

HSWRI Aquaculture Program Research Report

*** February - March 2016 ***



King Harbor Volunteers - Raising and Releasing Seabass Since 1993!

The King Harbor Ocean Enhancement Foundation (KHOEF), a non-profit organization led by Rich Ford and John Whitaker, was one of the earliest groups to partner with HSWRI and join the Ocean Resources Enhancement and Hatchery Program (OREHP). The group released their first cohort of white seabass in 1993 and have since released over 114,000 seabass. Located in Redondo Beach, the KHOEF originally utilized a boat slip in King Harbor (Figure 1). After receiving several grants and financial support from the OREHP, however, they decided to build a land-based system where they could have more control over the quality of their water. With its flow-through design, the culture facility consists of two 5,000 gallon tanks with a degassing column to reduce supersaturation of the water. Their pump taps into a salt water supply from an adjacent power plant that draws water from an intake 600m away and 10m deep!

The KHOEF has a very strong volunteer base with 31 active volunteers ranging from kids to retirees. A typical day for volunteers involves cleaning the tanks, feeding the fish, and recording data and observations. Most of the volunteers are recreational fishermen or divers, so they are incredibly passionate about giving back to the ocean. During a recent release, Rich



Figure 1. The original KHOEF sea cage.



Figure 2. Everyone comes out to help release the seabass into the harbor!

Ford said, “Actually, after a while, the fish are almost like family to you... You’re here cleaning and helping the fish – it’s almost like a religion.” Our fish tag recovery program has collected 72 fish released from King Harbor with some being over 10 years old.

More than 30 volunteers were present in March to help release the 2,700 fish that were under their care for the previous five months. Now they are ready for their next batch from the hatchery.

Sportfishing Community Weighs in on Potential Enhancement Species

As we reported in our April-May 2015 newsletter, HSWRI established the Dick Laub Fisheries Replenishment Program (DLFRP) in 2014 to advance our understanding of the potential for stocking supplemental species to white seabass. As with the OREHP white seabass program, the southern California sportfishing community is integral to the development and success of the DLFRP. In view of this, HSWRI teamed up with Coastal Conservation Association of California (CCA-CAL) earlier this year to determine what species the sportfishing community might like to see replenished in a similar manner to white seabass.

To accomplish this, we compiled a survey questionnaire based on information provided by the California Department of Fish and Wildlife (DFW), and on discussions with CCA-CAL and other stakeholders. The survey was then distributed at several events throughout southern California, including angling group meetings, fishing tournaments, tackle shows and seminars. Survey participants were asked to rank, from a list of thirteen marine finfish, the top three they would like to see replenished in southern California. They were also provided a blank space to list an additional species if necessary.

Almost 500 responses were received, with participants showing a clear overall preference for 1) California halibut; 2) California yellowtail; 3) kelp bass; and 4) giant sea bass as potential stock enhancement candidates (Figure 3). California halibut was consistently the top ranked species at each surveyed location (from Marina Del Rey south to San Diego). Other than those listed on the survey questionnaire, no other species was identified by the respondents as being a high priority for replenishment. These surveys provide us with important feedback on the species preferences of the southern California sportfish community and the results will be incorporated into a species selection analysis being undertaken by HSWRI. As the DLFRP expands, we hope to build on our existing collaboration with CCA-CAL and the sportfishing community to assist with broodstock collection efforts.

