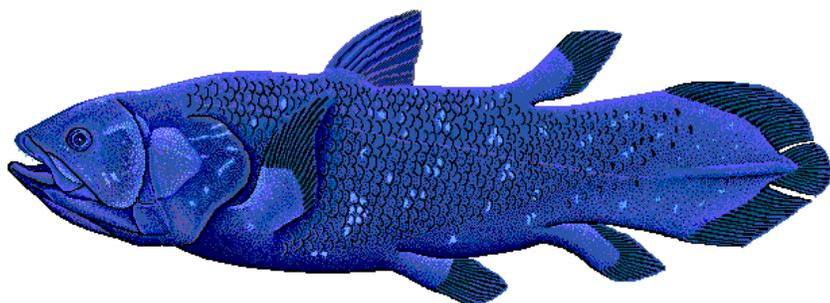




Western Fisheries Research Center (WFRC)

## Western Fisheries Science News



*Latimeria chalumnae*, a species of coelacanth (family Latimeriidae). Drawing by former FishBase artist Robbie Cada.

### People Are In Some Ways More Fish-Like Than We Think

The coelacanth (*Latimeria sp.*), sometimes referred to as the “missing evolutionary link” between fish and tetrapods, was once widespread in seas and inland waters throughout the world. Because the coelacanth fossil record ended abruptly at the end of the Mesozoic era about 70 million years ago, it was originally thought to be extinct. However, the species was rediscovered in the Indian Ocean in 1938. Two modern coelacanth species are known; *Latimeria chalumnae* and *Latimeria menadoensis*. Because modern coelacanths are remarkably similar to their fossilized relatives, they are often referred to as a “living fossil.” The thick scales of the coelacanth provide protective armor for this large fish, which can grow to the size of a six-foot human. Its coloration is dark blue or brownish with white flecks and likely serves as camouflage against its known habitat, which is often covered with white oyster shells.

Despite the coelacanth’s awkward appearance, they swim slowly and gracefully through the water. They have fins made up of fleshy, muscular lobes built on bones and joints with fin rays along the outer edges that resemble the limbs of four-legged land animals.

There is much we do not understand about the coelacanth and its place in the evolution of land-dwelling animals such as humans. Scientists at the WFRC are helping to unlock some of these mysteries by using advanced techniques in molecular biology. Surprisingly, the coelacanth genome is close to the size of our own—about 3 billion base pairs. A genome contains all of the hereditary information of an (continued on page 2)

### Events

**Sea Star Wasting Disease:** The WFRC - Marrowstone Marine Field Station (MMFS) is currently hosting scientists from Cornell University (Dr. Drew Harvell and Dr. Colleen Burge) who are studying sea star wasting disease (SSWD), an emerging disease that has rapidly resulted in dramatic impacts to sea star populations on the east and west coasts of North America. The current research emphasis involves identification of the disease-causing agent. As a marine ecosystem health facility with precautionary biosafety and biosecurity infrastructure, the MMFS is uniquely capable of providing support for new and emerging disease issues such as SSWD and other diseases of marine animals. For more information, contact Paul Hershberger at [phershberger@usgs.gov](mailto:phershberger@usgs.gov) or 360-385-1007.

**USGS Meets to Discuss Chemical Ecology of Lampreys and Eels:** WFRC biologists Jeff Duda and Mike Hayes recently traveled to Michigan to meet with scientists from the Northern Appalachian Research Branch (USGS), the Hammond Bay Biological Laboratory (USGS) and from Michigan State University. Topics discussed included chemical ecology of sea lampreys and possible applications to the management of Pacific lamprey and American eels. For more information, contact Mike Hayes at [mhayes@usgs.gov](mailto:mhayes@usgs.gov) or 206-526-2537.

(continued from pg. 1) organism, and mapping it can help provide important information including the origins and health risks of a species. The complete coelacanth genome sequence was published in the journal "Nature" in 2013 ([Amemiya, C., et al., 496: 311-316](#)). A significant number of genes and regulatory elements (non-coding regions) involved in limb development were found when the coelacanth genome was compared to those of land animals indicating genome modifications during vertebrate adaptation to land. Additional changes were found for the immune system that may be part of the response to "land-based" pathogens.

