

# ICES WKCOST REPORT 2010

ICES ADVISORY COMMITTEE

ICES CM 2010/ACOM:42

## Report of the Workshop on implementation of the Common Open Source Tool (COST)

13–16 April 2010

Nantes, France



**ICES**

International Council for  
the Exploration of the Sea

**CIEM**

Conseil International pour  
l'Exploration de la Mer

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## Executive summary

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31 participants from 15 countries attended the meeting, bringing 15 case studies to be analysed by COST. It is to be noticed that not all countries brought case studies, because of problems in exporting their datasets or inconsistencies with the information required for the importation to the COST data structure.

The agenda of the meeting was divided into periods of presentation immediately followed by practical sessions.

The Bayesian approach and the simulation package were presented. The simulation package is a tool for validating and optimising the sampling strategies. As such, the tool is developed and available, but the considerable work of validation and optimisation remain to be done, and this is not reserved to the COST team.

During the discussion on the tool, its use and future developments, a lot of recommendations were made, among which:

- Improve the documentation of the methods in the help files and in the user manual;
- Improve and create error messages, everywhere they are too generic;
- Continue debugging the code;
- Extend the Bayesian package to other sampling strategies;
- Maintain the mailing list;
- Make the tool user friendly;
- Create a FAQ section;
- Validate thoroughly the proposed precision methods;
- Create templates for processing data;
- Include survey data and calculation of abundance indexes/

The majority of these recommendations argue in favour of a COST 2 project.

More pragmatic and small changes were suggested and noted for an implementation in 2010. These changes will be listed in the WKCOST report, and a message will be given to all COST users when new releases of the packages will be available.

It is recalled that the procedure to subscribe to the COST users mailing list is to fill the form on this website <https://lists.berlios.de/mailman/listinfo/cost-project-users>

In conclusion, out of the 15 case studies analysed during the session, all of them succeeded in the importation, exploration, validation and consolidation of the datasets, 12 succeeded in estimating a length and age structures, 7 succeeded in estimating biological parameters and 6 succeeded in estimating discards volumes. The decreasing figures are mainly due to the unavailability of the relevant data for the estimation.

## 1 Opening of the meeting

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The meeting was held in the premises of Ifremer Nantes, from 13 to 16 April 2010, and was chaired by Joël Vigneau, coordinator of the COST project.

31 participants (list in annex 1) from 15 countries attended the meeting, bringing different case studies to be analysed by COST.

## 2 Adoption of the agenda

---

The terms of references of the workshop included (i) a presentation of the COST R bundle, (ii) practical sessions for using the different methods developed, and (iii) reflections on a COST potential expansion.

The agenda of the meeting was divided into periods of presentation immediately followed by practical sessions. With this way of doing, the following topics were addressed:

- Importation of datasets;
- Searching for outliers and errors, spatial exploration;
- Stratification and recoding;
- Choosing the appropriate raising method and estimating discards;
- Raising length and age structures and exporting the results;
- Estimating biological parameters.

The Bayesian approach and the simulation package were presented by Dorleta Garcia (leader of the COST simulation package). The simulation package is a tool for validating and optimising the sampling strategies. As such, the tool is developed and available, but the considerable work of validation and optimisation remain to be done, and this is not reserved to the COST team.

The agenda of the meeting is presented in Annex 2. The agenda was approved by the group.

## 3 Background and scientific justification

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The training workshop on COST tools was proposed by PGCCSBS (ICES, 2009). The scientific justification was that issues about quality assurance are included in the current MoU between EC and ICES committing ICES to communicate any problems regarding data collected under the DCF Council Regulation (EC) No 199/2008 and EC Decision 2008/949/EC, and be responsible about the quality control of the aggregated data used for assessment. As part of this quality assurance, the approach proposed by PGCCDBS is based on a set of quality indicators computed for each parameter available for stock assessment. Three indicators are proposed (ICES CM 2007/ACFM:09): compliance with protocols, coverage of the sampling achieved and precision of the estimates. These quality indicators are under development in ICES within two dedicated workshops, WKACCU in 2008 that has dealt with the first two indicators and WKPRECISE in 2009 that has dealt with the last one.

