JRC Scientific and Technical Reports

Scientific, Technical and Economic Committee for Fisheries (STECF)

Report of the Sub Group on Management Objectives and Strategies (SGMOS 10-06). Part d) Evaluation of Multi-Annual Plan for hake and Nephrops in areas VIIIc and IXa.

18-22 OCTOBER 2010, VIGO

Edited by John Simmonds, Cristina Silva, Valentin Trujillo and Jose Maria Da Rocha Alvarez

EUR 24631 EN - 2010

JRC
EUROPEAN COMMISSION

ipsc
Institute for the Protection and Security of the Citizen

The mission of the Institute for the Protection and Security of the Citizen (IPSC) is to provide research results and to support EU policy-makers in their effort towards global security and towards protection of European citizens from accidents, deliberate attacks, fraud and illegal actions against EU policies

The Scientific, Technical and Economic Committee for Fisheries (STECF) has been established by the European Commission. The STECF is being consulted at regular intervals on matters pertaining to the conservation and management of living aquatic resources, including biological, economic, environmental, social and technical considerations.

European Commission
Joint Research Centre
Institute for the Protection and Security of the Citizen

Contact information
Address: TP 051, 21027 Ispra (VA), Italy
E-mail: stecf-secretariat@jrc.ec.europa.eu
Tel.: 0039 0332 789343
Fax: 0039 0332 789658

https://stecf.jrc.ec.europa.eu/home
http://ipsc.jrc.ec.europa.eu/
http://www.jrc.ec.europa.eu/

JRC 61946

EUR 24631 EN
ISBN 978-92-79-18745-2
ISSN 1831-9424
doi:10.2788/56371

Luxembourg: Publications Office of the European Union

Printed in Italy

TABLE OF CONTENTS

SCIENTIFIC, TECHNICAL AND ECONOMIC COMMITTEE FOR FISHERIES (STECF)

STECF COMMENTS ON THE REPORT OF THE SUB GROUP ON MANAGEMENT OBJECTIVES AND STRATEGIES (SGMOS 10-06). PART D) EVALUATION OF MULTI-ANNUAL PLAN FOR HAKE AND NEPHROPS IN AREAS VIIIC AND IXA.

STECF OPINION EXPRESSED DURING THE PLENARY MEETING (PLEN-10-02) HELD IN BRUSSELS, 8-12 NOVEMBER 2010

1. INTRODUCTION

STECF is requested to review the reports of the **SGMOS-10-06** Working Group of October 18 – 22, 2010 (Vigo) meeting, evaluate the findings and make any appropriate comments and recommendations.

When reviewing the SG-MOS 10-06b report, the STECF was asked to highlight limits faced when evaluating or assessing management options in terms of economic and social impacts. STECF will be also requested to suggest paths to reduce these limits, either by indicating possible assumptions which would be followed to make fisheries, metiérs and fleets matching better or by highlighting possible modifications to the list and to the level of aggregation of economic parameters listed in the DCF.

2. TERMS OF REFERENCE

The STECF (SG-MOS 10-06) is requested to

A) Evaluate the following plans:

1. Multi-annual plan for hake and Nephrops in ICES sub areas VIIIc and IXa
2. Multi-annual plan for cod in the Baltic

Following and taking into account *inter alia* the STECF framework specified in Annex C of SG-MOS 10-06a and WDs prepared by participants prior to the meeting. Separate reports should be prepared for each plan.

B) Provide an Impact Assessment of the following plans:

3. Multi-annual plan for sole in the Western Channel
4. Sole and plaice in the North Sea

by taking into account *inter alia*, the external report prepared by MRAG on assessing the impact for the revision multiannual plan for sole and plaice, WDs on sole and plaice prepared by IMARES, LEI, and WD prepared by CEFAS and Seafish on WC sole. The report should follow the STECF framework specified in Annex B of SG-MOS 10-06a. Separate reports should be prepared for each plan.

3. STECF COMMENTS AND CONCLUSIONS

Approach to the work

In line with the STECF process, described in the STECF-SGMOS 09-02 and STECF-SGMOS 10-01 WGs, STECF set up a scoping meeting SG-MOS 10-06a which was held in Copenhagen in June 2010. This group involved Commission staff, Observers and STECF experts. The scoping meeting produced a report (STECF-SGMOS 10-06a) which specified a series of work activities to be carried out before the October meeting. Following this Working Documents were prepared by participants for the main meeting which was held 18-22 October 2010 in Vigo, Spain. At this meeting there were 19 experts (6 economists and 13 biologists), Five Commission staff attended part time (including two from CFCA) and eight observers nominated by Baltic, NS, NWW and SWW RACs, Member States and ICES. The study group was open to observers throughout and their participation was regarded by the group as a particularly important part of this work. The working procedures were organised to facilitate observer participation by scheduling the presentation and discussion of topics on specific days to allow part time attendance if required. STECF is grateful for the input from observers.

