EURO-BASIN
BASIN SCALE ANALYSIS, SYNTHESIS AND INTEGRATION

SEVENTH FRAMEWORK PROGRAMME THEME 6 Environment

Collaborative project (Large-scale Integrating Project)

Project no: 246 933

Project Acronym: EURO-BASIN

Project title: European Basin-scale Analysis, Synthesis and Integration

Deliverable 1.7 Report and delivery of consolidate historical data to provide spatially explicit estimates of stocks sizes, structure, biomass and diet of Tuna in the North Atlantic

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Actual submission date: 20.02.2013
Organisation name of the lead contractor of this deliverable: UniHB, Stéphane Pesant

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Project Coordinator: Michael St John, DTU Aqua

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Dissemination Level		
PU	Public	X
PP	Restricted to other programme participants (including the Commission)	
RE	Restricted to a group specified by the consortium (including the Commission)	
CO	Confidential, only for members of the consortium (including the Commission)	

Deliverable 1.7 Report and delivery of consolidated historical data is a contribution to **Task 1.3.7: Consolidate historical data to provide spatially explicit estimates of stocks sizes, structure, biomass and diet of Tuna in the North Atlantic**

Executive Summary:

CLS extracted fishing data for North Atlantic Albacore from ICCAT database (http://www.iccat.es/en/accesingdb.htm). With the assistance of AZTI and other colleagues at ICCAT and IRD, a first definition of albacore fisheries was achieved and fishing data, i.e., catch, effort, and size frequency, were rewritten in the text format used with the spatial ecosystem and population dynamics model SEAPODYM after a careful data screening. These files were then uploaded in the PANGAEA repository site with format information and maps and plots providing an overview of distributions and statistics. These spatially-disaggregated fishing data are used to run simulation experiments with SEAPODYM to optimize the model parameter and estimate spatial dynamics of albacore biomass by life stage (juvenile immature and mature fish) over the historical industrial fishing period (1960-2010). This is the first time that Atlantic tuna fishing data are used at a high spatial resolution to optimize a population dynamic model, and quickly this first analysis showed several inconsistencies in the data. A long series of exchanges with colleagues involved in ICCAT tuna assessments allowed a revision of the fisheries definition that will be uploaded on PANGAEA to replace the first version. There are currently ongoing optimization experiments with SEAPODYM to update the results on the estimate of dynamics of Atlantic albacore tuna over the last 50 years under the influence of both climate and fishing.

Relevance to the project & potential policy impact:

The aim of data archaeology tasks (T1.3.x) is for EURO-BASIN partners to harmonise their data and archive them at PANGAEA, bringing them into Open Access so that the broader scientific community can benefit from integrated, quality-checked datasets. Each of the data archaeology task (T1.3.x) is relevant to research activities in other Work Packages (see Table below). The present deliverable is directly relevant to research activities in Work Package 5 "Living Resources".

Data Archaeology (WP1)	Data Analysis
T1.3.1 (literature review)	WP2 Biological Pump
T1.3.2 (sample re-analysis)	WP3 Biogeography
T1.3.3 (rescue)	WP4 Trophic Flows
T1.3.4 (rescue)	
T1.3.5 (sample re-analysis)	
T1.3.6 (rescue)	WP5 Living Resources
T1.3.7 (data re-analysis)	
T1.3.8 (data re-analysis)	

The main outcome of these data archaeology tasks (T1.3.x) is the publication of a special issue in the open-access, peer-reviewed journal Earth System Science Data, as a mean to disseminate the work to the scientific community. EURO-BASIN modeling activities can already benefit from a recent ESSD special issue about Global distributions of Plankton Functional Types (http://www.earth-syst-sci-data-discuss.net/special_issue9.html). Complementary to that special issue, EURO-BASIN will publish an important compilation of data about biogeochemical rates mediated by plankton, biogeography of key plankton species, and estimates of the size, structure, biomass and diet of key fish stocks in the North Atlantic Ocean. The special issue will be published in 2013, following a progressive submission/review process of 10 months, starting in March. The present deliverable will directly contribute to the EURO-BASIN special issue in ESSD, as part of the paper entitled "Spatially explicit estimates of stocks sizes, structure and biomass of Tuna".