## 4 Training session

### 4.1 Presentation of COST tool

The European project COST (<http://wwz.ifremer.fr/cost>) financed through the call for proposal FISH/2006/15 – lot 2, has developed R packages dedicated to raising and estimating statistical properties of data used for assessment. As such, COST is an open source tool, integrating all the needs identified for the preparation of data for stock assessment, once the data has been collected. These needs include

- 1) quality checks, exploratory analysis and validation of datasets as suggested by WKACCU
- 2) analysis of the stratification and possibility to re-stratify the dataset in relation to the demand, as required by the DCF i.e. merging métiers, areas (see proposal for WKMERGE).
- 3) raising procedures and precision estimates for
  - a) volume of discards (following closely the recommendations of the ICES WKDRP, 2007)
  - b) length and age structures of catches and landings
  - c) biological parameters such as mean weight at length/age, maturity at length/age and sex-ratio at length/age

Variances are estimated for each estimate, i.e. for every length and age classes in each of the strata. The WKPRECISE (ICES 2009b) validated the precision indicator for each of the parameters proposed by COST.

COST has been designed to be used by responsible of field sampling for validating and optimizing their sampling plan, and to be used by stock coordinators for the preparation of data for stock assessment. To that aim, COST includes exportation methods to FLR and to InterCatch. The use of COST tools by the largest number of scientists is to be promoted, although much caution must be brought to the efficiency of the training workshop.

The status of the different COST packages, at the moment of the WKCOST is presented in the table below (excerpted from the COST website).

## COST Project

- Home Page
- Cost Project
- Software / Packages
- Documentation

### Packages

Standard Data Exchange Format :[ICES CRR 296](#)

The following packages are developed upon R version 2.8.1 and have been tested successfully upon R version 2.9.0, 2.10.0 and 2.10.1

Name of the package	Package (Windows version)	Package (Linux version)	Status	Responsibility	CVS	Help pages	Updated
Core package	<a href="#">COSTcore</a>	<a href="#">COSTcore</a>	1.3-8	Ernesto Jardim	<a href="#">COSTcore</a>	<a href="#">Download</a>	09/04/10
Exploratory Data Analysis	<a href="#">COSTeda</a>	<a href="#">COSTeda</a>	1.3-6	Mathieu Merzéréaud	<a href="#">COSTeda</a>	<a href="#">Download</a>	09/04/10
Design-based and frequentists models	<a href="#">COSTdbe</a>	<a href="#">COSTdbe</a>	1.3-6	David Maxwell	<a href="#">COSTdbe</a>	<a href="#">Download</a>	09/04/10
Bayesian models	<a href="#">COSTmbe</a>	<a href="#">COSTmbe</a>	1.1	David Hirst	<a href="#">COSTmbe</a>	<a href="#">Download</a>	31/07/09
Simulation	<a href="#">COSTsim</a>	<a href="#">COSTsim</a>	1.0	Dorleta Garcia	<a href="#">COSTsim</a>	<a href="#">Download</a>	30/07/09
Report	<a href="#">COSTreport</a>	<a href="#">COSTreport</a>	1.0	Mathieu Merzéréaud	<a href="#">COSTreport</a>	<a href="#">Download</a>	31/07/09

See the historical development of all the packages : [COST packages repository](#)

For running some examples, you may need to download [COSTdata](#)

### Tools

- [Sitemap](#)
- [PDF](#)
- [Links](#)
- [Print](#)

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## 4.2 Importation of datasets

This phase is considered as critical in using the COST tools. A number of participants failed to import their datasets in COST environment due to different problems. These problems are mainly due to missing information or inconsistencies with the information required for the importation to the COST data structure. In this case, the participants used example datasets provided by the COST team, but an internal reflection needs to be initiated within these countries to evaluate the causes and consequences of their difficulties.

It is recalled that FishFrame can export data in the required COST format therefore anyone able to upload data to Fishframe can then have their data exported into the COST format.

Recommendations for the improvement of the tool are

- Improve the documentation of the methods in the help files and in the user manual;
- Improve the error checking at the input phase. Make the error messages more readable/understandable;
- Create an "error base" and FAQ section, to create a list of problems encountered at the importation phase and appropriate solutions;
- A template for drafting a R script performing COST analysis is presented in Annex 4 and is highly recommendable to all users.