Building on this work, two new publications by WFRC immunologist John Hansen and colleagues recently addressed the genomic landscape of the coelacanth immune system. In the first manuscript ([Boudinot, P., et al. J. Exp. Zool. Part B. \(Mol. Dev. Evol.\) 9999B: 1-23; 2014](#)), the authors investigated the origins and evolution of gene families involved in the initial recognition and response to microbial pathogens, which affect innate immunity. The findings support the sister group relationship of coelacanth fish with tetrapods. The second paper ([Saha, N.R., et al. J. Exp. Zool. Part B. \(Mol. Dev. Evol.\) 9999B: 1-26. 2014](#)) provided detailed information on the adaptive immune system of coelacanths, which again demonstrated that immune systems of coelacanths are more closely related to tetrapods (including humans) than to bony fish such as carp or trout. Overall, this work highlights the complexity inherent in the coelacanth genome and provides a rich catalog of immune genes for future investigations.

When Dr. John Hansen, WFRC immunologist, was asked what his take home message would be for these latest articles; he replied that "people are in some ways more fish-like than we think." He went on to explain, "of course we do not have fins or live in the water, but our immune systems are quite similar to one another." For more contact John Hansen at [jhan-sen@usgs.gov](mailto:jhan-sen@usgs.gov) or 206-526-6588.

## Events

**USGS Presents at Future of Our Salmon Technical Workshop:** On March 18-20, WFRC researchers John Beeman, Matt Mesa, and Mike Parsley presented talks at a technical workshop for the Future of Our Salmon conference. The workshop, held in Spokane, WA, focused on restoring fish passage to historical locations throughout the Columbia River Basin. The objectives of the workshop were to review recent advances in passage technology, identify obstacles and successes, and develop viable solutions. The findings from this workshop will be reported at the Future of Our Salmon conference April 23-24 in Portland, OR. For more information, visit <http://goo.gl/2tXjG1> or contact John Beeman at [jbeeman@usgs.gov](mailto:jbeeman@usgs.gov) 509-538-2299.

**USGS Scientists Present at WA-BC Chapter of the American Fisheries Society Annual Meeting:** WFRC scientists Brady Allen, Toby Kock, and Matt Mesa presented at the 2014 annual meeting of the WA-BC of the AFS, March 24-27, in Vancouver, WA. Allen and Kock co-chaired a symposium titled "An evolving perspective of steelhead: summary of recent insights that are refining the future management of an iconic species", and provided talks on their research of steelhead in Rock Creek and the Cowlitz River, both Washington State tributaries to the Columbia River. Mesa presented a talk on the impact of irrigation diversion screens on juvenile lampreys in the Columbia River basin. For more information, visit [2014 WA-BC AGM program](#) or contact Brady Allen at [ballen@usgs.gov](mailto:ballen@usgs.gov), Toby Kock at [tkock@usgs.gov](mailto:tkock@usgs.gov) or Matt Mesa at [mmesa@usgs.gov](mailto:mmesa@usgs.gov) at 509-528-2299.

## Publications

**Publication Evaluates Fish Susceptibility to Infectious Disease:** In a recent article published in the *Journal of Aquatic Animal Health*, scientists from WFRC along with colleagues at NOAA Northwest Fisheries Science Center evaluate whether enhanced resistance to a bacterial disease in an introduced population of Chinook salmon in Lake Michigan was concomitant with a reduction in genetic variation at that trait. For more information, visit <http://goo.gl/rO2XC4> or contact Maureen Purcell at [mpurcell@usgs.gov](mailto:mpurcell@usgs.gov) or 206-526-2052.

**New USGS Open File Report Evaluates Effectiveness of Fish Collection Prototype at Cowlitz Falls Dam:** For more information, visit <http://goo.gl/tsAerp> or contact Toby Kock at [tkock@usgs.gov](mailto:tkock@usgs.gov) or 509-538-2299.

### USGS Western Fisheries Research Center

6505 N.E. 65th Street

Seattle, Washington 98115

<http://wfrc.usgs.gov/> 206-526-6282

To unsubscribe email [dabecker@usgs.gov](mailto:dabecker@usgs.gov)