Report:

ICCAT is the international fisheries management organisation in charge of tuna species for the Atlantic Ocean. Historical fishing data can be obtained from a public database (http://www.iccat.es/en/accesingdb.htm). Catch, fishing effort and length frequency of catch by various fisheries are used in stock assessment models to estimate changes in biomass and fishing impact. Current stock assessment models use only one or a very few large geographical region to estimates population dynamics parameters. The model SEAPODYM developed at CLS and used in EURO-BASIN is a spatially-explicit model describing the dynamics of tuna under the joint effects of environmental variability and fishing. Thus unlike standard stock assessment model, SEAPODYM uses spatially disaggregated fishing data in its parameter optimization approach. It requires the most homogeneous definition of fisheries with criteria characterizing fishing gear catchability, target species, fishing strategy, etc..

North Atlantic albacore fishing data were extracted by CLS from the ICCAT database and prepared to be used in the SEAPODYM model following a first definition of fisheries (Table 1; figure 1) in agreement with definition of fisheries used by ICCAT stock assessment working group as provided by AZTI. After a careful data screening, these files were uploaded in the PANGAEA repository site with associated files describing format distribution and basic statistics, and used for optimization in simulation experiments with SEAPODYM and to measure the fishing impact over the historical industrial fishing period (1960-2010) in the North Atlantic.

Table 1: Definition of fisheries for the North Atlantic albacore (E= effort; C= catch)

Fishery code	Country	Gear	Time Period	Catch unit / Effort unit	Nb of EC data	resolution
L1	Japan	LL	1971-2010	Nb / nb. hooks	2383	5
L2	Japan	LLHB	1980-2007	Nb / nb. hooks	4964	5
L3	USA	LL	1987-2010	Nb / nb. hooks	12425	1
L4	Venezuela	LL	1971-2010	Kg / nb. hooks	7763	1
L5	Vanuatu	LL	2004-2006	Nb / nb. hooks	2959	1
L6	Taiwan	LLFB	1971-2007	Kg / nb. hooks	4453	5
L7	Korea	LLFB	1974-2007	Kg / nb. hooks	1343	1
T8	France	TROL	1989-1990	Nb / nb. sets	5032	1

T9	France	MWTD	1989-1994	Kg / d. fishing	605	1
T10	USA	MWTD	1991-1995	Kg / d. fishing	320	1
G11	France	Gillnet	1989-1994	Kg / fishing hours	448	5
B12	Spain	BB	1975-2000	Kg / d. fishing	303	1
B13	[1]Venezuela	BB	1983-2010	Kg / d. fishing	386	1
S14	Venezuela	PS	1983-2010	Kg / d. fishing	724	1
[1] not used currently as there are very few and very localized data						

