

*Regional
e-Notes*

Letter from the Director

Aloha & Season's Greetings!

As the year draws to a close, my team and I would like to wish you and your family a very happy holiday season.

In this final issue of 2010, you will find details about an upcoming CTSA biosecurity workshop, as well as a summary of the CTSA-funded Harlequin Shrimp project.

As always, if you have any suggestions, concerns, or comments, please do not hesitate to let us know. We look forward to seeing you again in the new year!

Mahalo,

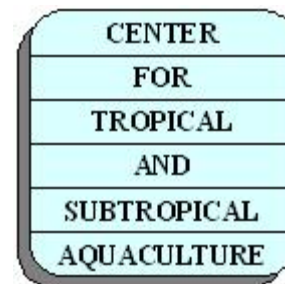
Cheng-Sheng Lee
Executive Director, CTSA

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Upcoming CTAHR Regional Biosecurity Workshop on January 9, 2011

An update of the CTSA Biosecurity project is to take place at the next monthly meeting of the Hawaii Goldfish and Carp Association scheduled for Sunday, January 9, 2011. Doors open at 1:00pm and meeting begins promptly at 1:00pm. Entrance and participation is free.

Where: Salt Lake Elementary School, 1331 Ala Liliko Street, Honolulu, Hawaii, 96818.

What: Hawaii's aquaculture output reached a record high of \$34.7 million in 2008 with the freshwater ornamentals contributing 10% of the total output. Much of that was attributed to one species, koi. Want to find out more about Koi Herpes Virus (KHV) a major threat to Hawaii's producers? Become informed regarding steps being taken through a newly executed Center for Tropical and Subtropical Aquaculture (CTSA) supported project that brings together public and private partners to protect and develop added value for Hawaii's koi producers.

The discussions are to be facilitated by Kathleen McGovern-Hopkins, Junior Aquaculture Extension Agent, Department of Molecular Biosciences and Bioengineering, College of Tropical Agriculture and Human Resources. Dr. Allen Riggs DVM, State Department of Agriculture, Aquaculture Development Program, Aquatic Veterinarian, will provide brief overviews on Koi Herpes Virus (KHV) and the Specific Pathogen Free (SPF) Shrimp Broodstock Program that is a potential model for a similar program for koi. Dr. Clyde Tamaru, Aquaculture Specialist CTAHR, will be providing an overview of the planned activities for the "Diagnostic and Surveillance Objectives" of the newly implemented REGIONAL BIOSECURITY: OPERATIONAL BIOSECURITY AND

Solicitation of participants in the project as well as stakeholder input as to next steps will also be part of the discussions.

Culturing the Harlequin Shrimp *Hymenocera picta*

by Sean M. Moss, PhD.
Vice President, Oceanic Institute



Fig 1. Photograph depicting size differences of juvenile harlequin shrimp fed: 1) pieces of frozen *Linckia* arms (smallest shrimp in upper left), 2) pieces of live *Linckia* arms (middle-size shrimp in top of photo), and 3) whole live *Linckia* (large shrimp in foreground). All three shrimp in this photo were approximately the same age.

The harlequin shrimp, *Hymenocera picta*, is a popular marine ornamental invertebrate sold in pet shops around the world. Most harlequin shrimp purchased by hobbyists are collected from shallow tropical waters of the Pacific Ocean, including Hawaii. Collecting wild harlequin shrimp is not sustainable and may cause collateral damage to coral reefs. Although *H. picta* have been bred in captivity by local aquaculturists such as Frank Baensch, Karen Brittain, and Syd Kraul, there is a paucity of published information about the captive reproduction of these valuable aquarium shrimp. With funding from CTSA, we have generated valuable information about the behavior, reproductive biology, and larval rearing of *H. picta*, so the prospects for commercial production of harlequin shrimp is promising.

In an effort to study the behavior and reproductive biology of *H. picta* in captivity, Hawaii Pacific University graduate student, Danielle McKay Gross, documented the effects of mate switching on reproductive performance of female shrimp. In the wild, *H. picta* are found in socially monogamous, heterosexual pairs. Danielle's work showed that wild-caught pairs in captivity readily accepted new partners as evidenced by immediate pair-sitting and routine copulation with new mates. Females did not appear to suffer any reproductive cost to losing their long-term male partners and immediately produced large clutches of eggs which were fertilized by new male mates. Mean (\pm SD) clutch size ($2,268 \pm 1,112$ versus $2,391 \pm 1,512$), % hatch (62 ± 36 versus 67 ± 40), and number of viable larvae ($1,343 \pm 1,019$ versus $1,940 \pm 1,460$) were not statistically different before and after mate switching. Results indicate that, although *H. picta* typically form heterosexual pair bonds, they can adapt their mating strategy to take advantage of new reproductive opportunities by readily accepting new mates when established partners are no longer available. Danielle's work resulted in her receiving a Master's of Science degree in Marine Science from Hawaii Pacific University in 2009.