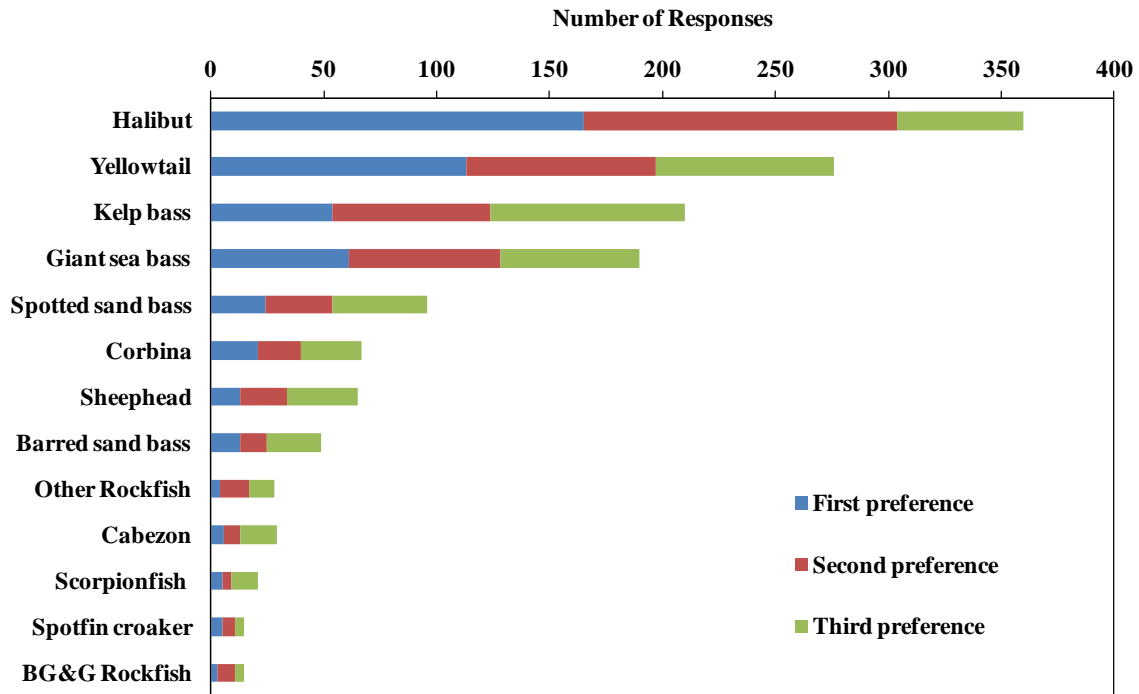


Figure 3. Number of votes received by each species. The BG&G Rockfish group is Brown, Gopher or Grass Rockfish.

HSWRI Scientists Make Showing at AQUACULTURE 2016

AQUACULTURE 2016 took place as the Triennial meeting in Las Vegas, NV, from February 22 - 26th. According to the organizers, the triennial conference is the largest aquaculture and tradeshow meeting in the world with nearly 4,000 attendees from over 90 countries typically attending. The Triennial combines the annual meetings of the World Aquaculture Society, National Shellfisheries Association, Fish Culture Section of the American Fisheries Society, and the National Aquaculture Association. HSWRI was well represented with attendees and co-authorship of 12 presentations listed below. Institute attendees included Don Kent, Mark Drawbridge, Dave Jirsa, Kevin Stuart, Federico Rotman, Mike Shane, Ruairi MacNamara and Connie Silbernagel.

In the area of fish nutrition, several presentations were given across the full range of life stages from larvae to brood fish. Special thanks to our collaborators from Oregon State University, NOAA Fisheries, Southern Illinois University, and Auburn University. Funding was provided primarily by the Western Regional Aquaculture Center, NOAA Fisheries and the United Soybean Board.

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- Matt Hawkyard, Ben Laurel, Yoav Barr, **Kevin Stuart**, **Mark Drawbridge** and Chris Langdon. METHODS FOR THE TAURINE ENRICHMENT OF LIVE PREY AND THEIR IMPACTS ON MARINE FISH LARVAE
 - Matt Hawkyard, **Kevin Stuart**, **Mark Drawbridge** and Chris Langdon. DEVELOPMENT OF ALGINATE COMPLEX PARTICLES AND THEIR USE FOR EVALUATING COMPOUNDS THAT ENHANCE FEEDING BY MARINE FISH LARVAE
 - **Dave Jirsa**, Jesse Trushenski, **Andrea Marino**, and **Mark Drawbridge**. EMULSIFIERS IN SOYBEAN OIL-BASED DIETS FOR CALIFORNIA YELLOWTAIL
 - Guillaume P. Salze, **Dave O. Jirsa**, **Kevin Stuart**, D. Allen Davis, and **Mark A. Drawbridge**. EFFECTIVE USE OF CARBOHYDRATES AS A DIETARY ENERGY SOURCE IN CALIFORNIA YELLOWTAIL *Seriola lalandi*
 - **Kevin Stuart**, Ron Johnson, Lisa Armbruster, and **Mark Drawbridge**. MANIPULATION OF ARACHIDONIC ACID IN THE DIET OF ADULT CALIFORNIA YELLOWTAIL *Seriola lalandi*
 - Lisa Armbruster, **Kevin Stuart**, **Mark Drawbridge**, Ronald Johnson CALIFORNIA YELLOWTAIL *Seriola lalandi* EGG QUALITY AND CHEMICAL COMPOSITION

A special session on marine stock enhancement allowed us to present two papers associated with the OREHP.