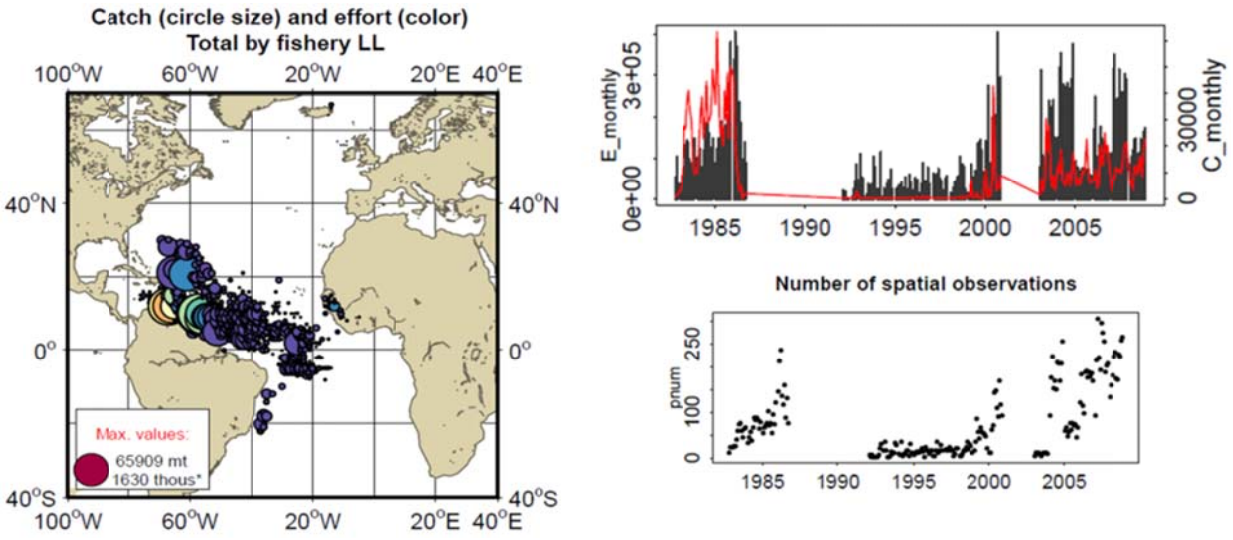

Figure 1: Example of maps and plots describing fishing data (E= effort; C= catch) by fishery, allowing to detect inconsistencies and mistakes (eg localisation of fishing effort on land).

During optimization experiments there were difficulties for the model to converge with plausible estimates of parameters defining habitat movement and population dynamics. Several inconsistencies were finally identified in the use and definition of fisheries. One of the most critical is that fishing effort on albacore decreased drastically in the early 1970s in the longline Asian fleets due to the introduction of monofilament longline fishing gear and a change in the target species, with bigeye tuna becoming increasingly fished in relation with the development of the sashimi market. Discussions with colleagues involved in ICCAT albacore working group allowed also to identify several series of missing data or existing higher spatial resolution for some fisheries that were not used because current standard stock assessment models do not use spatially-disaggregated data. Therefore, a revised definition of fisheries (Table 2) is now proposed and currently used in a second series of optimization experiments with SEAPODYM.

The best parameterisation achieved from the Maximum Likekihood Estimation approach is evaluated against fishing data, biological and ecological knowledge of the species and independent

biomass estimates. Then model outputs, ie monthly spatial distribution of biomass by age/size of albacore over the whole historical period 1960-2010 can be provided to other EURO-BASIN working groups for comparative analyses. If there is no other changes needed in the fisheries definition, this revised data set will be uploaded on the PANGAEA site and can be used by other colleagues as a reference spatially-disaggregated dataset of fishing effort and catch for other analyses or simulations.

This new approach and results will be also presented at the next ICCAT meeting of the albacore working group to demonstrate the interest of this approach for the study and management of Atlantic albacore tuna.

Table 2: Revised definition of fisheries for the North Atlantic albacore (E= effort; C= catch) to be used for SEAPODYM application

Fishery code	Country	Gear	Time Period	Catch unit / Effort unit	Nb of EC data	Resolution
L1	Japan	LL	1956-1972	Nb / nb. hooks	5481	5
L2	Japan	LL	1973-2010	Nb / nb. hooks	15734	5
L3	USA	LL	1987-2010	Nb / nb. hooks	69200	1
L4	Taiwan-SubTro	LL	1967-1986	Nb / nb. hooks	2527	5
L5	Taiwan-Tro	LL	1967-1986	Nb / nb. hooks	935	5
L6	Taiwan-SubTro	LL	1987-2007	Nb / nb. hooks	343	5
L7	Taiwan-Tro	LL	1987-2007	Nb / nb. hooks	514	5
L8	Korea	LLFB	196*-1979	Kg / nb. hooks	1928	1
L9	Korea	LLFB	1980-2007	Kg / nb. hooks	4495	5
T10	France	TROL	1989-1990	Nb / nb. sets	6289	1
T11	France	MWTD	1989-1994	Kg / Nb.Sets	605	1
B12	Spain	TROL	To be completed using AZTI non-official data			1
B13	Spain	BB	Anecdotical catch Not used			1
B14	Spain-CANARY	BB	1975-2010	Kg / Day at sea	110	1

Notes: Japanese LL (L1) contains 1281 records on 1deg resolution and kg as C units, ALL with zero catch for ALB. They were neglected. Same problem for L2: 3822 records for 02JP00 flag (1deg and kg as C units), 3820 among them have C=0. This part of the data was not included. Two records (one in 1977 and another in 1983) with nonzero catches (1800 and 25100 correspondingly) are not included either. Korean (L9) and French data (T11) have wrong QuadID in 2010, which puts the data on land. Very likely should give West and not East. French trawl (T11) has 1048 records: 302 with D.Fishing; 605 with Nb.Sets and 141 with D-at-sea effort units. They cannot be combined within a single fishery Spanish-Canary (B14) fishery has 430 records: 320 have no effort unit, 110 have Days-at-sea

PANGAEA Data Archiving & Publication PDI-3123

EuroBASIN - Task 1.3.7 Consolidate historical data to provide spatially explicit estimates of stocks sizes, structure, biomass and diet of Tuna in the North Atlantic

Details

Type:	Task	Status:	Open
Priority:	Major	Resolution:	Unresolved

Description

Responsible: CLS; Participants: DTU-AQUA and MRI-HAFRO
Start: Month 4; End Month 16.

