



4-29-2005

## Range extension and ecological information for *Orconectes virilis* (Hagen 1870) (Decapoda: Cambaridae) in Idaho, USA

William H. Clark

State Office of Technical Services, Idaho Department of Environmental Quality, Boise, Idaho and Albertson College of Idaho, Caldwell, Idaho

Gary T. Lester

EcoAnalysts, Inc., Moscow, Idaho

Follow this and additional works at: <https://scholarsarchive.byu.edu/wnan>

---

### Recommended Citation

Clark, William H. and Lester, Gary T. (2005) "Range extension and ecological information for *Orconectes virilis* (Hagen 1870) (Decapoda: Cambaridae) in Idaho, USA," *Western North American Naturalist*. Vol. 65 : No. 2 , Article 3.

Available at: <https://scholarsarchive.byu.edu/wnan/vol65/iss2/3>

This Article is brought to you for free and open access by the Western North American Naturalist Publications at BYU ScholarsArchive. It has been accepted for inclusion in Western North American Naturalist by an authorized editor of BYU ScholarsArchive. For more information, please contact [scholarsarchive@byu.edu](mailto:scholarsarchive@byu.edu), [ellen\\_amatangelo@byu.edu](mailto:ellen_amatangelo@byu.edu).

RANGE EXTENSION AND ECOLOGICAL INFORMATION  
FOR *ORCONECTES VIRILIS* (HAGEN 1870)  
(DECAPODA: CAMBARIDAE) IN IDAHO, USA

William H. Clark<sup>1,3</sup> and Gary T. Lester<sup>2</sup>

**ABSTRACT.**—We report the 1st record of the crayfish *Orconectes virilis* (Hagen 1870) from Idaho and the Pacific Northwest, USA. We also provide an updated checklist of recent Idaho crayfishes, which now includes 2 families (Astacidae and Cambaridae), 3 genera (*Pacifasticus*, *Orconectes*, and *Procambarus*), and 7 species and subspecies (*Pacifasticus connecticus* (Faxon 1914), *P. gambelii* (Girard 1852), *P. leniusculus leniusculus* (Dana 1852), *P. leniusculus klamathensis* (Stimpson 1857), *P. leniusculus trowbridgii* (Stimpson 1857), *O. virilis*, and *Procambarus clarkii* (Girard 1852)). Native crayfish were not found at the *O. virilis* collection sites. The localities where *O. virilis* was found were characterized by low-gradient streams impacted by fine sediment. Aquatic invertebrates found in association with *O. virilis* tended to be the more pollution-tolerant taxa.

*Key words:* Crustacea, Decapoda, Idaho checklist, Cambaridae, *Orconectes virilis*, introduced species, water quality, physical habitat structure, invertebrate associates.

While identifying contract macroinvertebrate samples from Idaho waters for the Idaho Department of Environmental Quality Beneficial Use Reconnaissance Program (Beneficial Use Reconnaissance Project Technical Advisory Committee 1999), taxonomists at EcoAnalysts, Inc. (Moscow, ID), encountered *Orconectes virilis* (Hagen 1870), a species of crayfish not previously known from Idaho. *Orconectes virilis* is known from lakes and streams east of the Continental Divide in eastern Canada from Saskatchewan to Ontario, and in the United States from Montana to Arkansas, east to New York and Maine (Hobbs 1972, 1974, 1989); it has been introduced into California, Utah, Arizona, New Mexico, Maryland, parts of New England and Tennessee, western Colorado, and parts of Canada (Riegel 1959, Hobbs 1974, Bouchard 1977, Unger 1978). Invasive populations of *O. virilis* may be a threat to freshwater biodiversity (Bouchard 1977, Chambers et al. 1990, Hanson et al. 1990, Savino and Miller 1991, Miller et al. 1992, Warren 1997, Lodge et al. 2000). Clark and Wroten (1978) reported a depauperate Idaho crayfish fauna, with only 3 native species in the genus *Pacifasticus*, and 1 introduced species, *Procambarus clarkii* (Girard

1852). Miller (1960) did not find *O. virilis* in Oregon.

#### MATERIALS AND METHODS

Field methods used to collect benthic macroinvertebrate samples are described in detail in Beneficial Use Reconnaissance Project Technical Advisory Committee (1999). In Idaho the macroinvertebrates in wadeable streams were collected in 3 riffle samples per stream reach using a Hess sampler with a 500-micron mesh net (Hess 1941) with the “Canton modification” (Canton and Chadwick 1984). A kick-net was used to collect additional specimens at the China Creek locality (Fig. 1). Samples were preserved in 70% ETOH and stored separately in the field. In the laboratory the 3 samples were composited, counted, and 500 randomly selected individual invertebrates were identified.

