
HSWRI Aquaculture Program Research Newsletter

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HSWRI Showcases Research at AQUACULTURE AMERICA 2017

AQUACULTURE AMERICA 2017 recently took place in San Antonio, TX, and was attended by HSWRI scientists including Don Kent, Mark Drawbridge, Mike Shane, Kevin Stuart, Federico Rotman, and Ruairi MacNamara. The event ran over three days in February and brought together participants from research, industry and 14 aquaculture organizations. As in previous years, HSWRI was well represented, with co-authorship of six presentations in a variety of specialist sessions.

In the Finfish Reproduction session, Kevin Stuart presented research on the spawning dynamics and egg quality of California yellowtail. This project involved NOAA's Northwest Fisheries Science Center (NWFS) and Southwest Fisheries Science Center (SWFSC), and was funded primarily by the Western Regional Aquaculture Center and NOAA Fisheries. [Kevin Stuart, Ron Johnson, Lisa Armbruster, John Hyde and Mark Drawbridge. *Captive spawning and egg quality of California yellowtail (Seriola dorsalis)*].



Figure 1. Kevin Stuart presents research results on yellowtail reproduction at Aquaculture America.

Federico Rotman spoke in the Engineering section on the effectiveness of a self-cleaning tank for larval production of California yellowtail and white seabass. These trials were ran in our Mission Bay laboratory with assistance from Ocean's Design of San Diego and supported through funding from the University of Southern California Sea Grant, Laub Family Trust and Der Fruchtbaum Family Trust.

[Federico Rotman, Kevin Stuart, Mark Drawbridge and Mike Paquette. Self-cleaning larval rearing tanks to improve larval production of California yellowtail (Seriola dorsalis) and white seabass (Atractoscion nobilis)].

A Restoration and Stock Enhancement session was also held at the meeting, where Ruairi MacNamara gave an overview of the progress to date on the Dick Laub Fisheries Replenishment Program and our efforts to undertake stocking of California halibut. *[Ruairi MacNamara, Mark Drawbridge, Mike Shane and Ed Camp. Building on stock enhancement success in southern California: case study of a developing California halibut (Paralichthys californicus) replenishment program].*

Finally, there were three talks in various Fish Nutrition sessions given by HSWRI collaborators from Auburn University and University of Miami: *[Guillaume Salze, Kevin Stuart, Allen Davis and Mark Drawbridge. Effects and interactions of taurine supplementation in broodstock and larval feeds in California yellowtail (Seriola dorsalis); Guillaume Salze, Dave Jirsa, Mark Drawbridge and Allen Davis. Interaction between dietary soy and animal protein onto the taurine requirement in white seabass Atractoscion nobilis and California yellowtail (Seriola dorsalis); Mark Portman, Daniel Benetti, Rick Barrows, Jorge Suarez, Kevin Stuart and Mark Drawbridge. Effect of dietary moisture on growth and intestinal histology in Seriola dorsalis: a preliminary assessment of a novel moist feed].*

Attendance at conferences like this is an important way to highlight the work being done by HSWRI and to develop future research collaborations and partnerships. We would like to gratefully acknowledge the sponsors and granting agencies listed in this newsletter, without whose support this would not have been possible.



Figure 2. A small-scale self-cleaning tank on display at the Aquaculture America tradeshow. Full scale units are now commercially available from Ocean's Design.

The Efficacy of Flatfish Stocking Programs Elsewhere and Implications for California Halibut.

As reported in previous editions of the Aquaculture Newsletter, efforts have been ongoing by HSWRI to identify endemic species for stock replenishment in southern California. A species selection analysis, based on biological and management criteria, has indicated that California halibut (*Paralichthys californicus*) could be a suitable candidate for stocking. Culture research on California halibut has been undertaken at HSWRI since the 1980s, and the species is now subject to renewed focus as part of the Dick Laub Fisheries Replenishment Program.



Figure 3. Large California halibut reared at HSWRI circa 2000.

Though HSWRI has over three decades of experience releasing white seabass, the contrasting life-history attributes of California halibut mean that much additional research and experimental work is necessary to determine release protocols appropriate for this species. Fortunately, several species of flatfish have been stocked worldwide (from East Asia and Europe to the eastern and Gulf coasts of the US), representing a unique baseline of information on which to draw from. We reviewed programs for Japanese flounder, Turbot, Winter flounder, Summer flounder and Southern flounder, in order to understand the current state of knowledge and identify critical information gaps relating to flatfish stocking. Among these species, each of the flounders are in the same genus (*Paralichthys*) as California halibut. Japanese flounder (*Paralichthys olivaceus*) are by far the most extensively stocked species – around 25 million juveniles are released annually in Japan, with additional releases in Korea and China. Several Japanese case studies have long-term assessments showing that releases can significantly (and cost-effectively) contribute to fishery yield – the most successful years of stocking were characterized by recovery rates of 20–30% (no. of recaptured fish / no.



Figure 4. A pilot release of several hundred halibut into Mission Bay circa 2000.

of released fish) and contribution rates of up to 50% (number of recaptured fish / number of total harvested fish). Releases of other flatfish species, including those in the United States (Winter, Summer and Southern flounder), have typically been more experimental in scale (the most comprehensive releases have numbered about 380,000 juvenile Southern flounder in Texas since 2006). Researchers have investigated important stocking issues, particularly in relation to optimal size-at-release, pre-release conditioning to improve survival in the wild, and site selection. These studies also provide valuable information on appropriate tagging and sampling techniques necessary to conduct post-release assessment.

Combined with what we have learned through our stocking program with white seabass, this information will greatly accelerate any future replenishment program with California halibut. The successes achieved in Japan with a very closely related species also bodes well for future success here in southern California.

Acknowledgements

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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.

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