Reports

In total five separate reports are prepared by STECF-SGMOS 10-06 WGs, the first, scoping meeting report STECF-SGMOS 10-06a was dealt with by the STECF summer plenary. The remaining four reports are deal with here:-

STECF-SGMOS 10-06b Report of the Impact Assessments for North Sea plaice and sole multiannual management.

STECF-SGMOS 10-06c Report of the Impact Assessments for Western Channel sole multiannual management.

STECF-SGMOS 10-06d. Report of the Evaluations of Southern hake and Nephrops Multi-annual plan

STECF-SG MOS 10-06e. Report of the Evaluations of Baltic cod Multi-annual plan

STECF provides below general comments and conclusions on this Evaluation the comments aspect of the ToR are included in the other reports (SGMOS 10-06b-e).

STECF Comments

Compliance: During the first four years of plan fishing effort and fishing mortality have been rather stable and not in line with plan expectations. Since 2005 hake landings have been higher than the recommended TAC and landings are now 2.2 times the TACs. This information suggests that the Southern hake recovery plan was not really enforced.

While regulated fishing effort has declined, operative effort (catch weighted effort) has increased as effort transferred to gears that catch more hake with the same effort.

Success of the plan : Southern Hake stock assessments from ICES show that there has been an increase in SSB, mostly derived from strong year classes entering in the

stock in 2005-2007. However, the F reduction from 2006 expected from the plan has not been achieved.

Failure to enforce the plan means that objectives of F reduction has not been achieved and $F=F_{msy}$ will probably not be reached by the intended date of 2015. In consequence, the plan is not succeeding in achieving its stated objectives.

The main elements of the plan have had the greatest influence in the failure to achieve the plans objectives are a lack of landing control and insufficient reduction of fishing effort in the fleets fishing hake and *Nephrops*.

Considerations for Impact Assessments

Linking this plan with catches of other future plans for other species caught within a variety of fisheries is an approach that would provide better economic understanding of the consequences of a plan. Management could consider more explicitly the contribution of each fleet for the fishing mortalities of the different species.

The current failure to achieve F reductions needs to be addressed if there is to be any expectation of success for such a plan in the future. Any revisions require an evaluation of future landings compliance and choice of effort reduction that is likely to be effective in reducing fishing mortality.

ANNEX 1 REPORT OF THE SUB GROUP ON MANAGEMENT OBJECTIVES AND STRATEGIES (SGMOS 10-06). PART D) EVALUATION OF MULTI-ANNUAL PLAN FOR HAKE AND NEPHROPS IN AREAS VIIIC AND IXA.

SUMMARY

THE SGMOS 10-06 met Copenhagen in June 2010 and produces a scoping plan for the Evaluation of the historic performance the hake and Nephrops plan. The group met again in Vigo between 18-22 October 2010 and prepared this report for the November 2010 plenary of STECF. Based on the evaluation carried out the group came to the following conclusions:-

Southern Hake stock assessments show that the expected F reduction according to the plan from 2006 has not been achieved. There has been an increase in SSB, mostly derived from strong year classes entering in the stock in 2005-2007.

Hake landings were always higher than the recommended TAC. During the first four years of plan implementation fishing effort and fishing mortality have been rather stable and far from plan expectations. This information suggests that the Southern hake recovery plan was not really implemented.

Failure to implement the plan means that the Objectives of the Common Fisheries Policy have not been reached and probably will not be reached by the intended date of 2015. In consequence, the plan is not succeeding in achieving its stated objectives.

The main elements of the plan have had the greatest influence in failing to achieve the objectives are a lack of landing control and insufficient reduction of effective fishing effort in the fleets fishing hake and Nephrops. TACs for hake have not been enforced; landings now exceed TACs by 2.2 times. While regulated fishing effort has declined, effective effort has increased as effort transferred to gears that catch more hake.

Linking this plan with catches of other future plans for other species caught within a variety of fisheries is an approach that would provide better economic understanding of the consequences of a plan.

After four years of the starting date of the Recovery Plan, the data and knowledge of the fleet behaviour have increased and, in the future, it would be possible to manage the fishery considering the contribution of each fleet for the fishing mortalities of the different species.

