



Non-Native Species & the Great Lakes

A Series of Fact Sheets Identifying Species that Pose Invasion Threats

Species: Killer Shrimp (*Dikerogammarus villosus*)



Introduction: The U.S. Environmental Protection Agency and the National Oceanic and Atmospheric Administration have listed the ‘killer shrimp’ as a potential Great Lakes aquatic invasive species.ⁱ A particularly voracious and aggressive predator, *D. villosus* preys on a range of invertebrates, particularly native shrimps and young fish, potentially causing their extinction.ⁱⁱ If this shrimp is introduced through ballast water, it may contribute to the threat of an “invasional meltdown” in the Great Lakes.ⁱⁱⁱ

Description: *D. villosus* is an invasive non-native shrimp that has spread from the Ponto-Caspian Region of Eastern Europe^{iv}. It is native to the Danube River System and areas around the Black and Caspian Seas.^v It can grow to 30 mm long in ideal conditions, much larger than native freshwater shrimp^{vi}. It often has striped or spotted markings, and due to its voracious appetite, it is commonly known as ‘killer shrimp.’^{vii}

It is extremely aggressive, and is considered a much more deadly predator than native amphipods due to its larger and more powerful mouthparts.^{viii} The ‘killer shrimp’ is also a very versatile organism. It can colonize a wide variety of substrates, and survive large fluctuations in temperature, salinity and oxygen levels^{ix}. It can endure a wide range of temperatures (up to 23 degrees Celsius) and salinities (up to approx. 20%).^x

Ecological Effects: *D. villosus* has recently invaded and spread throughout Western Europe.^{xi} Its populations have caused significant ecological disruption, including reduced biodiversity and local species extinction.^{xii} Not only is it a shredder and detritus feeder, but it also preys on macroinvertebrates and the eggs, larvae, and adults of fish species.^{xiii} Its aggressive behavior causes the replacement of indigenous amphipods, along with changes in the composition of invaded community food webs.^{xiv} ‘Killer shrimp’ may also be an intermediate host of acanthocephalan worms, which are a parasite of birds and fish.^{xv} Although not yet known to occur North America, “there is major concern about the potential environmental impact of this amphipod should it be introduced.”^{xvi}

Means of Introduction: The spread of *D. villosus* throughout Western Europe was greatly accelerated by canal construction between major rivers, “such as the canal between the Rivers Main and Danube.”^{xvii} ‘Killer shrimp’ actively migrate upstream and often “hitch a ride on boats.”^{xviii} They are also possibly spread with fish stocks being introduced from one lake to another.^{xix} Studies show that the species could easily survive in the ballast water of large ships, thus the species could move all over Europe and even to North America.^{xx} With many other invaders from the Ponto–Caspian Region established in the Great Lakes, this new invader might become part of a larger “invasional meltdown,” particularly since zebra mussel (*Dreissena polymorpha*) beds may facilitate the success of this large amphipod by providing suitable substrate.^{xxi}

ⁱ See E. Baker, *Watchlist of Potential Great Lakes Aquatic Invasive Species*, GLANIS (NOAA), available at <http://www.glerl.noaa.gov/res/Programs/glanis/watchlist.html> (Ex. i); U.S. ENVTL. PROT. AGENCY, PREDICTING FUTURE INTRODUCTIONS OF NONINDIGENOUS SPECIES TO THE GREAT LAKES B-1, B-18 (2008), available at [://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=190305#Download](http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=190305#Download) (Ex. ii).

ⁱⁱ See Tricarico, E. et al., *The Killer Shrimp, Dikerogammarus villosus, is Spreading in Italy*, 5 AQUATIC INVASIONS 211, 214 (2010), available at <http://www.vliz.be/imisdocs/publications/226202.pdf> (Ex. iii); CROSNIER, D., & MOLLOY, D., *Killer Shrimp – Dikerogammarus villosus*, AQUATIC NUISANCE SPECIES RESEARCH PROGRAM: U.S. ARMY CORPS OF ENGINEERS 4 available at http://el.erdc.usace.army.mil/ansrp/dikerogammarus_villosus.pdf (Ex. iv).

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- ⁱⁱⁱ Dick, J.T.A. & Platvoet, D. *Predatory impact of the freshwater invader Dikerogammarus villosus* (Crustacea: Amphipoda). 59 CAN. J. FISH AQUAT. SCI. (6):1078, 1081 (2002) available at <http://dare.uva.nl/document/29002> (Ex. v).
- ^{iv} See Tricarico, *supra* at 211-214.
- ^v Dick, J.T.A. & Platvoet, D. *Invading predatory crustacean Dikerogammarus villosus eliminates both native and exotic species*. 267 PROC. BIOL. SCI. (1447): 977, 977 (2000) available at <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1690628/pdf/10874746.pdf> (Ex. vi); see also Dick, J., *Alien Invasive Species in Northern Ireland* (2006), available at <http://www.habitas.org.uk/invasive/species.asp?item=50005> (Ex. vii).
- ^{vi} *Id.*
- ^{vii} Crosnier & Molloy, *supra* at 2-3.
- ^{viii} *Id.* at 1.
- ^{ix} See Tricarico, *supra* at 211.
- ^x *Id.* See also Dick & Platvoet at 977.
- ^{xi} See Tricarico, *supra* at 211-214.
- ^{xii} *Id.*
- ^{xiii} *Id.* at 211.
- ^{xiv} *Id.* at 211-214.
- ^{xv} Crosnier & Molloy, *supra* at 2-3.
- ^{xvi} *Id.*
- ^{xvii} Dick, J., *Alien Invasive Species in Northern Ireland* (2006), available at <http://www.habitas.org.uk/invasive/species.asp?item=50005>; Dick, J.T.A. & Platvoet, D. (2000) *Invading predatory crustacean Dikerogammarus villosus eliminates both native and exotic species*. 267 PROC. BIOL. SCI. (1447) 977-983 available at <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1690628/pdf/10874746.pdf>.
- ^{xviii} *Id.*
- ^{xix} *Id.*
- ^{xx} *Id.* at 977.
- ^{xxi} Dick, J.T.A. & Platvoet, D. *Predatory impact of the freshwater invader Dikerogammarus villosus* (Crustacea: Amphipoda). 59 Can. J. Fish Aquat. Sci. at 1078, 1081; See also Elena Tricarico et al, *The Killer Shrimp, Dikerogammarus villosus, is Spreading in Italy*, 5 AQUATIC INVASIONS 213 (2010), available at <http://www.vliz.be/imisdocs/publications/226202.pdf>.