

HSWRI Aquaculture Program Research Report **** October & November 2009 ****



White Seabass Release and Recovery Year End Update

HSWRI researchers released 152,000 juvenile white seabass (WSB) into ocean waters of southern California in 2009. This represents the limit to the number of WSB allowed by regulators for release during the 2009 calendar year. More than 7,700 white seabass were scanned for tags from U.S. fishery landings this year. From these efforts, 29 tagged adult WSB were recovered or one tagged fish for every 255 scanned. The ages of the fish recovered ranged from 3 to 12 years with lengths of 72 to 125 cm and weights of 3.0 to 15.4 kg. The distances that these fish were recovered from their release sites ranged from < 5 to 200 nautical miles with an average of about 52 nm (Figure 1). One WSB released in an embayment in San Diego was caught near Santa Rosa Island in the northern part of the Southern California Bight.

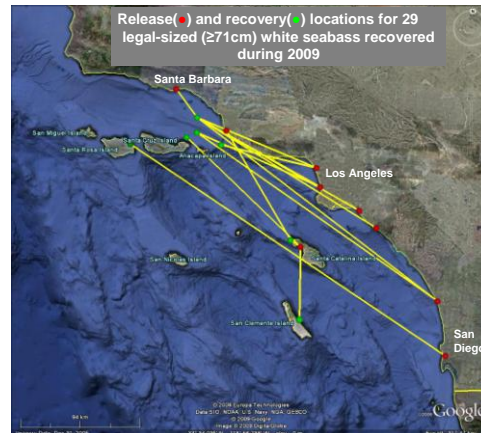


Figure 1. WSB release and recovery locations during 2009.

Group Spawning Dynamics in Captive White Seabass

White seabass are broadcast-spawners in the family Sciaenidae (drums and croakers, Figure 2). Because broadcast-spawners release gametes *en masse* into the water column, the dynamics of group spawn events are difficult, if not impossible, to identify without genetic means. Understanding these dynamics is critically important in order to estimate genetic diversity and relatedness within and among brood fish and offspring and to determine hatchery-wide effective size. Acquiring this information will enable HSWRI researchers to further maximize genetic diversity among WSB released and thereby further minimize potential genetic impacts to the wild population.



Figure 2. Adult WSB swimming with other brood fish.

In a collaborative project with Dr. Russ Vetter and Dr. John Hyde of NOAA, we used five microsatellite loci to assign parent-offspring relationships to 60 yolk sac larvae from each of 71 spawn events that occurred in 2008. The spawn events were produced by 25 male and 25 female adult WSB held in one 45-m³ pool. Prior to working with the larvae, tissue samples were collected from all of the adult brood fish for genotyping so that accurate parent-offspring assignments could be made (Figure 3). We found that eggs from one female were typically fertilized by 6-7 males in a single spawn event. The contribution of each female varied throughout the spawning season, while the contributions from males were more consistent within and among spawn events. Finally, some females spawned at intervals of every 1-3 weeks, others burst spawned over 2-3 days, and some displayed a mixture of spawning modes. Both sexes appeared to maximize the genetic diversity of their offspring by reproducing with as many mates as possible.

These results are being prepared for publication and the next study will explore the possibility of domestication selection in the hatchery environment.



Figure 3. Hatchery personnel collect tissue samples from WSB brood fish and use PIT tags to track individuals.

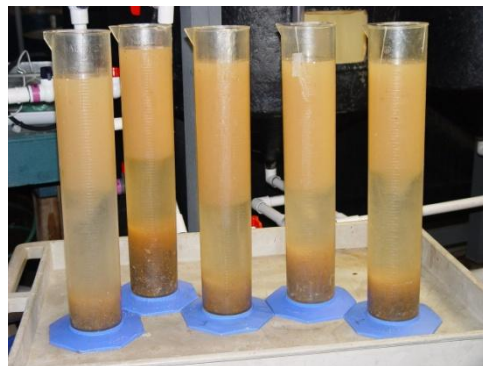


Figure 4. Graduated cylinders are used to enumerate spawn size by volume. Millions of orange colored eggs float at the surface of the cylinders.

High Density Production of the Rotifer (*Brachionus plicatilis*)

HSWRI has been working with high density rotifer reactors since 2001. Rotifers are microscopic zooplankton used worldwide as a live food for the culture of larval fishes (Figure 5). Their attributes as a prey organism include their small size, slow swimming speed, ability to be cultured at high densities and high reproductive rate. The primary demand for rotifer production at HSWRI is to support the culture of California yellowtail (*Seriola lalandi*). Currently HSWRI has four rotifer production systems; one is 500 L and three are 1000 L (Figure 6). All bio-reactors are temperature-controlled at 24°C and supplied with sterilized brackish water at 20 ppt.

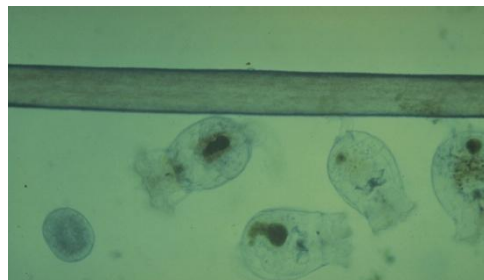


Figure 5. Microscopic rotifers shown below a thread of human hair.

In 2009, we reached a peak daily standing stock in all four bio-reactors of over 20 billion rotifers. At that time, two of the reactors were operating at over 8,000 rotifers per mL each. This significant population of rotifers allowed us to maintain a consistent density of 30 rotifers per mL in our larval rearing tanks for yellowtail. In 2009, we enriched approximately three billion rotifers per day, which was a 50% increase from 2008. The increase in rotifer production in 2010 was a result of various improvements to our methods and overall understanding of the needs of the rotifers at these high densities. We added ozone to the water supply and a mixing vessel that allowed us to consistently maintain the water at optimal salinity.



Figure 6. High density recirculating rotifer production system (1000L).

Our ability to consistently produce healthy rotifers at high densities is a very positive step toward mass culture of marine finfish. Our near term goals for rotifer production will be focused on reducing the use of algal paste as a food source for the rotifers because of its high cost, as well as greater automation of various processes related to live feed production.

Acknowledgements

This document reports on Aquaculture Research Projects supported by numerous grants, contracts and private contributions. It also represents the hard work of many dedicated staff and volunteers throughout southern California. This information was contributed by HSWRI staff, and compiled by Aquaculture Research Assistant, Lisa Goldie, under the direction of Senior Research Scientist and Aquaculture Program Manager, Mark Drawbridge.

The Aquaculture Research Program has been active for more than 25 years at HSWRI. The primary objective of this Program is to evaluate the feasibility of culturing marine organisms to replenish ocean resources through stocking, and to supply consumers with a direct source of high quality seafood through traditional aquatic farming. Please direct any questions to Mark Drawbridge at mdrawbridge@hswri.org.

Aquaculture research at HSWRI is currently supported by these major contributors:

- The California Department of Fish and Game's Ocean Resources Enhancement and Hatchery Program
- Cabrillo Power/NRG
- SeaWorld San Diego
- The U.S. Fish and Wildlife Service's Sport Fish Restoration Account



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- Chevron Corporation
 - The Catalina Seabass Fund
 - The Shedd Family
 - The Fletcher Foundation
 - California Sea Grant
 - NOAA Fisheries
 - National Sea Grant Program, National Marine Aquaculture Initiative
 - USDA National Institute of Food and Agriculture
 - United Soybean Association
 - San Diego County Fish and Wildlife Advisory Commission