



Western Fisheries Research Center (WFRC)

Western Fisheries Science News



WFRC partners in the Coastal Steelhead Research Team. Top: Left to Right. Rob Rhodes and Larry Gilbertson, Quinault Nation; Bruce Stewart and Marcia House, Northwest Indian Fisheries Commission; Sonia Mumford, USFWS. Front: Tyler Jurasin, Quinault Nation; Rachel Breyta, WFRC; Ray Brunson, USFWS.

IHN Research at the WFRC

Infectious Hematopoietic Necrosis (IHN) is a viral disease of both hatchery and wild salmon and trout which poses a serious threat to the success of both federal and state conservation hatcheries and the commercial aquaculture industry in portions of North America, Europe and Asia. Infectious Hematopoietic Necrosis was first detected in the 1950s in Washington and Oregon hatcheries where sockeye salmon were being decimated by a then unknown fish disease. Biologists from the WFRC were among the first to show that the cause was a virus and in 1969, gave the disease its present name.¹ Although WFRC immediately began work to develop methods to prevent transmission such as egg disinfection with iodophors, IHN was eventually spread to other locations in North America, Europe and Asia by the shipment of virus-contaminated rainbow trout eggs and fry. Today, the IHN virus (IHNV) is found among native anadromous salmonids of the North Pacific Ocean as well as among farmed rainbow trout populations in parts of North America, Europe and Asia. (Continued on page 2)

¹ Amend, D.F., Yasutake, W.T., and Mead, R.W., 1969. A hematopoietic virus disease of rainbow trout and sockeye salmon: Transactions of the American Fisheries Society 98: 796–804.

Events

USGS Assists High School Science: Researchers at the WFRC in Seattle hosted a senior from Henry M. Jackson High (Everett Public Schools—WA) to learn about the scientific method and more specifically, embryonic development in fish. The student is a member of the Jackson Science Research and Engineering club and plans to present his work at an upcoming science fair. For more information, contact John Hansen at jhansen@usgs.gov or 206-526-6588.

USGS Invited to Present Research at NOAA Watershed Program Meeting: On March 2, Fishery Biologists Patrick Connolly (WFRC) and Ryan Bellmore (Forest and Rangeland Ecosystem Science Center) will give a presentation at NOAA's Northwest Fisheries Science Center (Seattle, WA). The presentation titled "Food Webs, Fish, and Stream Restoration in the Methow Watershed: Summarizing a Decade of Research" will be part of NOAA's Watershed Program meeting. For more information, contact Patrick Connolly at pconnolly@usgs.gov or 509-538-2299 ext. 269.

USGS at 2014 Willamette Basin Fisheries Science Review: On February 10-12, John Beeman, Noah Adams, and Toby Kock gave a presentation at the 2014 Willamette Basin Fisheries Science Review in Portland, OR. Beeman and Adams will be presenting results from an evaluation of the Cougar Dam portable floating fish collector and Kock will be describing the behavior, distribution, and passage metrics of juvenile salmonids at Detroit Dam. The Willamette Fisheries Science Review is a multi-day conference highlighting research results from 2014. These projects in the Willamette Valley are funded by the U.S. Army Corps of Engineers (USACE). WFRC has been working with the USACE in the Willamette Basin to help understand and improve fish passage through dam structures. For more information, contact John Beeman at jbeeman@usgs.gov, Noah Adams at nadams@usgs.gov, or Toby Kock at tkock@usgs.gov; 509-538-2299.

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As it spread, the IHN virus appears to have diversified and in the 1990s, WFRC molecular epidemiological and surveillance research identified three major genetic subgroups of IHNV, designated U, M, and L because they occur in the upper, middle, and lower parts of the IHNV geographic range in North America. Strains in parts of Europe and Asia appear to have further evolved into novel genotypes (E and J respectively) following the introduction of IHNV from North America.

