CANADA

[1] SWEDEN

[22] UNITED STATES

[1] NETHERLANDS

[1] UNITED KINGDOM

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

[Austropotamobius pallipes](#) EN

[Catostomus clarkii](#) LC

[Cyprinodon tularosa](#) VU

[Orconectes wrighti](#) VU

[Pyrgulopsis trivialis](#) DD

[Cambarus elkensis](#) VU

[Catostomus insignis](#) LC

[Lithobates chiricahuensis](#) VU

[Pacifastacus fortis](#) CR

BIBLIOGRAPHY

31 references found for *Orconectes virilis*

Managment information

[Aquatic Nuisance Species Information System \(ANSIS\), 2007. Species Profiles: - Northern Crayfish](#)

Summary: Available from:

http://el.erdc.usace.army.mil/ansrp/ANSIS/html/orconectes_virilis_northern_crayfish.htm[Accessed 13 July 2010]



GLOBAL INVASIVE SPECIES DATABASE

FULL ACCOUNT FOR: *Orconectes virilis*

[Centre for Environment, Fisheries & Aquaculture Science \(CEFAS\), 2008. Decision support tools-Identifying potentially invasive non-native marine and freshwater species: fish, invertebrates, amphibians.](#)

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:

<http://cefas.defra.gov.uk/our-science/ecosystems-and-biodiversity/non-native-species/decision-support-tools.aspx> [Accessed 13 October 2011]

[The guidance document](http://www.cefas.co.uk/media/118009/fisk_guide_v2.pdf) is available from http://www.cefas.co.uk/media/118009/fisk_guide_v2.pdf [Accessed 13 January 2009].

Davidson, Elizabeth W.; Jennifer Snyder; Donald Lightner; Gregory Ruthig; Julie Lucas; Joel Gilley, 2010. Exploration of potential microbial control agents for the invasive crayfish, *Orconectes virilis*. *Biocontrol Science and Technology*, 1360-0478, Volume 20, Issue 3, 2010, Pages 297 ? 310

[Godfrey, L. 2002. UC Pest Management Guidelines. University of California.](#)

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

Available from: <http://www.ipm.ucdavis.edu/PMG/r682500211.html> [Accessed 13 July 2003]

[Hewitt, C.L., Campbell, M.L. and Gollasch, S. 2006. Alien Species in Aquaculture. Considerations for responsible use. IUCN, Gland, Switzerland and Cambridge, UK. viii + 32 pp.](#)

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).

Available from: <http://data.iucn.org/dbtw-wpd/edocs/2006-036.pdf> [Accessed 22 September 2008]

General information

[Ahern, David; Judy England and Adam Ellis, 2008. The virile crayfish, *Orconectes virilis* \(Hagen, 1870\) \(Crustacea: Decapoda: Cambaridae\), identified in the UK. *Aquatic Invasions \(2008\) Volume 3, Issue 1: 102-104*](#)

Summary: Available from: http://www.aquaticinvasions.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.](#)

Summary: Available from: <http://nas.er.usgs.gov/queries/factsheet.aspx?SpeciesID=215> [Accessed 13 July 2010]

Bryan, Scott D.; Robinson, Anthony T.; Sweetser, Michael G., 2002. Behavioral responses of a small native fish to multiple introduced predators. *Environmental Biology of Fishes*. 63(1). January, 2002. 49-56.

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.

Chambers P.A., Hanson J.M., Burke J.M., Prepas E.E. 1990. The impact of the crayfish *Orconectes virilis* on aquatic macrophytes. *Freshwater Biology*, 24: 81-91.

Clark, William H.; Lester, Gary T., 2005. Range extension and ecological information for *Orconectes virilis* (Hagen 1870) (Decapoda : Cambaridae) in Idaho, USA. *Western North American Naturalist*. 65(2). APR 05. 164-169.

[Collicut, D. 1998. *Biology of Northern Crayfish*. Nature North.](#)

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

Available from: <http://www.naturenorth.com/fall/crayfish/Fcray.html> [Accessed 13 July 2003].



GLOBAL INVASIVE SPECIES DATABASE

FULL ACCOUNT FOR: *Orconectes virilis*

[CONABIO. 2008. Sistema de informaci3n sobre especies invasoras en M3xico. Especies invasoras - Crust3ceos. Comisi3n Nacional para el Conocimiento y Uso de la Biodiversidad. Fecha de acceso.](#)

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/invasoras/index.php/Portada>), under the section Novedades for information on updates.

Invasive species - crustaceans is available from:

http://www.conabio.gob.mx/invasoras/index.php/Especies_invasoras_-_Crust3%A1ceos [Accessed 30 July 2008]

Spanish:

La lista de especies del Sistema de informaci3n sobre especies invasoras de m3xico cuenta actualmente con informaci3n acerca de nombre cient3fico, familia, grupo y nombre com3n, as? como h3bitat, estado de la invasi3n en M3xico, rutas de introducci3n y ligas a otros sitios especializados. Algunas de las especies de mayor riesgo ya tienen una liga directa a la p3gina de alertas. Es importante resaltar que estas listas se encuentran en constante proceso de actualizaci3n, por favor consulte la portada (<http://www.conabio.gob.mx/invasoras/index.php/Portada>), en la secci3n novedades, para conocer los cambios.

