RUSTY CRAYFISH

Overview

The rusty crayfish (*Orconectes rusticus*) is native to the Ohio River basin and portions of the states of Ohio, Kentucky and Indiana. It has invaded lakes and streams of the Great Lake states and provinces, including Minnesota, Wisconsin, Michigan, Illinois and Ontario.

This invasive crustacean dwells in areas where rocks, logs or other debris can be used as cover; they do not, however, dig burrows, as do other crayfish. Habitat requirements also include permanent lakes or streams that provide suitable water quality year round. Upon establishment, rusty crayfish cause a range of ecological impacts. These include displacing and/or hybridizing with native crayfish, decreasing the density and variety of invertebrates, and reducing the abundance and diversity of aquatic plants that native fish use for cover and food. Several characteristics of the rusty crayfish provide a competitive edge in the invasion process. They are non-discriminatory, opportunistic feeders, consuming aquatic vegetation, worms, snails, leeches, clams, insects, other crustaceans, detritus, fish eggs and small fish. Their high metabolic rate allows feeding at two times the level of similarly sized native crayfish. Also notable is their ability to reproduce without both sexes present. One female carrying viable sperm can begin a new population if released into a suitable environment. Rusty crayfish also exhibit aggressive behavior, forcing native crayfish from suitable refugia, thus increasing the predatory pressure on the natives. As a result, native crayfish populations can be considerably reduced by the invasion of rusty crayfish.

Photo: Jeff Gunderson, Minnesota Sea Grant

Identification

The rusty crayfish can be difficult to identify as they are easily confused with other, similar species found in the region. Distinguishing characteristics of the rusty crayfish are their large claws and brown-colored bodies. They also exhibit dark, rusty spots on each side of their carapace, as though picked up with paint on one's forefinger and thumb. The spots may not always be present or well developed on rusty crayfish from some waters. The rusty's claw is grayish-green to reddish-brown and is smooth, with black bands at the tips.

The Toronto Zoo established "Project Crayfish" in 2007 to educate the public about the population status and distribution of several native and exotic crayfish species in Ontario, including the rusty crayfish. As part of the program, the zoo produced a guide to aid in field identification: http://pinicola.ca/crayfishontario/craydentpage.htm.

Size: Can grow over 4 inches in length

Native Range: Ohio, Tennessee, and Cumberland drainages

Occurrences in the Great Lakes Basin

Although native to parts of some Great Lakes states (Indiana and Ohio), the rusty crayfish has expanded its home ranges in these areas. It also has invaded portions of other Great Lakes states. In the early 1960s, the species was discovered in several Wisconsin streams, and had spread to Minnesota waters by 1967. The rusty crayfish was found in Illinois in 1973, and was collected in the eastern portions of the basin in Pennsylvania in 1976 and New York in 1978. There are accounts of rusty crayfish collections in Ontario dating back to the 1960s in the Kawartha Lakes.

Means of Introduction and Spread: Humans are considered the primary pathway of introduction, particularly recreational anglers using rusty crayfish for live bait. Non-resident anglers have transported rusty crayfish from the Ohio River basin northward for use in water bodies in the Great Lakes basin. With population increases in these areas, rusty crayfish have been harvested for the regional bait market and biological supply companies, contributing to their spread. Another pathway for spread is the improper disposal of rusty crayfish into the wild after use in school classrooms and home aquaria.

Status: The rusty crayfish has spread to areas outside of its native range. It has established reproducing populations (or has been collected) in areas of all Great Lakes states and the province of Ontario. It also has spread to areas beyond the Great Lakes basin, including east to New England, west to Colorado, Wyoming, and Oregon, and south to North Carolina and Tennessee.

