A New Tool for Assessing the Potential Disease Impacts of Propagated Marine Fish on Wild Stocks

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SUMMARY

A growing number of marine finfishes are currently under investigation as candidates for artificial propagation – for stocking, endangered species restoration, and human consumption. This project addresses a leading concern about placing hatchery-born fish into an environment where they either directly or indirectly co-mingle with wild species – the potential to introduce or spread disease.

To this end, fish pathologists developed a genetics-based tool for detecting a herpes-like virus in white seabass. The white seabass (a popular sport and commercial fish in Southern California) was selected for the study, as it is spawned and reared for stocking at an experimental, research-oriented hatchery in northern San Diego County, operated by Hubbs-SeaWorld Research Institute. The new tool, though specific to the herpes virus, can be viewed as a "how-to" approach for detecting and monitoring a wide range of microbial pathogens that may or may not be common in the wild.

Adult white seabass in an open-ocean pen off Catalina Island. Image: M. Drawbridge/HSWRI

PROJECT

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White seabass herpes virus particles purified from infected tissues, stained and imaged by electron microscopy. Virus particles are about 100-nanometers wide. Image: R. Hedrick/UC Davis

The first step of this project was to identify, via electron microscopy, herpes-like virus particles in the intestinal tissues of cultured white seabass. A portion of the herpes virus, including a gene unique to the pathogen, was then sequenced and used to develop a polymerase chain reaction (PCR) test to detect viral DNA directly in fish tissues.

The PCR test was used to quantify the prevalence of the virus in 100 white seabass specimens that had been collected and frozen by Mark Okihiro, a fish pathologist with the California Department of Fish and Game, following an outbreak at the hatchery in 2005.

As measured by the PCR technique, 52 of the 100 specimens tested positive for the virus.

To investigate whether apparently healthy fish might also harbor the virus, scientists tested 62 hatchery-born adult fish collected from a population in late 2006, shortly before their release. None of these fish tested positive for the virus.

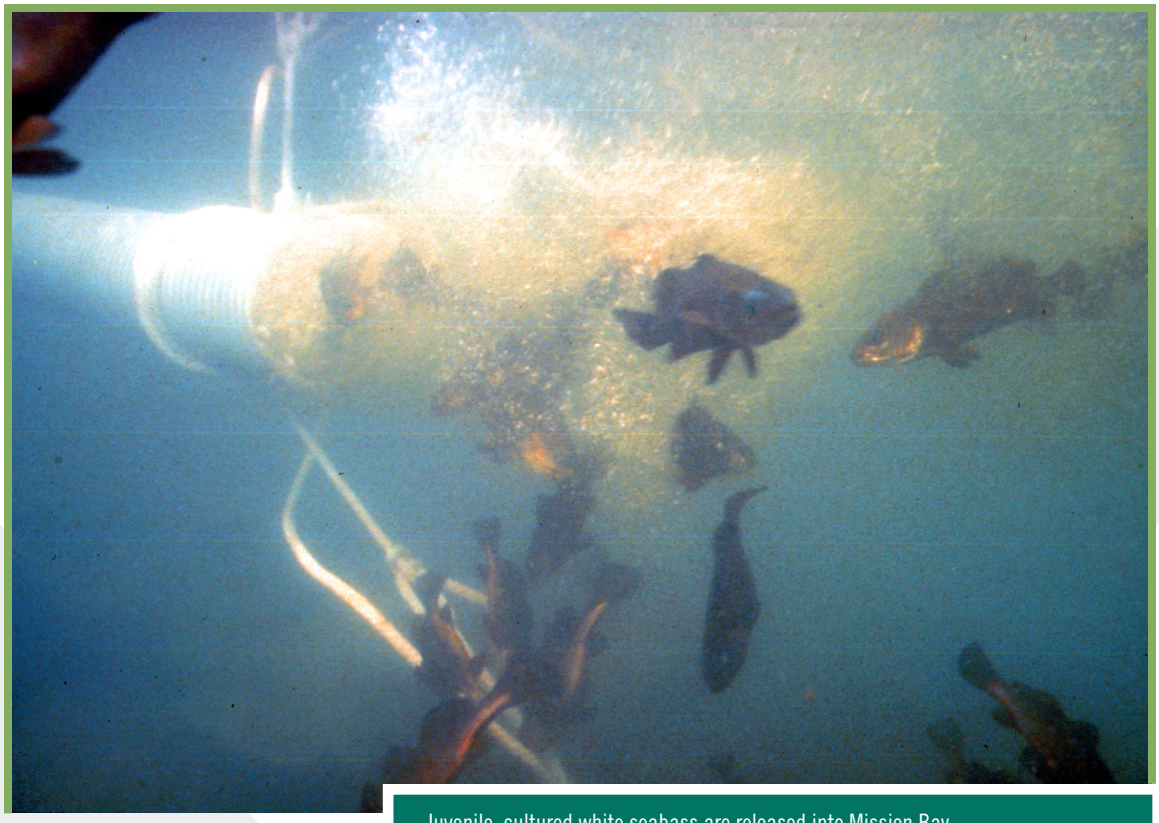
In 2006 and 2007, more than 83 wild white seabass were collected off Imperial Beach, Point Loma, La Jolla, Carlsbad, Oceanside Harbor, Newport Bay, Santa Rosa Island, Santa Catalina Island and Anacapa Island. None of these fish tested positive for the virus either.

In the last year of the project, the herpes virus disappeared from the seabass hatchery and a new sporozoan parasite was discovered. In response, the researchers began characterizing this new parasite and tested wild fish for evidence of its presence. The new sporozoan was not detected in any of the wild fish sampled.

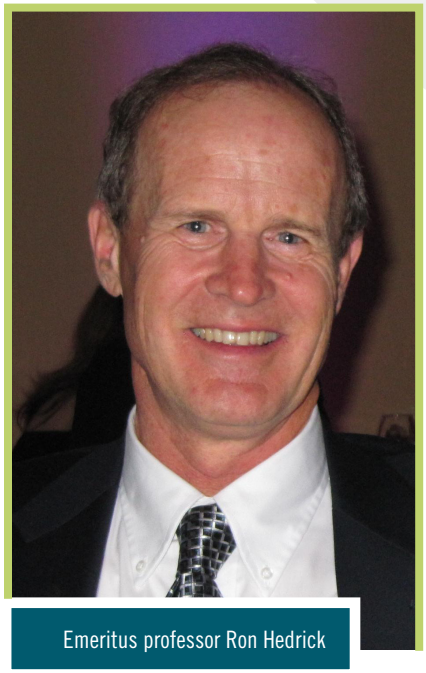
IMPACTS

The development of the new diagnostic tool has allowed the first insights into the presence of key pathogens in wild populations of white seabass. These initial investigations suggest that neither the herpes virus nor the sporozoan parasite is likely common in wild fish and that conservative approaches are warranted to prevent releasing infected hatchery-born fish.

Results of this project have been shared with the California Department of Fish and Game, which oversees the enhancement program, and the Hubbs-SeaWorld Research Institute, which rears and releases the white seabass on behalf of the state.



Juvenile, cultured white seabass are released into Mission Bay in San Diego for stock enhancement. Image: M. Drawbridge/HSWRI



Emeritus professor Ron Hedrick

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