Due to its advanced laboratory facilities and scientific expertise, the WFRC has long been recognized as a world leader in research to minimize the serious economic losses, environmental impacts and other costs involved in fish disease prevention, containment, and management. The WFRC research has led to new and improved rapid diagnostic methods, such as the real-time reverse-transcriptase polymerase chain reaction (RT-rPCR) assay as well as to novel vaccines and other approaches to controlling the disease in hatcheries. The WFRC's on-line [IHN virus database](#) has also enhanced our overall understanding of the molecular epidemiology of IHN in both hatchery and wild fish populations and how fisheries management techniques can be used to break chains of virus transmission. Research results are reported by consultations with fishery management agencies, presentations at meetings and numerous publications in peer-reviewed scientific journals. A synopsis of two recent WFRC publications on IHN follows:

Universal reverse-transcriptase real-time PCR for infectious hematopoietic necrosis virus (IHNV). Purcell, M.K., R.L. Thompson, K.A. Garver, L.M. Hawley, W.N. Batts, L. Sprague, C. Sampson, and J.R. Winton. [Dis. Aquat. Org., 106\(2\):103-11](#) (2013). DOI: 10.3354/dao02644

Fast and reliable diagnostic tests are particularly important in IHN control. In this paper, WFRC researchers report the development and validation of a universal RT-rPCR assay targeting a region of the nucleocapsid (N) gene that appears highly conserved among all isolates of IHNV examined to date. Compared to the conventional PCR test or virus isolation in cell culture, this new assay is faster, more sensitive, and is highly repeatable within and between laboratories. The advantages of this new diagnostic method have led to its adoption by the World Organization for Animal Health (OIE). (Continued in column 2)

Events

USGS Western Fisheries Research Center Scientist Presents Webinar for Great Lakes Fish Health Committee (GLFHC) Winter Meeting:

On February 3, 2015, Diane Elliott presented a webinar for the GLFHC winter meeting in West Lafayette, IN. The topic of the webinar was USGS research on non-lethal detection of *Renibacterium salmoninarum*, the causative agent of bacterial kidney disease (BKD), a serious disease that occurs in the Great Lakes and most other areas of the world where wild or cultured salmonid fishes are present. Development of non-lethal methods for patho- (Continued in column 2)

Emergence of MD type infectious hematopoietic necrosis virus in Washington State coastal steelhead trout. Breyta, R., A. Jones, B. Stewart, R. Brunson, J. Thomas, J. Kerwin, J. Bertolini, S. Mumford, C. Patterson, and G. Kurath. 2013 [Dis. Aquat. Org. 104\(3\): 149-195](#), (2013). DOI: 10.3354/dao02596.

In this study, scientists at the WFRC partnered with colleagues in the U.S. Fish and Wildlife Service, the Northwest Indian Fisheries Commission, the Quinault Nation, and the Washington Department of Fish and Wildlife, to investigate a significant emergence of IHNV among coastal steelhead trout in Washington State.

Prior to 2007 IHN disease did not occur in coastal steelhead trout. Beginning in 2007 and continuing through 2011, there were 8 IHNV epidemics in juvenile steelhead trout, involving 7 different coastal fish culture facilities in 4 separate watersheds. During the same period, IHNV was detected in asymptomatic adult steelhead trout from 6 coastal watersheds. Fish populations in some rivers were untouched while others suffered significant and recurrent infection and mortality. Under the leadership of WFRC's Dr. Gael Kurath, genetic typing by University of Washington post-doctoral researcher Rachel Breyta revealed that the IHNV isolated from coastal steelhead trout were in the M genogroup and that there were 2 distinct waves of viral emergence between the years 2007 and 2011. Phylogenetic analysis revealed that these M genogroup viruses were part of the MD subgroup and that several novel genetic variants arose in the coastal sites. Comparison of the spatial and temporal incidence of coastal MD viruses with that of the rest of the Pacific Northwest revealed that the likely source of the emergent viruses was Columbia River Basin steelhead trout.

Events

gen detection has been a research priority of the GLFHC to reduce numbers of fish sacrificed for pathogen monitoring, and is particularly important for testing of fish in threatened or endangered populations or for testing valuable broodstock. Non-lethal sampling methods combined with tag identification of sampled fish can also enhance studies of disease ecology. With funding from the Great Lakes Fishery Trust, WFRC scientists developed a promising new method for non-lethal detection and quantification of *R. salmoninarum* in salmonids as small as 3 grams in weight. A manuscript describing the research has been accepted for publication in the journal *Diseases of Aquatic Organisms* and a prepress abstract is posted at <http://www.int-res.com/prepress/d02846.html> (DOI: 10.3354/dao02846). For more information, contact Diane Elliott at dgelliott@usgs.gov or 206-526-6282.

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