

# Modelling approaches: Support to BFT Stock Assessment

## Statistical conversion of catch-at-size to catch-at-age

Alberto Murta<sup>1</sup>, José Francisco Loff<sup>2</sup>

<sup>1</sup> Instituto Português do Mar e da Atmosfera (IPMA), amurta@ipma.pt

<sup>2</sup> JFL - Consultoria Estatística, jfloff@phistat.com

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## 1 Introduction

As agreed by contract ICCAT-GBYP 03/2012a, JFL - Consultoria Estatística and Instituto Português do Mar e da Atmosfera (IPMA), developed software to allow for the statistical conversion of catch-at-size data to catch-at-age, under the form of an R package.

This document details the tasks performed, as per the aforementioned contract, and is complemented by the draft version of a paper and by the software package itself.

## 2 Tasks

### 2.1 Review

A review on the available methods for estimating catch-at-age data from catch-at-size information was performed, focusing on two main groups: those based on the classic Age-Length Key (ALK) method - for which the ALKs produced can only be applied to the same population from which the catch-at-size samples were drawn - and those based

on the inverse ALK method, which don't have this restriction. A total of 7 methods were considered, and are described on the paper that accompanies this document.

## **2.2 Implementation**

All but one of the 7 methods were implemented as R functions and integrated as a R package. All functions were thoroughly documented and include examples of usage.

## **2.3 Simulated data set**

A data set was generated from real data, simulating the age/length structure of two different fish populations. A total of 1000 bootstrap samples were drawn from one of these simulated populations, thus simulating the usual method of using a small subset of fish for ageing (e.g. by otolith reading). This resulted in a population for which some age/length data was known and another for which only catch-at-size information was available, and was the basis for evaluating the performance of the implemented algorithms. The data-generation procedure is documented in the accompanying paper.

This data was included on the R package and also thoroughly documented, making it possible for the package's end-user to test it and run the examples included in the package's documentation.

## **2.4 Comparison of methods**

The 1000 bootstrap replicates referred in the previous section were used to test all the implemented methods, producing 1000 estimates of 48 parameters per method. These parameters were compared with those of the sampled population, and its mean squared errors (MSE) calculated. These MSE were then compared across methods.

In order to compare the ALK methods with a common catch-at-size to catch-at-age conversion method, the age-slicing method was also implemented as a R function and

included in the package. This method was also applied to the simulated populations, and compared alongside the others.

The details of this comparison, its results and its discussion are also part of the paper that accompanies this document.