

Project Number:	1730-352-0501-NE
Project Title:	Testing replacement of fishmeal and fish oil in <i>Seriola riviola</i> diets with soy-based protein and oil
Organization:	University of Nebraska-Lincoln
Principal Investigator Name:	Tom Clemente

Project Status - What key activities were undertaken and what were the key accomplishments during the life of this project? Please use this field to clearly and concisely report on project progress. The information included should reflect quantifiable results (expand upon the KPIs) that can be used to evaluate and measure project success. Technical reports, no longer than 4 pages, may be included in this section.

In 2017 the program conducted a grow-out feeding trial, wherein the 40% SPC formulation was prepared by a commercial feed mill, Ziegler Bros., employing a finishing feed approach wherein the formulated pellets were coated with 90:10 ratio, omega-3 enriched soybean oil (stearidonic acid): fish oil, with the finishing feed used during the final 30 days of growth, where the ration was flipped and 90% of the oil coating consisted of fish oil and 10% omega-3 enriched soybean oil. The outcome mirrored our early feeding trials with this formulation, feed conversion solid, and growth rates comparable to the commercial feed. However, there was an observed a slight reduction in feed consumption, which was attributed to the fish oil source, Alaskan Pollock oil, which previous formulation used anchovy oil.

The original approach was to investigate potential to get regulatory approval for aquafeed use of the omega-3 oil enriched product from Monsanto designated SoyMega™, given the success in its use in oil blends with Kampachi. However, due to multiple factors, this avenue was disbanded and the program is targeting the incorporation of high oleic acid soybean oil in blends with fish oil. The rationale being such a formulation would have all feed ingredients are readily available on the market.

In 2017 the program also evaluated the inclusion of an algal ingredient inclusion (Heliae) in a SPC recipe that incorporates 48.5% SPC in the diet. Our group previously successfully tested such a diet with Kampachi in 2013, using two different algal inclusion pastes. The outcome of this evaluation revealed that lack of palatability with the revised 48.5% SPC diet with the new algal paste.

The final activity that occurred during 2017 was the continuation of the development of an algal feedstock to complement our 48.5% SPC formulation. To this end culturing efforts targeted the design of media recipes that would maximize growth without compromising omega-3 oil accumulation or taurine synthesis (two critical aquafeed ingredients) in the cell of our target algae Tetraselmis. Secondly, we are continue with our selected genetic engineering of this algae as a means to boost its capacity to synthesize taurine co-product, a key ingredient in finfish diets formulation with high levels of plant-based protein sources.

Did this project meet the intended Key Performance Indicators (KPIs)? List each KPI and describe progress made (or not made) toward addressing it, including metrics where appropriate.

Over the course of 2017 this program met KPI associated with the target to secure a private feed mill preparing the 40% SPC formulation in a grow-out trial with Kampachi. However, as stated above, further pursuing of a securing aquafeed use of a stearidonic acid enriched soybean, currently de-regulated for human use, SoyMega™, has been put on hold. The KPI targeting the formulation of a marine-free aquafeed suitable for Kampachi through inclusion of algal paste, and increasing SPC levels to 48.5% was addressed using a proprietary algae from Heliae. In our earlier 48.5% SPC formulation using a Tetraselmis strain as the major algal inclusion the growth performance of Kampachi was excellent, but the cost of the algal component needs to be reduced. Hence, the rationale for the evaluation of an alternative algae for the 48.5% SPC formulation. As communicated above the inclusion of the Heliae algal ingredient impacted palatability of the feed. Thus the KPI targeting optimizing of culturing conditions and genetic

improvements for Tetraselmis as a means to enhance its attractiveness in the 48.5% SPC formulation through cost reduction by focusing on maximizing its potential to synthesize two key ingredients, omega-3 fatty acids and taurine.

Expected Outputs/Deliverables - List each deliverable identified in the project, indicate whether or not it was supplied and if not supplied, please provide an explanation as to why.

- Demonstration of a commercial feed mill production of the 40% SPC diet was suitable for Kampachi performance in a grow out trial. This outcome will impact acceptability of the SPC diet by the commercial formulators and aid in the translating this diet for commercial production.

Describe any unforeseen events or circumstances that may have affected project timeline, costs, or deliverables (if applicable.)

What, if any, follow-up steps are required to capture benefits for all US soybean farmers?
Describe in a few sentences how the results of this project will be or should be used.

Research and outcomes on usage of ingredients derived from terrestrial-based feedstocks to displace fish meal and fish oil in aquaculture will need to be effectively communicated and tested in partnership commercial feed mill formulators to aid in the translation of these improved formulations to the aquaculture industry. For this reason, it might be wise to consider hosting biennial gatherings of the soybean in aquaculture community with relevant private sector participation to help foster these communications.

List any relevant performance metrics not captured in KPI's.