Management and Current Regulations:, In the absence of a regional approach, management strategies to prevent further spread of rusty crayfish is implemented on a localized basis for water bodies in the Great Lakes basin. Current strategies are focused on public education on crayfish identification, proper disposal of bait and other live organisms, and the encouragement of timely reports of sightings to local DNR offices and other state agencies. In some Great Lakes states, biological control via predation by fishes (*e.g.,* smallmouth bass) has been suggested as a means to control populations of the invasive crayfish. This strategy could provide benefits to local anglers with stricter limits on fish catch-size limits and increases in individual fish size. Possession, transport, and use of rusty crayfish for bait are prohibited in Illinois, Michigan, Minnesota, Pennsylvania, Wisconsin, and Ontario.

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Distribution Maps: Geographic information on the location of aquatic invasive species sightings in the United States is made available through the U.S. Geological Survey, Nonindigenous Aquatic Species (NAS) program (http://nas.er.usgs.gov). The NAS distribution maps for the rusty crayfish can be found online at: http://nas2.er.usgs.gov/viewer/omap.aspx?SpeciesID=214.

Significant Contributions Provided by:
U.S. Geological Survey, Nonindigenous Aquatic Species Program. 2009. http://nas.er.usgs.gov

References:

- Indiana Department of Natural Resources Factsheet. http://www.in.gov/dnr/files/RUSTY_CRAYFISH.pdf
- Gunderson, Jeff. 2008. Rusty Crayfish: A Nasty Invader. Minnesota Sea Grant. http://www.seagrant.umn.edu/ais/rustycrayfish_invader
- University of Wisconsin Sea Grant Institute Factsheet. http://seagrant.wisc.edu/Home/Topics/InvasiveSpecies/Details.aspx?PostID=653

Studies, Assessments and Management Plans

Assessing ecosystem vulnerability to invasive rusty crayfish (*Orconectes rusticus*) (2011)
Olden, J.D., M.J. Vander Zanden, and P.T. J. Johnson
http://www.fish.washington.edu/research/oldenlab/pdf/2011/EcologicalApplications_2011.pdf
Using the rusty crayfish as a case study, researchers have modeled the exposure risk *(i.e.,* likelihood of introduction and establishment) and the sensitivity (*i.e.,* likelihood of impacts on native crayfish) of several Wisconsin lakes and streams to predict ecosystem vulnerability to species invasions. The results of this effort may offer an effective strategy for natural resource managers to prioritize on-the-ground management actions for aquatic invaders.

Invasive Species Policy at the Regional Level: A multiple Weak Links Problem (2009)
J.A. Peters and D.M. Lodge
Fisheries, Volume 34, Issue 8
http://www.tandfonline.com/doi/abs/10.1577/1548-8446-34.8.373 (Abstract)
This study examined the weaknesses in region-wide regulation of invasive species with the involvement of multiple jurisdiction. Using the rusty crayfish as a model organism, the authors identified a continuum of inconsistent regulations throughout the Great Lakes region, and emphasized the role of this inconsistency in hindering the successful prevention of rusty crayfish and other invasives throughout the basin.

Assessing the impacts of rusty crayfish on submergent macrophytes in a north-temperate U.S. lake using electric fences (2008)
The American Midland Naturalist
http://findarticles.com/p/articles/mi_6924/is_/ai_n28519583
To experimentally reduce rusty crayfish densities in a lake, electric "fences" were used along with hand removal. The goals of this experiment were to both determine the impacts of crayfish on three species of macrophytes and to assess the effectiveness of electric fences as a control mechanism.

Fish predation and trapping for rusty crayfish (*Orconectes rusticus*) control: a whole-lake experiment (2006)
C. Hein, B. Roth, A. Ives, and M.J. Vander Zanden
Canadian Journal of Fisheries and Aquatic Sciences, Vol. 63
https://mywebspace.wisc.edu/dsshapiro/web/johnsarts/fishpredation.pdf
This study examined a two-fold approach to rusty crayfish control. Using both direct trapping to remove organisms and fishing restrictions to increase predation stress, the authors suggest that the combination of both techniques is a useful control mechanism for established invasive crayfish populations.