The species was initially identified using Smith (2001) and Thorpe and Covich (2001). Specimens were sent to Christopher A. Taylor, Illinois Natural History Survey, for verification. Voucher specimens of *Orconectes virilis* are deposited in the Orma J. Smith Museum of Natural History, Albertson College of Idaho (ALBRCIDA), Caldwell; the EcoAnalysts, Inc.

<sup>1</sup>State Office of Technical Services, Idaho Department of Environmental Quality, 1410 North Hilton Street, Boise, ID 83706 and Orma J. Smith Museum of Natural History, Albertson College of Idaho, Caldwell, ID 83605.

<sup>2</sup>EcoAnalysts, Inc., 105 East 2nd Street, Suite #1, Moscow, ID 83843.

<sup>3</sup>Present address: Idaho Power Company, Box 70, Boise, ID 83707.

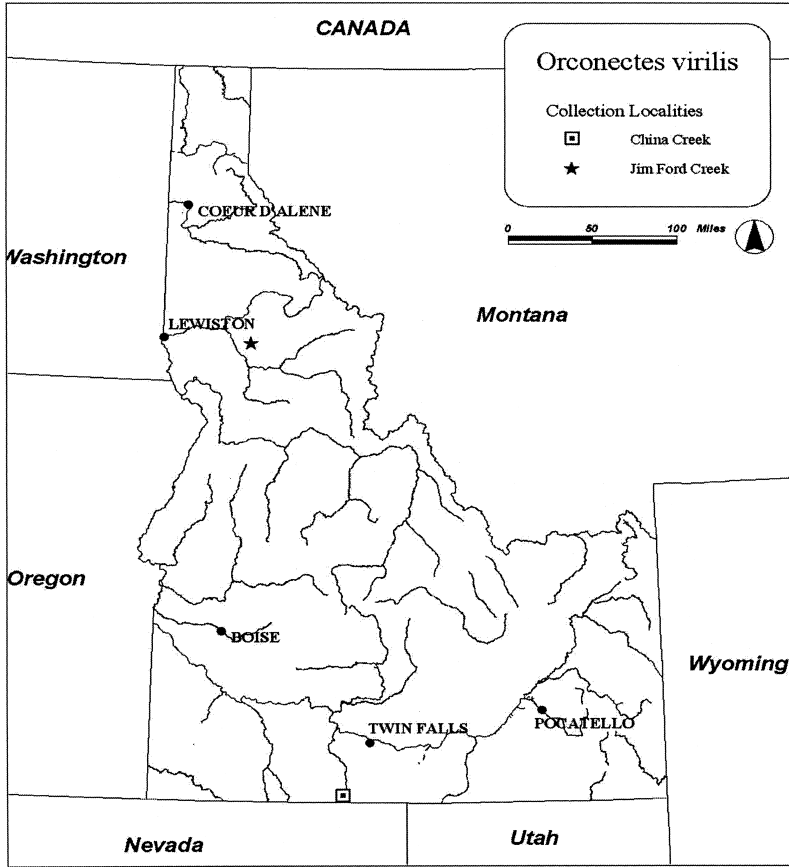


Fig. 1. Known distribution (collection localities) of *Orconectes virilis* (Hagen) in Idaho, USA.

TABLE I. Water quality and habitat variables for *Orconectes virilis* (Hagen) in Idaho. N/A = data not taken.

Variable	China Creek	Jim Ford Creek
Date	5 August 1999	14 July 2000
Temperature (°C)	12.6	23
Dissolved oxygen (mg · L <sup>-1</sup> )	7.6	4.45
Dissolved oxygen (% saturation)	69	N/A
Specific conductance (μS · cm <sup>-1</sup> )	158	N/A
pH (SU)	7.5	7.4
Total dissolved solids	0.1	N/A
Discharge (cfs)	0.26	1.70
Habitat type	glide/pool	pool
Stream width (meters)	1.7	3.5
Substrate embeddedness (%)	50–75	100
NO <sub>3</sub> + NO <sub>2</sub> (mg · L <sup>-1</sup> )	N/A	2.41
Total N (mg · L <sup>-1</sup> )	N/A	3.11
Total P (mg · L <sup>-1</sup> )	N/A	0.15
N/P ratio	N/A	20.7

TABLE 2. Invertebrate associates of *Orconectes virilis* (Hagen) in Idaho.