During the CTSA project, a significant achievement was made when OI researchers Dr. Charles Laidley, Dr. Chad Callan, and Ms. Melissa Carr (also a Hawaii Pacific University graduate student) produced post-settled harlequin shrimp juveniles from captive broodstock (Fig. 2).

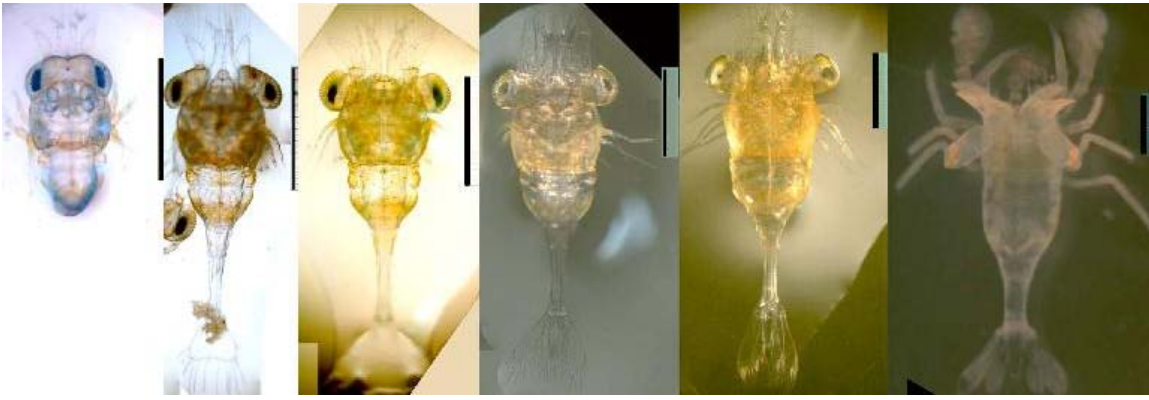


Fig 2. Photomicrographs of harlequin shrimp larval development. Images (left to right) represent shrimp on day 1, 3, 8, 12, 22 post-hatch and day 39 (settled postlarva). Scale bar = 1 mm.

Settlement of postlarvae began 34 days after hatching and continued through day 57. Peak settlement occurred between days 40 and 44. Newly settled shrimp were translucent yellow and pink and did not appear to feed for 3-4 days post settlement. After one or two molts (4-6 days), postlarval shrimp began to assume the coloration exhibited by adults (white with purple and pink spots, and readily fed on live *Linckia* seastars. The highest larval survival (70%) was achieved using a combination of *Artemia* nauplii and rotifers as live prey. This work demonstrated that harlequin shrimp juveniles can be produced in captivity using larval-rearing techniques similar to those used to produce marine fish.

Limited published literature suggests that juvenile and adult harlequin shrimp feed exclusively on live asteroid echinoderms, particularly those of the genera *Linckia* and *Acanthaster*. However, anecdotal reports indicate that *H. picta* also feed on other echinoderms and that there may not be an obligatory need for live feed. The restricted diet of *H. picta* represents a major obstacle to the large-scale marketing of this marine ornamental because reliance on live asteroid prey presents a significant challenge and economic burden to the aquarium hobbyist. In addition, the routine collection of live seastars from the wild to feed juvenile and adult *H. picta* may have an ecological cost. In an effort to explore alternative diets for *H. picta*, we conducted a preliminary feeding trial, using naïve juvenile shrimp, to assess whether frozen *Linckia* and *Asteria* seastars can be used as a feed. Seastars of the genus *Asteria* are collected as by-catch and considered a nuisance species by shellfish growers in North America and thus might provide a more sustainable feed source for maintaining harlequin shrimp in captivity. Shrimp fed the frozen diets exhibited survival that was similar to that of shrimp fed live *Linckia*. However, shrimp fed frozen *Linckia* exhibited reduced growth and delayed pigmentation compared to shrimp reared on live *Linckia* (Fig. 1). In addition, newly settled shrimp which were initially exposed to live *Linckia* could be transitioned to frozen diets. However, shrimp transitioned from live *Linckia* to frozen *Linckia* exhibited lower survival than shrimp transitioned from live *Linckia* to frozen *Asteria*.

Information generated from this CTSA-funded project can be used to develop more effective techniques for the captive production of harlequin shrimp and to develop formulated diets to replace live seastars. Such developments could eventually support commercial efforts to produce and market this valuable marine ornamental species while simultaneously protecting the marine environment.

NMC-CREES demonstrates aquaculture sustainability through field, media day

By Clarissa David, taken from the Saipan Tribune. November 22, 2010.