Potential corridors for the rusty crayfish, *Orconectes rusticus*, in northern Wisconsin (USA) Lakes: lessons for exotic invasions (Abstract)
Landscape Ecology (2004) 20
http://www.springerlink.com/content/h458810646641424/fulltext.pdf?page=1
In this study, 35 lakes in northern Wisconsin were sampled to determine the presence of *Orconectes rusticus*, the rusty crayfish. The authors related the pattern of their occurrence to several parameters related to potential invasion routes that could influence the distribution of these crayfish in the lakes.

U.S. and Canadian Federal Resources

Rusty Crayfish
Stop Aquatic Hitchhikers!
http://www.protectyourwaters.net/hitchhikers/crustaceans_rusty_crayfish.php

Rusty Crayfish
Aquatic Nuisance Species Task Force Species of Concern
http://www.anstaskforce.gov/spoc/rustycrayfish.php

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Midwest Region-Rusty Crayfish Fact Sheet
U.S. Fish and Wildlife Service
http://www.fws.gov/Midwest/ashland/WC_Rusty.html

Aquatic Invasive Species
Fisheries and Oceans Canada
http://www.dfo-mpo.gc.ca/science/environmental-environnement/invasive_e.htm

Rusty Crayfish (*Orconectes rusticus*)
Ontario Federation of Anglers and Hutners
http://www.invadingspecies.com/Invaders.cfm?A=page&PID=4

Rusty Crayfish (*Orconectes rusticus*)
National Sea Grant Network & Geographic Education Alliances-Exotic Aquatics on the Move
http://www.iisgcp.org/exoticsp/rusty_crayfish.htm

Rusty Crayfish Fact Sheet
U.S. Geological Survey-Nonindigenous Aquatic Species
http://nas.er.usgs.gov/queries/FactSheet.asp?speciesID=214

State and Provincial Resources

Rusty Crayfish
Illinois Environmental Protection Agency
http://www.epa.state.il.us/water/conservation/lake-notes/aquatic-exotics/aquatic-exotics.pdf

Rusty Crayfish Fact Sheet
Indiana Department of Natural Resources
http://www.in.gov/dnr/files/RUSTY_CRAYFISH.pdf

Rusty Crayfish Fact Sheet
Pennsylvania Sea Grant
http://pennstatebehrend.psu.edu/seagrant/publications/fs/RustyCrayfish.pdf

Rusty Crayfish (*Orconectes rusticus*)
Michigan Department of Natural Resources
http://www.michigan.gov/dnr/0,1607,7-153-10370_12145_25065-33021--,00.html

Rusty Crayfish: A Nasty Invader
Minnesota Sea Grant
http://www.seagrant.umn.edu/ais/rustycrayfish_invader

Rusty Crayfish (*Orconectes rusticus*)
Minnesota Sea Grant
http://www.seagrant.umn.edu/ais/rustycrayfish

Rusty Crayfish (*Orconectes rusticus*)
Minnesota Department of Natural Resources
http://www.dnr.state.mn.us/invasives/aquaticanimals/rustycrayfish/index.html

Rusty Crayfish Factsheet
Wisconsin Sea Grant
http://seagrant.wisc.edu/Home/Topics/InvasiveSpecies/Details.aspx?PostID=653

Rusty Crayfish (*Orconectes rusticus*)
Wisconsin Department of Natural Resources
http://dnr.wi.gov/invasives/fact/rusty.htm

Alien Profile: Rusty Crayfish
Wisconsin Department of Natural Resources-Environmental Education for Kids (EEK!)
http://dnr.wi.gov/org/caer/ce/eek/critter/invert/Rustycrayfish.htm

Rusty "the Bully" Crayfish (*Orconectes rusticus*)
Sea Grant Nonindigenous Species (SGNIS)
http://www.iisgcp.org/NabInvader/Lakes/suspects/suspect_rusty.html

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