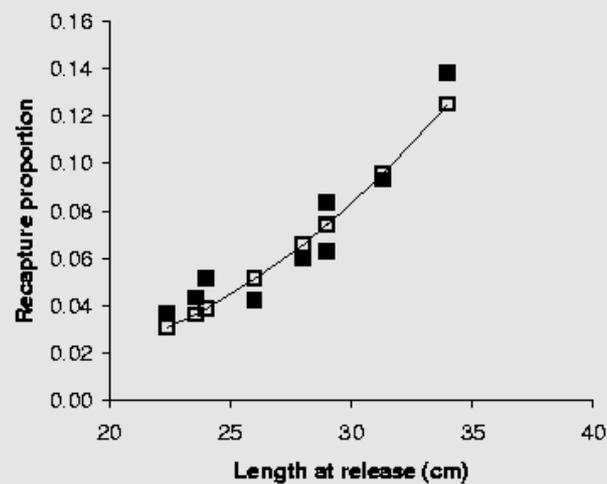




## Enhancefish

# Fisheries enhancement decision support tool and toolkit



## Project Brief

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## Introduction

Aquaculture-based fisheries enhancements aim to increase production or other benefits from fisheries through the release of hatchery reared fish into lakes, rivers or the coastal oceans. Developing enhancements requires more than the production and release of hatchery fish. Only certain fisheries can benefit from enhancements even in principle. Where enhancement can be beneficial in principle, careful management of hatchery production, release and harvesting regimes is often required for benefits to materialize. Usually this involves assessing and modifying not only the technical aspects of the fishery, but institutional arrangements, marketing etc. There are thus two important aspects to the assessment of development options for enhanced fisheries: gaining a holistic understanding of the enhancement system, and quantitative evaluation of management option.

The quantitative assessment of management options in enhanced fisheries poses particular problems, because the common stock assessment methods can not easily be used to assess fisheries based on hatchery releases. The purpose of the present project is to change this: to develop, test and promote a decision support tool and toolkit for aquaculture-based fisheries enhancements: **EnhanceFish**.

### What is **EnhanceFish**?

**EnhanceFish** is a methodology for the quantitative assessment of aquaculture-based fisheries enhancement. It can be used for example to

- Evaluate whether releases of hatchery fish are likely to increase yields in a fishery for which enhancement has been proposed
- Assess the likely impacts of releases on the wild stock of the target species where one exists
- Analyse data from release experiments to estimate population parameters
- Identify optimal release and harvesting regimes for

The **EnhanceFish** toolkit has three components:

- (1) The **EnhanceFish** tool, a software package. It contains a mathematical population model for enhanced fisheries and is used to carry out the quantitative analyses.
- (2) The **EnhanceFish** manual, which explains the principles underlying the **EnhanceFish** model and assessment methods. It also provides guidance on the practical use of the tool, including worked examples.
- (3) The **EnhanceFish** guide, which provides guidance on how to link the quantitative analyses supported by **EnhanceFish** to management and development of enhancements.

### Who should use EnhanceFish?

**EnhanceFish** is designed for use by fisheries and other natural resources professionals including for example government officers, NGO staff or development consultants. Normally such professionals should interact closely with relevant stakeholders before, during and after the quantitative analysis. Use of **EnhanceFish** requires understanding of some basic concepts of fish stock assessment, which are outlined in the manual. It does not require specialist knowledge of mathematical skills.

## What is the scientific basis for *EnhanceFish*?

Underlying *EnhanceFish* is an extended 'dynamic pool' fisheries model with explicit representation of size-dependent mortality, density-dependence in the recruited phase, and differences in population parameters of wild and stocked population components. *EnhanceFish* provides empirical distributions of key parameters to allow prognostic evaluations, and conduct risk assessments. Much of the science underlying *EnhanceFish* has been supported by the DFID Fisheries Management Science Programme. All key results have been published in the scientific literature (see the reference section at the end of this briefing).

## How can I get involved

*EnhanceFish* is currently under development. Preliminary ('beta') versions of the software, manual and guide will become publicly available in September/October 2005. If you are interested, please download the software, and use it to analyse a fishery you are working on (or simply try out the worked examples). Please let us know your comments and ideas!

A training workshop on *EnhanceFish* will be held in September/October 2005. The workshop will start with an electronic discussion during which participants will work to gain a holistic understanding of an enhancement system they are working on. This will be followed by a one-week residential course in Bangkok, during which participants will learn to use *EnhanceFish* to conduct quantitative analyses and translate these into management advice.

## Where can I get further information?

For further information and downloads please visit the *EnhanceFish* web site:

<http://www.aquaticresources.org/enhancefish.html>

### Key contacts:

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## Further reading

The following publications describe key aspect of the science underlying **EnhanceFish**;

Lorenzen, K. (in press) Beyond recapture rates: using a size-dependent mortality model to gain management information from release experiments. *Fisheries Research*

Lorenzen, K. (2005) Population dynamics and potential of fisheries stock enhancement: practical theory for assessment and policy analysis. *Philosophical Transactions of the Royal Society B*. 360: 171-189.

Lorenzen, K. & Enberg, K. (2002) Density-dependent growth as a key mechanism in the regulation of fish populations: evidence from among-population comparisons. *Proceedings of the Royal Society B* 269: 49-54.

Lorenzen, K. (2000) Allometry of natural mortality as a basis for assessing optimal release size in fish stocking programmes. *Canadian Journal of Fisheries and Aquatic Sciences* 57: 2374-2381.

Lorenzen, K., Juntana, J., Bundit, J. & Tourongruang, D. (1998) Assessing culture fisheries practices in small water bodies: a study of village fisheries in Northeast Thailand. *Aquaculture Research*. 29: 211-224.

Lorenzen, K., Xu, G., Cao, F., Ye, J. & Hu, T. (1997) Analysing extensive fish culture systems by transparent population modelling: bighead carp, *Aristichthys nobilis* (Richardson 1845), culture in a Chinese reservoir. *Aquaculture Research* 28: 867-880.

Lorenzen, K. (1996) The relationship between body weight and natural mortality in fish: a comparison of natural ecosystems and aquaculture. *Journal of Fish Biology* 49: 627-647.

Lorenzen, K. (1996) A simple von Bertalanffy model for density-dependent growth in extensive aquaculture, with an application to common carp (*Cyprinus carpio*). *Aquaculture* 142: 191-205.

Lorenzen, K. (1995) Population dynamics and management of culture-based fisheries. *Fisheries Management and Ecology* 2: 61-73.