

# Research and Development of Marine Stock Enhancement in the US

## Background

Marine stock enhancement is the intentional release of cultured juvenile finfish and shellfish to increase the number of recruits to a recruitment-limited fishery or spawning stock.

Full and careful development of marine stock enhancement in the US would:

- Provide socioeconomic benefits by bolstering a multi-billion dollar recreational fishing industry that includes jobs in lodging, food service, transportation, fishing equipment, and other sectors (1, 2).
- Provide biological benefits to society by i) aiding stock recovery, ii) providing protection for endangered species, and iii) uncovering the natural ecology, life history and environmental requirements of valuable marine species.
- Provide an important source of marine-derived protein to meet increasing demand for seafood, reduce the massive seafood trade-imbalances, and provide health benefits to the US population.
- Provide a model for responsible stock enhancement by implementing the Responsible Approach (3, 4). Marine stock enhancement is accelerating around the world and in some countries on a massive scale (e.g., China, 5). Careful assessments of genetic and ecological risks currently lag far behind implementation in other countries, putting wild stocks and our seafood supply at risk.

The United States, through the Science Consortium for Ocean Replenishment and Enhancement (SCORE), is playing a key role in the responsible development of marine fisheries enhancement technology for use in rebuilding depleted wild stocks and boosting fishing opportunity by increasing fish available for harvest (6).



Institution	Species	State
Gulf Coast Marine Laboratory-USM	Spotted sea trout	MS
Hubbs Sea World	White sea bass	CA
Mote Marine Laboratory	Common snook	FL
University of New Hampshire	Winter flounder	NH
NOAA Fisheries	Lingcod	WA

## Progress

Over the past two decades, US research has developed methods to maximize benefits and avoid harmful practices that might contribute to collapse of domestic and foreign fish stocks (4). The US stock enhancement scientific community has had a major impact by:

- Increasing published quantitative assessments of enhancement effects;
- Critically examining and debating the efficacy of enhancement (e.g. 7, reviewed in 8);
- Developing and disseminating a responsible science-based approach to stock enhancement worldwide (3, 4);
- Documenting improved post-release survival of stocked marine fishes (9-14);
- Optimizing release strategies to improve economic efficiency of stocking (e.g. 15);
- Documenting enhancement impact on marine fishery landings (13-14, 16-18);
- Quantifying density-dependent interactions of stocked hatchery and wild fish in Hawaii and Florida and documenting evidence for increased production from stocking (19-20); and
- Developing new models for salmon in the Pacific Northwest to provide guidance for managing production and harvest of hatchery and wild populations (21).

The cautious, science-based approach to stock enhancement in the US has limited stock enhancement efforts to fairly small-scales.

## Future Needs

After two decades of careful research, stock enhancement programs in the US are ready to take the next step. There is a critical need for stock enhancement projects on larger ecological scales. Integration of enhancements with broader scientific, institutional, and fisheries-management perspectives will allow effective planning, implementing and evaluation of the next generation of enhancement programs (4). Increasing successful marine enhancements will require the resources to support:

- Expanding and optimizing research and production facilities to produce and monitor large numbers of fish necessary for large-scale enhancement;
- Greater awareness among all stakeholders of the issues, pitfalls, progress and opportunities in this field by Public officials who fund enhancement programs, so that they understand what it takes to develop an effective program or reform an existing one;
- Active adaptive management (22) to gauge the effectiveness of improving and managing fisheries systems in the face of uncertainty;
- Adapting the Responsible Approach (3, 4) to local circumstances; and
- Fostering further collaboration from leading scientists in disciplines directly related to stock enhancement (6, 23).

## References Cited

The references cited here are posted at <http://www.stockenhancement.org/usprograms/whitepaperrefs.html>

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