The current failure to achieve F reductions needs to be addressed if there is to be any expectation of success for such a plan in the future. Revisions require evaluation of landings compliance and effort reduction that is effective in reducing fishing mortality.

1. INTRODUCTION

This report is one of four reports prepared under SGMOS 10-06b, each dealing with a separate item on the ToR below. The work followed the plans from the Scoping meeting SGMOS 10-06a Copenhagen 7-11 June 2010. This report follows the structure defined by STECF which is given below in Annex A.

It forms a review of the practical implementation of the management plan considering the actions taken and measures implemented at the Member State level.

2. TERMS OF REFERENCE

The STECF (SG-MOS 10-06) is requested to

A) Evaluate the following plans:

1. Multi-annual plan for hake and Nephrops in ICES sub areas VIIIc and IXa
2. Multi-annual plan for cod in the Baltic

Following and taking into account *inter alia* the STECF framework specified in Annex C of SG-MOS 10-06a and WDs prepared by participants prior to the meeting. Separate reports should be prepared for each plan.

B) Provide an Impact Assessment of the following plans:

3. Multi-annual plan for sole in the Western Channel
4. Sole and plaice in the North Sea

by taking into account by *inter alia*, the external report prepared by MRAG on assessing the impact for the revision multiannual plan for sole and plaice, WDs on sole and plaice prepared by IMARES, LEI, and WD prepared by CEFAS and Seafish on WC sole. The report should following the STECF framework specified in Annex B of SG-MOS 10-06a. Separate reports should be prepared for each plan.

The scoping meeting is reported in SG MOS 10-06a. The Impact Assessments are dealt with in reports SG-MOS 10-06b and c and the Evaluation of Baltic cod in SG MOS 10-06e.

3. PARTICIPANTS

Name	Address	Telephone no.	Email
STECF members			
Willy Vanhee	Hospitaalstraat,8400,Oostende, Belgium	+32 59433083	wvanhee@pandora.be
External experts			
Heleen Bartelings	Alexanderveld 5 2585 DB The Hague	+31(0) 703358320	heleen.bartelings@wur.nl
Jörg Berkenhagen	vTI-Inst. Sea Fisheries, Palmaille 9, 22767 Hamburg, Germany	+4940 38905206	joerg.berkenhagen@vti.bund.de
Jose Maria Da Rocha Alvarez	Campus Lagoas Marcosende, 36200,Vigo,Spain		jmrocha@uvigo.es
Margit Eero	Charlottenlund Castle,DK-2920, Charlottenlund, Denmark		mee@aqua.dtu.dk
Leyre Goti	General Concha 44, 4ºcentro izda, 48012,Bilbao,Spain		leyregoti@yahoo.com
Joakim Hjelm	Turistgatan 5,SE-45321, Lysekil, Sweden		joakim.hjelm@fiskeriverket.se
Tore Jakobsen	Nordnesg. 50,5005,Bergen,Norway		tore.jakobsen@imr.no
Sven Kupschus	Pakefield Road,NR33 0HT, Lowestoft,United Kingdom	+441502 524454	sven.kupschus@cefas.co.uk
David Miller	Haringkade 1,1976 CP, IJmuiden, Netherlands		david.miller@wur.nl
Arina Motova	S. Konarskio str. 49,LT-03123, Vilnius, Lithuania		arina.motova@erpi.lt
Rasmus Nielsen	Charlottenlund Castle, Jaegersborg Allé 1, DK-2900, Charlottenlund, Denmark	+ 4533963381	rn@aqua.dtu.dk
Tom Peatman	MRAG Ltd, 18 Queen St., London W1J 5PN	+44 2072557784	t.peatman@mrag.co.uk
Tiit Raid	Estonian Marine Institute, University of Tartu, Estonia		tiit.raid@gmail.com
Cristina Silva	Av. de Brasília,1449-006,Lisboa, Portugal	+351 213027096	csilva@ipimar.pt
Valentin Trujillo	IEO, CO de Vigo Cabo Estay – Canido, Apdo 1552, E-36280 Vigo Espania		valentin.trujillo@vi.ieo.es
Christopher Zimmermann	vTI-Inst. Baltic Sea Fisheries, Alter Hafen Süd, 18055 Rostock, Germany	+49 3818116115	czimmermann@clupea.de
JRC experts			
Robert Scott	Via E.Fermi,21027,Ispra,Italy	+390332 783692	robert.scott@jrc.ec.europa.eu
John Simmonds	Via E Fermi,21020,Ispra,Italy	+390332 785311	john.simmonds@jrc.ec.europa.eu
European Commission			
Rodrigo Ataíde Dias	Rue Joseph II 79,1000, Brussels, Belgium		rodrigo.ataide-dias@ec.europa.eu
Peter Hopkins	Rue Joeseph II 79,1049, Brussels, Belgium		peter.hopkins@ec.europa.eu
Anna Zaradna	Rue Joseph II, 79,1049, Brussels, Belgium	+3222987481	anna-maria.zaradna@ec.europa.eu
CFCA			
Vincent Esclapez	CFCA, Garcia Barbon ,36201,Vigo, Spain	986 12 06 63	vincent.esclapez@cfca.europa.eu
Mario Santos	CFCA,Garcia Barbon ,36202,Vigo, Spain	987 12 06 63	mario.santos@cfca.europa.eu
Observers			
Manuela Azevedo	H.C Andersens Boulevard 44-46,DK-1553, Copenhagen, Denmark	+45 33386700	manuela@ices.dk
António Cunha	Av. Marginal,3830-552,Gafanha da Nazaré, Portugal		antonio.cunha@testacunhas.pt
Magnus Eckeskog	Åsögatan 140,116 24,Stockholm, Sweden	+46(8)250790	magnus.eckeskog@fishsec.org
Reine Johansson	H.C. Andersens Boulevard, 1553, Copenhagen, Denmark	+45 33935000	ai@bsrac.org
Geert Meun	Vlaak 12,8321 RV,Urk,Netherlands		gmeun@visned.nl
Jim Portus	Westbeer House 50 Fore Street Ivybridge Plymouth, Devon UK, PL21 9AE,		swfpo@btinternet.com
Roar Schou	H. C. andersens Boulevard 37, 1553, Copenhagen, Denmark	+45 33935000	rbs@nexohavn.dk
Cristina Rosa	Direcção-Geral das Pescas e Aquicultura, Av. de Brasília, 1449-030 Lisboa, Portugal		crosa@dgpa.min-agricultura.pt