Associated taxa	China Creek 5 August 1999	Jim Ford Creek (both locations) 14 July 2000
NEMATODA		X
OLIGOCHAETA		
Enchytraeidae	X	
Lumbricina		
<i>Prostoma</i> sp.		X
CRUSTACEA		
Amphipoda		
<i>Gammarus</i> sp.	X	
<i>Hyalella</i> sp.		X
Ostracoda		X
ACARI	X	X
INSECTA		
Ephemeroptera		
<i>Baetis tricaudatus</i>	X	
<i>Centroptilum</i> sp.	X	
<i>Dipheter hageni</i>	X	
<i>Nixe</i> sp.	X	X
<i>Paraleptophlebia</i> sp.		X
PLECOPTERA		
Chloroperlidae	X	
Capniidae		X
Perlodidae		X
HEMIPTERA		
Corixidae	X	X
MEGALOPTERA		
Sialis sp.		X
COLEOPTERA		
<i>Optioservus</i> sp.	X	
TRICHOPTERA		
<i>Cheumatopsche</i> sp.	X	
<i>Glossosoma</i> sp.	X	
<i>Lepidostoma</i> sp.	X	
DIPTERA		
<i>Dicranota</i> sp.	X	
<i>Simulium</i> sp.	X	X
Syrphidae	X	

(EI), macroinvertebrate taxonomic laboratory, Moscow, Idaho; and the Illinois Natural History Survey, Champaign (INHS).

#### Materials Examined

IDAHO: **Clearwater County:** Jim Ford Creek: 2 specimens (EI), 0.5 m upstream from Hwy 11 bridge, 46°22.545'N, 115°56.953'W, 918 m elev., 20 October 2000, J. Davis. Jim Ford Creek: 1 specimen (ALBRCIDA), 10 m above hydroelectric diversion, 46°23.004'N, 115°56.953'W, 913 m elev., 20 October 2000, J. Davis.

IDAHO: **Twin Falls County:** China Creek: 1 specimen (EI) 42°03'31"N, 114°46'11"W, 1530 m elev., 5 August 1999, D. Baldwin, R. Snyder, S. Stauffer, and S. Woodhead (DEQ sample #1999STWFA029). China Creek: 126 specimens (3 specimens INHS, 123 specimens

ALBRCIDA) 42°03'31"N, 114°46'11"W, 1530 m elev., 29 June 2000, W.H. Clark (collection event #10,233).

#### RESULTS AND DISCUSSION

These collection records for *Orconectes virilis* represent the 1st report of the genus and species for the State of Idaho as well as for the Pacific Northwest, USA. The proximity of the China Creek locality (Fig. 1) to Nevada suggests that the species may also be found there. The genus *Orconectes* is naturally distributed in North America east of the Continental Divide. In the northwestern United States and adjacent Canada, only 2 species of *Orconectes* occur: *O. virilis*, which is widespread in Montana, Wyoming, Alberta, and Saskatchewan,

TABLE 2. Continued.

Associated taxa	China Creek 5 August 1999	Jim Ford Creek (both locations) 14 July 2000
<i>Tipula</i> sp.	X	
<i>Ablabesmyia</i> sp.		X
<i>Chaetocladius</i> sp.	X	
<i>Chironomus</i> sp.		X
<i>Cladotanytarsus</i> sp.		X
<i>Conchapelopia</i> sp.		X
<i>Corynoneura</i> sp.		X
<i>Cricotopus</i> sp.		X
<i>Cricotopus bicinctus</i> group	X	X
<i>Cryptochironomus</i> sp.		X
<i>Dicrotendipes</i> sp.		X
<i>Eukiefferiella</i> sp.	X	X
<i>Eukiefferiella devonica</i> group	X	
<i>Micropsectra</i> sp.	X	
<i>Nanocladius</i> sp.		X
<i>Orthocladius amectens</i>		X
<i>Parametriocnemus</i> sp.	X	
<i>Paratanytarsus</i> sp.		X
<i>Paratendipes</i> sp.		X
<i>Pentaneura</i> sp.		
<i>Phaenopsectra</i> sp.	X	X
<i>Polypedilum</i> sp.		X
<i>Stictochironomus</i> sp.		X
<i>Tanytarsus</i> sp.	X	X
Tanypodinae	X	
<i>Thienemanniella</i> sp.		X
<i>Thienemannimyia</i> group	X	X
<i>Tvetenia bavarica</i> group	X	X
MOLLUSCA		
Bivalvia		
Sphaeriidae	X	X
Gastropoda		
<i>Ferrisia</i> sp.		X
<i>Physa</i> sp.		X
TOTAL TAXA	30	36

with introduced populations in Utah and northern California; and *O. immunis* (Hagen 1870), which occurs in Montana and Wyoming (Hobbs 1974, 1989). To further the general knowledge of crayfish in the state of Idaho and adjacent areas, we present a checklist of the recent species reported from Idaho.

