

## FY 2015 PHASE I AWARD WINNER

FIRM: Catalina Sea Ranch, LLC  
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AWARD: \$95,000.00

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PRINCIPAL INVESTIGATOR: Kelly Stromberg

TITLE OF PROJECT: Development of Genetics-based Selective Breeding Protocols for Improvement of the Mediterranean Mussel, *Mytilus galloprovincialis*, and Advancement of Aquaculture

SUBTOPIC NUMBER: 8.1.1F

### TECHNICAL ABSTRACT:

The problem this proposal seeks to remedy has positive and profound ramifications for the advancement of aquaculture. The aquaculture industry lags in genetically based selective breeding programs when compared to terrestrial commercial crops. This perpetuates our nation's \$11 billion dollar seafood deficit, puts U.S. aquaculture entrepreneurs at a disadvantage for success, and increases risk for bivalve crop degradation from climate change. Heterosis in bivalve crops have been documented in scientific literature, but studies remain scant and rarely address the genetic components of selection from breeding. To address this gap, a novel family line system will be developed within the emerging model organism *Mytilus galloprovincialis*, which will be used to generate the framework for a genetics based selective breeding protocol. Within this framework, there are three goals for Phase I: **1)** to establish genetically distinct family lines of blue mussels, focusing on desirable commercial characteristics, **2)** investigate genetics of viability and selection, and **3)** determine mutation rates and their impact on domesticated shellfish cultivars. These data will then be used (in Phases II/III) to develop genetic based selective breeding protocols. This research will provide immediate benefits to the U.S. economy, and have a long term global impact on a sustainable protein production from the sea.

### SUMMARY OF ANTICIPATED RESULTS:

#### Phase I Deliverables:

- Generation of 30 families of F1 inbred lines, to be used in future scientific and commercial endeavors.
- Measured differential growth and survival rates among families.
- Mapped annotation of genes associated with growth and survival characteristics, and description of time of earliest possible detection in larval cohort.
- Inherent mutation rate of Southern California *Mytilus galloprovincialis*.
- Working 'blue-house' facilities on Catalina Island, ensuring future research for CSR and various scientific teams.

#### Phase II Deliverables:

- Simple commercial strategies and protocols for genetic based selective breeding programs for blue mussels, and shellfish in general.
- Byssal thread strength and shell robustness measurements between families and associated genetic profiles.
- Continued inbreeding in family lines, and Isolation of improved cultivars (strategy depending on mutation rate described in Phase I).