- **Mark Drawbridge** and **Michael Shane**. A STATUS REPORT ON CALIFORNIA'S OCEAN RESOURCES ENHANCEMENT AND HATCHERY PROGRAM
- **Constance Silbernagel**, **Michael Shane** and **Mark Drawbridge**. QUALITY CONSIDERATIONS AND SURVEILLANCE IN MARINE STOCKING PROGRAMS

In the area of fish genetics, our collaborative research is lead by Dr. John Hyde and his team at NOAA's Southwest Fisheries Science Center (SWFSC) and Dr. Andrew Severin at Iowa State University. Funding has been provided by California Sea Grant, NOAA Fisheries, and NOAA's Saltonstall-Kennedy Program.

- Catherine Purcell, Elizabeth Smith, **Mark Drawbridge**, **Kevin Stuart**, Andrew Severin, and John Hyde. APPLYING GENETIC AND GENOMIC TOOLS

TOWARD UNDERSTANDING BROODSTOCK DYNAMICS AND LARVAL DEVELOPMENT IN THE CALIFORNIA YELLOWTAIL, *Seriola dorsalis*¹

- Catherine Purcell*, Andrew Severin, Vince Buonaccorsi, **Mark Drawbridge**, **Kevin Stuart**, and John Hyde. RNA-SEQ ANALYSIS OF LARVAL STAGES OF SLOW- AND FAST-GROWING YELLOWTAIL, *Seriola dorsalis*

Mike Shane highlighted HSWRI's Seabass in the Classroom (SITC) program in an education session and Mark Drawbridge was invited to give an overview of marine finfish farming opportunities in a session sponsored by the California Aquaculture Association.

- **Michael A. Shane** and **Mark A. Drawbridge**. SEABASS IN THE CLASSROOM: FISH AND STUDENTS GET SCHOOLED IN AQUACULTURE
- **Mark Drawbridge**. MARINE FINFISH FARMING IN CALIFORNIA

The privilege to attend this important conference is attributed to many of the sponsors and granting agencies listed in the acknowledgements of this newsletter. Additionally, the breadth of our research represented at the meeting was only made possible by the numerous collaborating individuals and agencies to whom we are extremely grateful.

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, as well as collaborators around the country. This information was contributed by HSWRI staff and compiled by Senior Research Scientist and HSWRI Aquaculture Program Director Mark Drawbridge.

The aquaculture research program has been active for more than 35 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 aquatic farming. Please direct any questions to Mark Drawbridge at mdrawbridge@hswri.org.

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

- Avalon Tuna Club Foundation
- Cabrillo Power/NRG
- Chevron Corporation

¹ *Seriola lalandi* was recently renamed *Seriola dorsalis* in the Eastern Pacific.



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- Der Fruchtbaum Family Trust
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 - Edison International
 - Fisherman's Landing
 - H & M Landing
 - Los Angeles Rod & Reel Club Foundation
 - Frank and Kathy LoPreste
 - NOAA's Saltonstall-Kennedy Program
 - Point Loma Sportfishing
 - Poseidon Water
 - San Diego County Fish and Wildlife Advisory Commission
 - Santa Monica Seafood
 - SDG&E Environmental Champions
 - Seaforth Sportfishing
 - SeaWorld & Busch Gardens Conservation Fund
 - SeaWorld Parks and Entertainment
 - SeaWorld San Diego
 - Sempra Energy Foundation
 - Joseph S. and Diane H. Steinberg 1992 Charitable Trust
 - The California Department of Fish and Wildlife's Ocean Resources Enhancement and Hatchery Program
 - The Catalina Seabass Fund
 - The Fletcher Foundation
 - The Shedd Family
 - The U.S. Fish and Wildlife Service's Sport Fish Restoration Account
 - United Soybean Board
 - USC Sea Grant
 - USDA National Institute of Food and Agriculture
 - Western Regional Aquaculture Center (WRAC)

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