4. DESIGN ISSUES

The plan is described in Council Reg. CE 2166/2005 and included here as Annex B. There are a few ambiguities and potential difficulties arising from the wording.

Article 5. Point 1: "Procedure for setting the TAC for the Southern hake stock":

1. *."... the TAC shall not exceed a level of catches ..."* When the Plan was made no discards were considered in the stock assessment model, i.e. landings and catches were modelled as equal. Since 2010, discards were included into the assessment model. Current ICES advice is based on landings. Insufficient data is available currently to monitor catch. The formulation needs to be in terms of a measurable quantity.

2. *"...[TAC] will result in a reduction of 10 % in the fishing mortality rate in the year of its application as compared with the fishing mortality rate estimated for the preceding year."* Using a change based on an decrement from a measured value from the previous year can lead to plan failure if there is TAC overshoot causing F to be too high. It is better to specify a series of targets (F targets) by year so that both implementation and measurement error can be taken into account over time.

No specific design issues were identified regarding setting the TACs, the plan implements a HCR that produce a TAC shared by MS following pre-agreed rules.

The plan was set according to 2004 assessment precautionary limit and reference points (B_{pa}=35kt, F_{max}=0.27). The last assessment (ICES, 2010) used new input data (including discards and Cadiz catches), different parameters assumptions (M, faster growth, etc) and a different model (age-length based, GADGET). Now, F_{max}, over new age range, is currently estimated at 0.26. Currently B_{pa} is not defined, the stock dynamics have been revised and the target value of SSB =35 kt may no longer be appropriate (see section 6.2).

The plan affects hake and *Nephrops*. The TAC is first set on hake and for *Nephrops " ...shall be set at a level that will result in the same relative change in its fishing mortality rate"* (article 6). The main problem to check imbalances is that F is unknown for *Nephrops* stocks, with exception for FU 28+29 (SW and S Portugal) where, due to the strong retrospective pattern, the assessments are only taken as indicative of stock trends. In practice TACs for Nephrops have been set with annual reductions of 10% in line with the effort restrictions.

There is no overlap with other plans.

5. ENFORCEMENT AND COMPLIANCE

There were two issues concerning the way that the effort limitation was set during the plan.