## 4.3 Searching for outliers and errors, spatial exploration

Some functions using R friendly user interface were implemented before the workshop in order to help participants exploring their datasets. These functions were seen as a nice way forward although they are not part of the package and are not described in the user manual. In order to progress on the easiness of use of the COST tools, these functions will be further tested and included in a future release of the package.

Recommendations for the improvement of the exploratory data analysis package are

- Improve the functions developed for the workshop and include them in the package;
- Improve the user manual for non experience people in R.;
- On the method for plotting the length samples (delta plot), it would be useful to look for unexpected sample weights, by calculating for each sample:

$$K = \text{sum}(\text{lenCls}^3 * \text{lenNum}) / \text{subSampWt}$$

this will give a rough 'condition factor' for each sample and is useful for identifying sample weights that are wrong. Just plot K for each sample in the same way that delta is plotted. This assumes allometric growth but this assumption is acceptable because only extreme outliers are sought.

- The method deltaCalc() uses the raised length distributions to calculate delta. An option could be to use the raw length distributions (and estimate the expected length distribution from the subsample weight) in this way it is possible to see the effect of the raising on the delta value.
- Reporting function for pdf output needs to be arranged.

#### 4.4 Stratification and recoding

In the COST data preparation process, the user must validate the datasets once explored and ensured there were no errors, and consolidate the datasets with the appropriate stratification. Consolidating the datasets is the ultimate phase before proceeding to the estimation. No specific recommendations were made on this issue.

#### 4.5 Choosing the appropriate raising method and estimating discards

COST has developed upon the ICES WKDRP (ICES, 2007) recommendations, which demand a certain number of tests before choosing the raising variable. Few participants could achieve a discards estimates because their datasets did not contain discards information or sufficient data to carry out the analysis.

Recommendation for the improvement of the design-based estimates package is

- improve the user manual in order to better explain what the functions do and how they do it: the different raising methods.

#### 4.6 Raising length and age structures and exporting the results

COST has developed methods to fill the gaps in the Age-Length keys, and this was subject to large part of practise and discussion. The participants expressed also the need to exactly understand the algorithms used for each of the methods. It was also found very confusing the number of methods to run in order to complete the output object.

Recommendations for the improvement of the design-based estimates package are

- An option should be added to use the multinomial model for filling the gaps in the ALK. For example, to predict the proportions at age for 250mm:

```
model=multinom(age~lenCls)
```

```
predicted=predict(model,data.frame(lenCls=250),type='probs')
```

- improve the user manual in order to better explain what the functions do and how they do it: the different raising methods.
- Include all methods for estimating variance, CVs and confidence intervals into the raising method; so that the user runs only one method which fits for all;
- Develop a function to calculate CVs analytical or by bootstrap according to the requirements of the technical report (TR). With the current method of creating db-objects for each species and each method, the calculation of CVs for the TR tables III\_E\_3 is very tedious. Instead of using db-objects to calculate precision, a unraised just using sampling data (cs), a method designed especially for this purpose would be desirable;
- Make template for processing data as COST has the flexibility to allow users to implement their procedures in various manors. If they still wish to do this then they can continue in this manor but it would be clear they are working outside the preferred norms.

#### 4.7 Estimating biological parameters

Like discards, few participants could run these methods on their datasets due to the non availability of this information in their datasets. Examples from the project were run, and one recommendation was made :

- Develop funtion to calculate mean length@ age and related precision.

#### 4.8 Modelling

The model-based estimates package was presented by Dorleta Garcia (leader of the simulation package in the COST project) and no practical session was planned due to the specific nature of the data and sampling strategy necessary to run the methods. Given the potential of the methods, participants recommended that

- further development should consider the most common strategies used in Europe, like the use of age-length keys.

### 5 Discussion

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A free and anonymous survey was carried out on the workshop, participants' expectations and ranking of the success of the meeting to meet the expectations, on a range from 1 to 5, depending on R knowledge and COST experience (one range from 0 to 2). The result is given below.

