



## Stress in Marine Fish

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We have given considerable attention to many aspects of our hatchery operations over the years. As we move from experimental scales of production to mass production levels, an understanding of stress in the culture system becomes even more critical. Typically when hatcheries are in operation for longer periods of time and the numbers of fish are increased, disease and other health issues (e.g., growth retardation) also increase. The best way to minimize the incidence of disease is through stress management.

During the culture process there are a variety of husbandry conditions that can induce acute and/or chronic stress in fish. These include rearing densities, lighting conditions, temperature, water quality perturbations, vibration, etc. In addition, handling events are an obvious source of potential stress, including sorting, grading, tagging, transport, and stocking. Defining baseline levels of stress under typical husbandry conditions is a first step in prioritizing where attention needs to be directed to minimize stress overall.

Baseline cortisol levels for white seabass being raised at HSWRI will be investigated under typical husbandry practices that cover a range of holding systems and associated environmental conditions. This includes sampling fish from intensive RAS tank systems as well as more extensive coastal cage systems. In addition to sampling from specific holding systems, we will sample fish before and after specific handling events in order to understand how high cortisol levels peak and what typical recovery times are. Prior to sampling, husbandry practices and environmental conditions for the target fish populations will be carefully documented. Information recorded during baseline testing will include fish age, tank type, fish density, food type and any handling procedures which may have influenced the population. Blood samples will be collected at each sampling point rapidly after capture (within 2 min, to obtain baseline cortisol concentrations). The blood plasma will be separated by centrifuge and aliquoted off for storage in a -80 C freezer. The samples will be stored until they are sent in for analysis at our diagnostic laboratories of our collaborators at CSULB. Comparisons of baseline cortisol levels will be made with those from manipulative studies.

This project seeks to accomplish the following objectives: 1) Measure baseline cortisol levels during typical culture practices to include various species, culture systems, ages and/or life stages of fish, handling and transportation techniques; 2) Evaluate the effects of specific culture variables on stress response using controlled manipulative experiments; 3) Use the USDA funding to leverage additional funding to expand the number of species, life stages, and culture variables we can evaluate; and 4) Disseminate results broadly to the U.S. aquaculture community through written publications and professional presentations.