



Assessment of a Marine Finfish Stock Enhancement Program in California

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Since 1986, scientists at Hubbs-SeaWorld Research Institute have been releasing cultured white seabass, *Atractoscion nobilis*, into the coastal waters of southern California in an effort to enhance depleted stocks of an important recreational and commercial fishery under the auspices of the Ocean Resources Enhancement and Hatchery Program (OREHP). As part of the responsible approach to assess the efficacy of these ongoing enhancement efforts, every fish is tagged internally in the cheek with a small, stainless-steel, coded wire tag (CWT). Each group of fish that is released has a tag with a unique code which enables investigators to identify the spawn date and culture history of the fish upon their recovery. Starting in 1988, sampling efforts were initiated to recover hatchery-reared white seabass (WSB) in order to assess their survival, movement, and the efficacy of the OREHP.

Fishery-independent sampling targets young fish, smaller than 71cm in length, by deploying multiple-mesh nets (2.4m deep by 45m length) overnight in embayments and nearshore coastal sites throughout the southern California Bight. Fishery-dependent sampling of both recreational and commercial fisheries targets fish larger than 71cm in length that are landed in U.S. and Mexican waters. Acoustic telemetry has been employed to identify rates of emigration from the release site, mortality, and predation of cultured WSB. Tag recoveries from the fishery-independent sampling have been used to construct quantitative models that estimate survival to the fishery according to the method and season of release.

More than 1.6 million hatchery-reared WSB have been released and over 1,800 of these fish have been recovered. Time at liberty has ranged from 1 day to 13 years with the farthest distance recovered from a release site at just over 300km. While some white seabass have been caught near their site of release several years later, others have been recovered over 280km away within 18 months after their release. A few individuals have moved from one bay to another along the mainland while others have been recovered at offshore islands and banks. Acoustic telemetry has shown that most cultured WSB emigrate from embayments during the first week after their release at night on ebbing tides. Quantitative models predict that survivorship to the fishery is greatest when cultured WSB are reared in a grow-out pen and released from March through November.

Cultured WSB can move moderate distances and survive for many years after their release. As an outcome of the quantitative model, the release strategies of the program are currently being modified to the fullest extent practicable. Achieving this goal will likely require modifications to current production plans, including broodstock management, as well as an increase in grow-out pen capacity. This quantitative assessment has also provided the ability to perform sensitivity analyses on variables such as size at release, and release method and season, to estimate the number of fish recruiting to the fishery under different scenarios. While dispersion was modeled and used to estimate mortality rates, it was based on data from the fishery-independent seasonal sampling methodology. In order to better understand how seasonal dispersal patterns may affect the mortality rates estimated by the model, HSWRI scientists are employing acoustic telemetry to study the movements of cultured WSB.

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