Rating COST experience	R Knowledge			Total Résultat
	0 – Low	1 – Medium	2 – High	
0 – No experience	3	3.5	3	<b>3.09</b>
1 – Some experience	2.5	3.67		<b>3.38</b>
2 – Good knowledge			4.33	<b>4.33</b>
<b>Total Résultat</b>	<b>2.9</b>	<b>3.63</b>	<b>4</b>	<b>3.36</b>

The progression of the rating is clear on both the COST experience and R knowledge, meaning that the more experienced was the participant the more beneficial was the formation. This is not surprising result, but this militates for (i) the improvement of the manuals, help files and error messages as recommended for a COST 2 project, and (ii) a differentiation of the course in sub-groups if there were another workshop on COST.

In conclusion, out of the 15 case studies analysed during the session, all of them succeeded in the importation, exploration, validation and consolidation of the datasets, 12 succeeded in estimating a length and age structures, 7 succeeded in estimating biological parameters and 6 succeeded in estimating discards volumes. The decreasing figures are mainly due to the unavailability of the relevant data for the estimation.

### 6 Recommendations

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Discussions on how to improve the software occurred on every occasion during the meeting. Some of these recommendations will be implemented during the summer, with the objective of proposing new versions of packages for September 2010. Other recommendations cannot be implemented shortly and have to be planned for a future project or continuation of the COST project. The two following sections detail those recommendations to be implemented shortly and in the long run, respectively.

Among the participants, it was a consensus that the help files and user manual needed to be improved and that error messages should be more explicit, if COST was

to be more widely use. This is the reason why some review will be done shortly to address the most obvious drawbacks, but only a new project can deeply review these documents and packages.

## 6.1 To be implemented shortly

Recommendations that may be implemented shortly relate to

- the better integration of the functions developed in preparation of the workshop (see section 4.3);
- the inclusion of the methods for calculating the variances, CVs and confidence intervals as part of the raising methods (see section 4.6);
- calculation of CVs without raising (see section 4.6);
- the addition of options in the delta method (see section 4.3);
- the possibility to use the multinomial model for filling gaps in ALK (see section 4.6);
- estimation of mean length at age and precision (see section 4.7);
- Review of the user manual, with a special focus on clear steps to be followed by beginners;
- Inclusion of templates used for the workshop in the COST website.

## 6.2 For the long-run

Recommendations that will need more expertise and development time relate to the

- Improvement of the documentation of the methods in the help files and in the user manual;
- Improvement and creation of error messages, everywhere they are too generic;
- Continuation of debugging the code;
- Extension of the Bayesian package to other sampling strategies;
- Maintenance of the mailing list;
- Making the tool user friendly;
- Creation of a FAQ section;
- Thorough validation of the proposed precision methods;
- Inclusion of survey data and calculation of abundance indexes.

These recommendations all argue in favour of a COST 2 project.

It is recalled that the procedure to subscribe to the COST users mailing list is to fill the form on the following website <https://lists.berlios.de/mailman/listinfo/cost-project-users>

## 7 References

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- ICES 2007. Report of the Workshop on Discard Raising Procedures (WKDRP). 6–9 February 2007, Spain. ICES CM 2007 ACFM:06. 57 pp.
- ICES 2008. Report of the Workshop on Methods to Evaluate and Estimate the Accuracy of Fisheries Data used for Assessment (WKACCU). 27–30 October 2008, Bergen, Norway. ICES CM 2008\ACOM:32. 40 pp.
- ICES 2009a. Report of the Planning Group on Commercial Catches, Discards and Bio-logical Sampling (PGCCDBS), 2-6 March 2009, Montpellier, France. ICES CM 2009/ACOM:39, 160 pp.
- ICES 2009b. Report of the Workshop on methods to evaluate and estimate the precision of fisheries data used for assessment (WKPRECISE). 8-11 September 2009, Copenhagen, Denmark. ICES CM 2009/ACOM:40. 43 pp.
- ICES 2010. report of the Workshop on methods for merging metiers for fishery based sampling (WKMERGE). 19-22 January 2010, Copenhagen, Denmark. ICES CM 2010/ACOM:40. 100 pp.

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## Annex 2: Agenda

---

### Tuesday 13 April

9:00 – 10:00: Welcome, network arrangement, practicalities,

10:00 – 13:00: Presentation of the COST libraries: Overview of the project.