A few aquaculture producers on Saipan attended the Field & Media Day conducted by the Northern Marianas College Cooperative Research, Extension and Education Services last Nov. 18 to promote sustainable practices in aquaculture.

"Our goal is to promote sustainable aquaculture activities among local aquaculture farmers," aquaculture extension agent Michael Ogo told Saipan Tribune. Ogo said the event featured a project overview of the Western Sustainable Agriculture Research and Education under the U.S. Department of Agriculture at the NMC As Terlaje campus.

WSARE aims to promote agriculture sustainability through various grants that facilitate advanced research and education across the western region which includes 13 states and four Pacific Island territories.

Following the project overview is a tour of two tilapia hatchery farms on island that benefited from competitive grants under the WSARE program.

The first farm was the aquaculture farm of Ines Guerrero in Fina Sisu. Guerrero received a \$15,000 grant for her project called Sustaining Tilapia Production in the CNMI through the use of an Artificial Fry Incubation System.

The second was the aquaculture farm of Pete Arriola in Dandan. Through WSARE, Arriola received \$10,469 for his project called the "Demonstration of the Feasibility Study of Solar Energy in Sustainable Agriculture to Address the High Cost in Conventionally Produced Electricity."

Jack Phan, who is involved with his family's retail and wholesale business, said he attended the event because he was interested to find out if he could start his own small-scale tilapia production and generate income from it. Through the activity, Phan said he learned about the different issues affecting aquaculture farmers such as the high cost of utilities, feeds, and the problem of water on island.

Glen Buultjens, who has been cultivating tilapia since March, said he has been raising fish and other animals as a hobby. Buultjens said through the field and media day, he learned about many things, including identifying a male from a female tilapia, breeding, and biofiltering.

Carol Hosono said she learned more about NMC-CREES and its programs while working for the Community Development Institute. According to Hosono, she and her husband John decided to venture in shrimp production last October "to do something to sustain us."

The Hosonos recently received a \$14,482 grant from WSARE to fund their project called "Maximizing Aquaculture Productivity with Sequential Polyculture Systems." Hosono said they attended the activity to expand their knowledge about aquaculture and learn from other aquaculture farmers about what they do in their production.

Ogo said the bottomline of the activity is to have sustainability in all aquaculture activities as well as maintain the local farmers' momentum in aquaculture production in the CNMI.

"Sustainable aquaculture in the CNMI will enable farmers and producers to harvest food not only for themselves but also for others to supplement their income and make it a form of livelihood. It addresses the issue on food security in the commonwealth," he said.

Claus Bier, program coordinator for NMC-CREES, said their next goal is to get funding to help address the high cost of feeds for the aquaculture farmers and producers on island.

AquaClip: UC Davis study finds wild salmon decline was not caused by sea lice from farm salmon

Taken from esciencenews.com. Monday, December 13, 2010

A new UC Davis study contradicts earlier reports that salmon farms were responsible for the 2002 population crash of wild pink salmon in the Broughton Archipelago of western Canada. The Broughton crash has become a rallying event for people concerned about the potential environmental effects of open-net salmon farming, which has become a \$10 billion industry worldwide, producing nearly 1.5 million tons of fish annually.

The new study, to be published online this week in Proceedings of the National Academy of

Sciences, does not determine what caused the crash, but it acquits the prime suspect: small skin parasites called sea lice.

The study's lead author is Gary Marty, a veterinary pathologist and research associate at the UC Davis School of Veterinary Medicine. An expert in fish diseases, Marty has been studying the health of pink salmon since the 1989 Exxon Valdez oil spill in Alaska.

"For anybody concerned about the effect of farm salmon on wild salmon, this is good news," Marty said. "Sea lice from fish farms have no significant effect on wild salmon population productivity."

The new study is the first to analyze 20 years of fish production data and 10 years of sea-lice counts from every salmon farm in the Broughton Archipelago and compare them against 60 years of population counts of adult pink salmon.

The study concludes that farm fish are indeed the main source of sea lice on the area's juvenile wild pink salmon, but it found no statistical correlation between lice levels on the farms and the lifetime survival of wild pink salmon populations.

[Click here to read the full article.](#)

The Center for Tropical and Subtropical Aquaculture (CTSA) is one of five regional aquaculture centers in the United States established and funded by the U.S. Department of Agriculture's National Institute of Food and Agriculture (NIFA) under grants 2005-38500-15720, 2006-38500-16901, 2007-38500-18471, and 2008-38500-19435. The regional aquaculture centers integrate individual and institutional expertise and resources in support of commercial aquaculture development. CTSA was established in 1986 and is jointly administered by the Oceanic Institute and the University of Hawaii.