#### Checklist of Recent Crayfishes Known to Occur in Idaho

##### ASTACIDAE

*Pacifasticus (Hobbsastacus) connectus* (Faxon 1914).  
Native to ID and OR.

*Pacifasticus (Hobbsastacus) gambelii* (Girard 1852).  
Native to WA, OR, ID, MT, northern CA, NV,  
and UT.

*Pacifasticus (Pacifasticus) leniusculus leniusculus*  
(Dana 1852). Native to British Columbia, OR,  
WA, ID. Introduced in CA, NV, UT, and Europe.

*Pacifasticus (Pacifasticus) leniusculus klamathensis*  
(Stimpson 1857). Native to British Columbia, WA,  
OR, CA, and western ID.

*Pacifasticus (Pacifasticus) leniusculus trowbridgii*  
(Stimpson 1857). Native to British Columbia,  
WA, OR, and western ID. Introduced to CA and  
NV.

##### CAMBARIDAE

*Orconectes (Gremicambarus) virilis* (Hagen 1871).  
Native to Alberta, Saskatchewan, Ontario, Quebec,  
MT, WY, eastern CO, ND, SD, NE, KS, OK, AR,  
MO, MI, WI, IA, IL, TN, IN, OH, NY, VA, NH,  
MA, ME, CT, and RI. Introduced into ID, CA,  
UT, CO, AZ, NM, TX, MS, AL, KY, TN, WV, VA,  
MD, and NJ.

*Procambarus (Scapulicambarus) clarkii* (Girard 1852).  
Native to LA and TX. Introduced throughout  
North America, Eurasia, Africa, some South  
Pacific islands, including HI.

Physical habitat and water-quality variables for sampling locations are presented in Table 1. These data help describe the physical habitat structure and summer water-quality conditions in which *O. virilis* has been found in Idaho. Table 1 shows that both waters are small-order, low-gradient streams impacted from grazing and other agricultural practices. In the summer, at least, they appear to be characterized by warm temperatures and corresponding low dissolved oxygen concentrations. The stream sites were characterized by low water velocity and appeared to be impacted by fine sediment (Table 1).

The invertebrates associated with *O. virilis* at these 2 sites are listed in Table 2. The groups and taxa listed are considered to be more pollution tolerant as would be expected to be found in more degraded systems (Hilsenhoff 1987, Barbour et al. 1999, Relyea et al. 2000).

Because nonindigenous crayfishes including *O. virilis* have been shown to impact freshwater biodiversity including the macroinvertebrate fauna (Bouchard 1977, Chambers et al. 1990, Hanson et al. 1990, Miller et al. 1992, Warren 1997, Lodge et al. 2000), we present the macroinvertebrate community associated with *O. virilis* in Idaho (Table 2). These 2 locations have similar invertebrate assemblages (Table 2), with the following major differences. The China Creek site had a taxa richness of 30, which included 1 major group not found at the Jim Ford Creek sites, and that was Trichoptera. Jim Ford Creek had a taxa richness of 36 and included 4 major groups not found in the China Creek samples: Megaloptera, Nematoda, Gastropoda, and Ostracoda.

We suggest that this species be monitored in the Pacific Northwest to determine its impacts on the native invertebrate fauna in the region. It is worthy of note that no native crayfish were found at the 2 collection sites in which *O. virilis* occurred (Table 2).

#### ACKNOWLEDGMENTS

The authors thank Christopher Taylor (Illinois Natural History Survey) for verifying the initial identification of *Orconectes virilis*. John Pfeiffer (EcoAnalysts, Inc.) originally identified the specimens and brought them to the attention of the second author (GTL). Sean Woodhead and Darren Brant (Idaho DEQ) assisted with logistical support. Christopher

Rogers (EcoAnalysts, Inc.) kindly reviewed a draft of this paper and offered helpful comments. Sean Coyle (Idaho DEQ) made Figure 1.