Presentation of COSTcore: data structure, Importation of datasets.

=> Practical session: Bringing all participants to the importation of their own dataset

14:00 – 18:00: Presentation of COSTeda (exploratory data analysis). Searching for outliers and errors, spatial exploration.

=> Practical session : data exploration.

### Wednesday 14 April

9:00 – 10:30: Participants case studies comments and analysis.

10:45 – 13:00: Presentation of COSTcore: Stratification and recoding.

=> Practical session: preparing datasets for the estimation.

14:00 – 18:00: Presentation of COSTdbe (design-based estimates). Choosing the appropriate raising method and estimating discards.

=> Practical session: Discards estimates.

### Thursday 15 April

9:00 – 10:30: Participants case studies comments and analysis.

10:45 – 13:00: Presentation of COSTdbe: raising length and age structures (with or without the use of Age Length Keys). Exportation of the estimates to InterCatch, FLR, csv tables.

=> Practical session: Estimating length and age structures

14:00 – 16:00: Practical session (continued)

16:15 – 18:00: Presentation of COSTdbe: Estimating biological parameters.

=> Practical session

### Friday 16 April

9:00 – 10:30: Participants case studies comments and analysis.

10:45 – 12:00: Presentation of modelling possibilities with COSTmbe. Presentation of simulation possibilities with COSTsim

12:00 – 13:00: general discussion on COST: usage, difficulties, ideas for the future,

14:00 – 17:00: Practical session: more comments and more analysis of participants case studies.

17:00: End of the workshop.

### Annex 3: Template for drafting a COST script

---

```

#           TITLE OF THE ANALYSIS
#
# SPECIES .....:
# METIER(S) .....:
# AREA(S) .....:
# YEAR(S) .....:
#
# USER(S) .....:
# -----
#
# INSTITUTE / LAB.....:
# DATE .....:
# EXPERT / TEAM .....:
#
# -----
#
# COST tools specifications
# R version .....:
# COSTcore version .....:
# COSTeda version .....:
# COSTdbe version .....:
# COSTmbe version .....:
# COSTsim version .....:
#
# -----

library(COSTcore)
library(COSTeda)

path <- "."
setwd(path)

# ----- A : IMPORTATION OF THE DATASET -----
#
# ----- B : EXPLORATORY ANALYSIS -----
#
# ---- B.1 : Subsetting the dataset -----
#
# ---- B.2 : Exploratory graphs -----
#
# ---- B.3 : Validating the dataset -----
#
# ---- B.4 : Reporting -----
#
# ---- B.5 : Mapping -----

```

```

#

# ----- C : STRATIFICATION -----
#
# ---- C.1 : Exploratory graphs -----
#

# ---- C.2 : Definition of the stratification -----
#

# ---- C.3 : Consolidating the dataset -----
#

# ---- C.4 : Reporting -----
#

# ---- C.5 : Mapping -----__
#

##### END OF EXPLORATORY ANALYSIS #####
# Save the consolidated objects and strata definition in a R object
# Load the R object                <----- Possibility to (re)start the
analysis from here

setwd(".")

library(COSTdbe)
library(COSTmbe)
library(COSTsim)

# ----- D : ESTIMATION -----
#
# ---- D.1 : Creation of the COST output object -----
#

# ---- D.2 : Proceeding to the estimations -----
#

# ---- D.3 : Plots of the results -----
#

# ----- E : ORGANISATION OF THE RESULTS -----
#
# ---- E.1 : Aggregating to upper levels -----
#

# ---- E.2 : Exportating the results -----
#

# ---- E.3 : Saving the R objects -----
# Save the consolidated objects, output objects and strata definition in a R object

```

## Annex 4: Recommendations

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<b>RECOMMENDATION</b>	<b>FOR FOLLOW UP BY:</b>
1. Update the COST packages and refresh the user manual and help files	Joël Vigneau and all COST package leaders.
2. Update the COST website with the workshop tutorials	Joël Vigneau
3. Reflect on a financial channel for a COST 2, a maintenance and debugging team	European Commission and all European Member States
4. Further development on methods and deliverables, maintenance and debugging	COST 2