Especies invasoras - Crust3ceos is available from:

http://www.conabio.gob.mx/invasoras/index.php/Especies_invasoras_-_Crust3%A1ceos [Accessed 30 July 2008]

Cooper, John E.; Armstrong, Suzanne A., 2008. Locality records and other data for invasive crayfishes (Decapoda : Cambaridae) in North Carolina. *Journal of the North Carolina Academy of Science*. 123(1). SPR 2007. 1-13.

Cooper, John E.; Braswell, Alvin L.; McGrath, Christopher, 1998. Noteworthy distributional records for crayfishes (Decapoda: Cambaridae) in North Carolina. *Journal of the Elisha Mitchell Scientific Society*. 114(1). Spring, 1998. 1-22.

[Delivering Alien Invasive Species Inventories for Europe \(DAISIE\), 2006. Species Factsheet *Orconectes virilis*](#)

Summary: Available from: <http://192.171.199.232/daisie/speciesFactsheet.do?speciesId=53409#> [Accessed 13 February 2010]

Fernandez P.J., Rosen P.C. 1996. Effects of the introduced crayfish *Orconectes virilis* on native aquatic herpetofauna in Arizona. IIPAM Project I94054 Crayfish Impacts on Wetland Herpetofauna. Heritage Program. Arizona Game and Fish Department, Phoenix AZ: 51pp.

Filipov?, Lenka; David M. Holdich; J?r?me Lesobre; Fr?d?ric Grandjean and Adam Petrusek, 2009. Cryptic diversity within the invasive virile crayfish *Orconectes virilis* (Hagen, 1870) species complex: new lineages recorded in both native and introduced ranges. *Biological Invasions* 2009 DOI 10.1007/s10530-009-9526-0

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

[Holdich, D. M.; J. D. Reynolds; C. Souty-Grosset; P.J. Sibley, 2009. A review of the ever increasing threat to European crayfish from non-indigenous crayfish species. *Knowledge and Management of Aquatic Ecosystems* \(2009\) 394-395, 11](#)

Summary: Available from:

<http://www.kmaejournal.org/index.php?option=article&access=standard&Itemid=129&url=/articles/kmae/pdf/2009/03/kmae09055.pdf> [Accessed 13 July 2010]

[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 21 July 2010]

Jezerinac, Raymond F.; Stocker, G. Whitney; Tarter, Donald C., 1995. The crayfishes (Decapoda: Cambaridae) of West Virginia. *Bulletin of the Ohio Biological Survey*. 10(1). 1995. 1-X, 1-193.

Johnson, J. E., 1986. Inventory of Utah USA Crayfish with Notes on Current Distribution. *Great Basin Naturalist*. 46(4). 1986. 625-631.

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

Mathews, Lauren M.; Adams, Luke; Anderson, Erica; Basile, Matthew; Gottardi, Elizabeth; Buckholt, Michael A., 2008. Genetic and morphological evidence for substantial hidden biodiversity in a freshwater crayfish species complex. *Molecular Phylogenetics & Evolution*. 48(1). JUL 2008. 126-135.

McAlpine, Donald F.; Fletcher, Timothy J.; Osepchok, Meagan A.; Savoie, Jean-Claude, 1999. A range extension for *Orconectes virilis* (Decapoda, Cambaridae) and a third crayfish species for New Brunswick, Canada. *Crustaceana* (Leiden). 72(3). April, 1999. 356-358.



GLOBAL INVASIVE SPECIES DATABASE

FULL ACCOUNT FOR: *Orconectes virilis*

McAlpine, Donald F.; McAlpine, Amber H. E.; Madden, Alan, 2007. Occurrence of the potentially invasive crayfish, *Orconectes virilis* (Decapoda, Cambaridae) in eastern New Brunswick, Canada. *Crustaceana* (Leiden). 80(4). APR 2007. 509-511.

[Olden, Julian D.; Larson, Eric R.; Mims, Meryl C., 2009. Home-field advantage: native signal crayfish \(*Pacifastacus leniusculus*\) out consume newly introduced crayfishes for invasive Chinese mystery snail \(*Bellamya chinensis*\). *Aquatic Ecology*. 43\(4\). DEC 2009. 1073-1084.](#)

Summary: Available from: http://www.fish.washington.edu/research/oldenlab/pdf/2009/AquaticEcology_2009.pdf
[Accessed 15 April 2011]

Rogowski, David L.; Stockwell, Craig A., 2006. Assessment of potential impacts of exotic species on populations of a threatened species, White Sands pupfish, *Cyprinodon tularosa*. *Biological Invasions*. 8(1). JAN 2006. 79-87.

Schuster, Guenter A.; Taylor, Christopher A.; Johansen, John, 2008. An Annotated Checklist and Preliminary Designation of Drainage Distributions of the Crayfishes of Alabama. *Southeastern Naturalist*. 7(3). 2008. 493-504.

Schwartz, Frank J.; Robert Rubelmann and James Allison, 1963. Ecological Population Expansion of the Introduced Crayfish, *Orconectes virilis*. *The Ohio Journal of Science* 63(6): 266, November, 1963