#### LITERATURE CITED

- BARBOUR, M.T., J. GERRITSEN, B.D. SYNDER, AND J.B. STRIBLING. 1999. Rapid bioassessment protocols for the use in streams and wadeable rivers: periphyton, benthic macroinvertebrates and fish. 2nd edition. EPA 841-B-99-002, U.S. Environmental Protection Agency, Office of Water, Washington, DC. 306 pp.
- BENEFICIAL USE RECONNAISSANCE PROJECT TECHNICAL ADVISORY COMMITTEE. 1999. 1999 Beneficial Use Reconnaissance Project workplan for wadable streams. Idaho Division of Environmental Quality, Boise. 82 pp.
- BOUCHARD, R.W. 1977. Distribution, ecology, and systematic status of five poorly known western North American crayfishes (Decapoda: Astacidae and Cambaridae). Pages 409–423 in O.V. Linquist, editor, Freshwater crayfish. University of Kupio, Kupio, Finland.
- CANTON, S.P., AND J.W. CHADWICK. 1984. A new modified Hess sampler. Progressive Fish-Culturist 46:57–59.
- CHAMBERS, P.A., J.M. HANSON, J.M. BURKE, AND E.E. PREPAS. 1990. The impact of the crayfish *Orconectes virilis* on aquatic macrophytes. Freshwater Biology 24:81–91.
- CLARK, W.H., AND J.W. WROTEN. 1978. First record of the crayfish, *Procambarus clarkii*, from Idaho, U.S.A. (Decapoda: Cambaridae). Crustaceana 35:317–319.
- HANSON, J.M., P.A. CHAMBERS, AND E.E. PREPAS. 1990. Selective foraging by the crayfish *Orconectes virilis* and its impact on macroinvertebrates. Freshwater Biology 24:69–80.
- HESS, A.D. 1941. New limnological sampling equipment. Limnological Society of America Special Publication 6:1–5.
- HILSENHOFF, W.L. 1987. An improved biotic index of organic stream pollution. Great Lakes Entomologist 20:31–39.
- HOBBS, H.H., JR. 1972. Crayfishes (Astacidae) of North and Middle America. In: Biota of freshwater ecosystems: identification manual. U.S. Environmental Protection Agency, Washington, DC. 173 pp.
- \_\_\_\_\_. 1974. A checklist of the North and Middle American crayfishes (Decapoda: Astacidae and Cambaridae). Smithsonian Contributions to Zoology 166. 161 pp.
- \_\_\_\_\_. 1989. An illustrated checklist of the American crayfishes (Decapoda: Astacidae, Cambaridae, and Parastacidae). Smithsonian Contributions to Zoology 480. 236 pp.
- LODGE, D.M., C.A. TAYLOR, D.M. HOLDICH, AND J. SKURDAL. 2000. Nonindigenous crayfishes threaten North American freshwater biodiversity. Fisheries 25(8):7–20.
- MILLER, G.C. 1960. The taxonomy and certain biological aspects of the crayfish of Oregon and Washington. Master's thesis, Oregon State College, Corvallis. 216 pp.
- MILLER, J.E., J.F. SAVINO, AND R.K. NEELY. 1992. Competition for food between crayfish (*Orconectes virilis*) and the slimy sculpin (*Cottus cognatus*). Journal of Freshwater Ecology 7:127–136.

- RELYEA, C.D., G.W. MINSHALL, AND R.J. DANEHY. 2000. Stream insects as bioindicators of fine sediment. *In: Proceedings Watershed 2000*. Water Environment Federation Specialty Conference, Vancouver, BC. 19 pp + 4 appendices.
- RIEGEL, J.A. 1959. The systematics and distribution of crayfishes in California. California Department of Fish and Game 45:29–50.
- SAVINO, J.F., AND J.E. MILLER. 1991. Crayfish (*Orconectes virilis*) feeding on young lake trout (*Salvelinus namaycush*): effect of rock size. *Journal of Freshwater Ecology* 6:161–170.
- SMITH, D.G. 2001. Pennak's freshwater invertebrates of the United States: Porifera to Crustacea. 4th edition. John Wiley and Sons, New York. 638 pp.
- THORPE, J.H., AND A.P. COVICH, EDITORS. 2001. Ecology and classification of North American freshwater invertebrates. 2nd edition. Academic Press, New York. 1056 pp.
- UNGER, P.A. 1978. Natural history inventory of Colorado, No. 3: the crayfishes of Colorado. University of Colorado Museum, Boulder. 20 pp.
- WARREN, G.L. 1997. Nonindigenous freshwater invertebrates. Pages 101–108 *in* D. Simberloff, D.C. Schmitz, and T.C. Brown, editors, Strangers in paradise: impact and management of nonindigenous species in Florida. Island Press, Washington, DC.

*Received 29 December 2003*

*Accepted 12 October 2004*