Consolidate historical data to provide spatially explicit estimates of stocks sizes, structure, biomass and diet of Tuna in the North Atlantic.
Sources: ICCAT database and Trawl and acoustics data from ICES, DTU and MRI-HAFRO [supports T5.1 and T5.2]

Attachments

alb_catch_14f.txt	6.96 MB	2012-10-23 18:20
ALB_fisheries.pdf	58 kB	2012-10-23 18:25
alb_LF_14f.txt	1.27 MB	2012-10-23 18:20
NAtl-Albacore_FishingData.pdf	1.39 MB	2012-10-23 18:39

Activity

All | Comments | Work Log | History | Activity

Stephane Pesant added a comment - 2012-09-07 13:18

UPDATE from the 18 months report:

Some issues regarding data access have been identified and we expect a 6 months delay in deliverable D1.7. Albacore fishing data (catch, effort and size frequencies) will be retrieved directly from the ICCAT database (http://www.iccat.int/en/accesingdb.htm). This will require specific algorithms, but we expect no issue. Difficulties have been encountered in accessing acoustic data from the Atlantic. However, significant progressed was made in developing the approach to process these data, based on other work for the Pacific.

Estimates of abundance of potential prey species for Bluefin Tuna from historical catch data has been re-allocated to DTU due to a change in work tasks but due to staff availability cannot be done until 2013. ome issues regarding access to acoustic data have been identified. Collaboration with ICES working groups will be established to find rapid solutions. The targeted data should be for relatively recent time periods (e. g., from 1950s onwards) rather than historic. This is in line with the needs of WP5.

Spatial fishing data (catch, effort and size) of albacore tuna were obtained from ICCAT database and discussed with colleagues from AZTI (H Arrizabalaga) during two informal meetings in CLS Toulouse, and AZTI, Sukarrieta for the best definition of fisheries to be used in the model SEAPODYM. The spatially disaggregated data required a serious screening before to be used with the model.

A definition of 14 Atlantic albacore fisheries since 1970 at monthly 1° or 5° resolution, with corresponding size frequencies distribution at various resolution (1°x1° to 20° x 20°). These corrected files will be used for parameter optimization and validation. They can be provided to WP1.

Limited progress were achieved in acquisition of acoustic transect for the North Atlantic Basin. There is a need to identify the data owners in the BASIN partners. One issue is that we are looking for micronekton acoustic data, ie total abundance index while many acoustic cruises are targeting some key (exploited) species. Data needed are 38kHZ transects with signal (either Sv or NASC) binned by vertical depth layers (e.g. 10 or 20 m from surface to X m, hopefully deeper than 600 m) and averaged along the track with latitude and longitude as well as the UTC time.
One–year series from the MARECO station (IMR, Bergen) has been identified that can be used for preliminary data assimilation experiment.

Janine Felden added a comment - 2012-10-22 15:19

Hi Patrick,

as you have noticed I have assigned you now as reported for this task dealing with the EuroBasinTask 1.3.7 in our PANGAEA ticket system. Everyone (reported, assigned data curator and watchers on this issue) will be informed about any changes via automatic generated emails. As you have just received.

To access the issue, please use the link given above. After you have login to the system you can start updating any field and upload files (data; reports). For uploading files please us the "More Action" button and choose "Attach files". Please keep in mind you can add or update files any time. You only have to open the issue by using the link and start working.

We are looking forward to receive your data and report during the next days. Please do not hesitate to contact us again for any further questions.

Cheers,
Janine

Lehodey added a comment - 2012-10-23 18:20 - Restricted to Users

Fishing data files (catch effort and size frequency of catch) for the North Atlantic Albacore (1956-2010). Extracted from ICCAT database.

People

Assignee:
Janine Felden

Reporter:
Lehodey

Watching (4)

Dates

Due:
2012-11-01

Created:
2012-09-07 13:17

Updated:
2012-10-23 18:39