Article 8. "Effort limitation". Point 2. was not implemented according to the description. The section states:*"…The adjustment shall be in the same proportion as the annual adjustment in fishing mortality that is estimated by ICES and STECF as being consistent with the application of the fishing mortality rates established according to the method described in Article 5."* However, in the 5 years setting TACs (2006-10) the interannual constraint on TAC change should have given F reductions that were greater than 10%. However, the effort reduction in number of days at sea as defined in the Annex IIb was always set at a 10% reduction.

In point 6 of the regulation preamble the purpose was to apply effort control: *"…and limitations on kilowatt-days whereby fishing efforts on those stocks are restricted to levels at which the TACs may not be exceeded"*. In practice the TACS were exceeded by progressively greater amounts and no additional effort reduction greater than 10% in days was applied

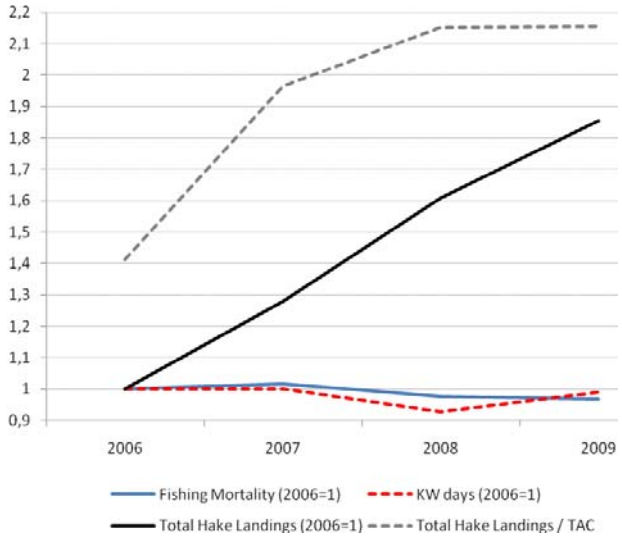

Figure 5.1. Fishing mortality, effort in kW days at sea, landings in weight and landings over TAC, during the first four years of the Plan.

Hake landings were always higher than the recommended TAC, rising from 1.4 times the TAC in 2006 to 2.2 times the TAC in 2009. Figure 5.1 shows the first four years of plan implementation, during which, effort and fishing mortality

have been rather stable, and far from plan expectations1. This information suggests that the Southern hake recovery plan was not really implemented.

6. ENVIRONMENTAL EFFECTS OF THE PLAN

6.1. Evaluation of the effects of the management plan on the fishery

For the hake fishery, no fishery response was observed in terms of F reduction.

The effort exerted on *Nephrops* in FU 28-29, estimated by ICES, has been reduced, mainly due to effort transfer to rose shrimp, the other target species of the crustacean fleet. This shift has caused a reduction in F on this Nephrops FU (ICES, 2010).

A detailed review of responses to effort by fleet segments, MS or areas is provided by STECF SGMOS 10-05 (Sub-group on effort management). This group analysed the landings, catch and effort trends in the period 2003-2009 using data provided by MS and the same data were used in the analyses presented in this report.

Figure 6.1 presents the trend in landings of hake and Nephrops showing the contribution of the different fleets in the period 2003-2009. Figure 6.2 shows the trends in effort since 2005, after the implementation of the effort control regime (the recovery plan started in 2006 but the effort reduction was first introduced in 2005).

The total landings of hake and the landings by fleet (Figure 6.1) have increased substantially and the total effort (Figure 6.2) shows a very modest decline of 10% from 2005-2009.

Figure 6.2 upper panel shows that although the total effort has slightly declined there is evidence of effort transfer from the Spanish Demersal trawl segment to the Spanish Gillnet >60mm. The effort in the Gillnet segment is relatively low but the catches are an important part of the total. Figure 6.2 lower panel shows the relative importance of the effort for each fleet in terms of their catch and shows that this fleet catches more hake per unit effort than the demersal trawl fleet from which the effort was transferred. The transfer of effort to fleets with higher catch rates has effectively negated the modest decline in regulated effort.

The Effort measure of kWdays is not a suitable unit for passive gears. Currently, information about the size of the nets, both in width and height, i.e. effective effort deployed, is not available. So not only is the effort control by kWday inappropriate but effective effort can change along the time series without detection. This would compromise the usage of kWday as an effort measure. This problem occurs for a range of static gears. This aspect is discussed and agreed within SGMOS 10-05 on effort dealing with for this area (Annex 2b of the SGMOS 10-05 report). If transfer of effort is to be allowed between active and passive gears a different method to account for effort should be found.

---

[1] See SGMOS 10-05 for a full description of effort and landing trends.

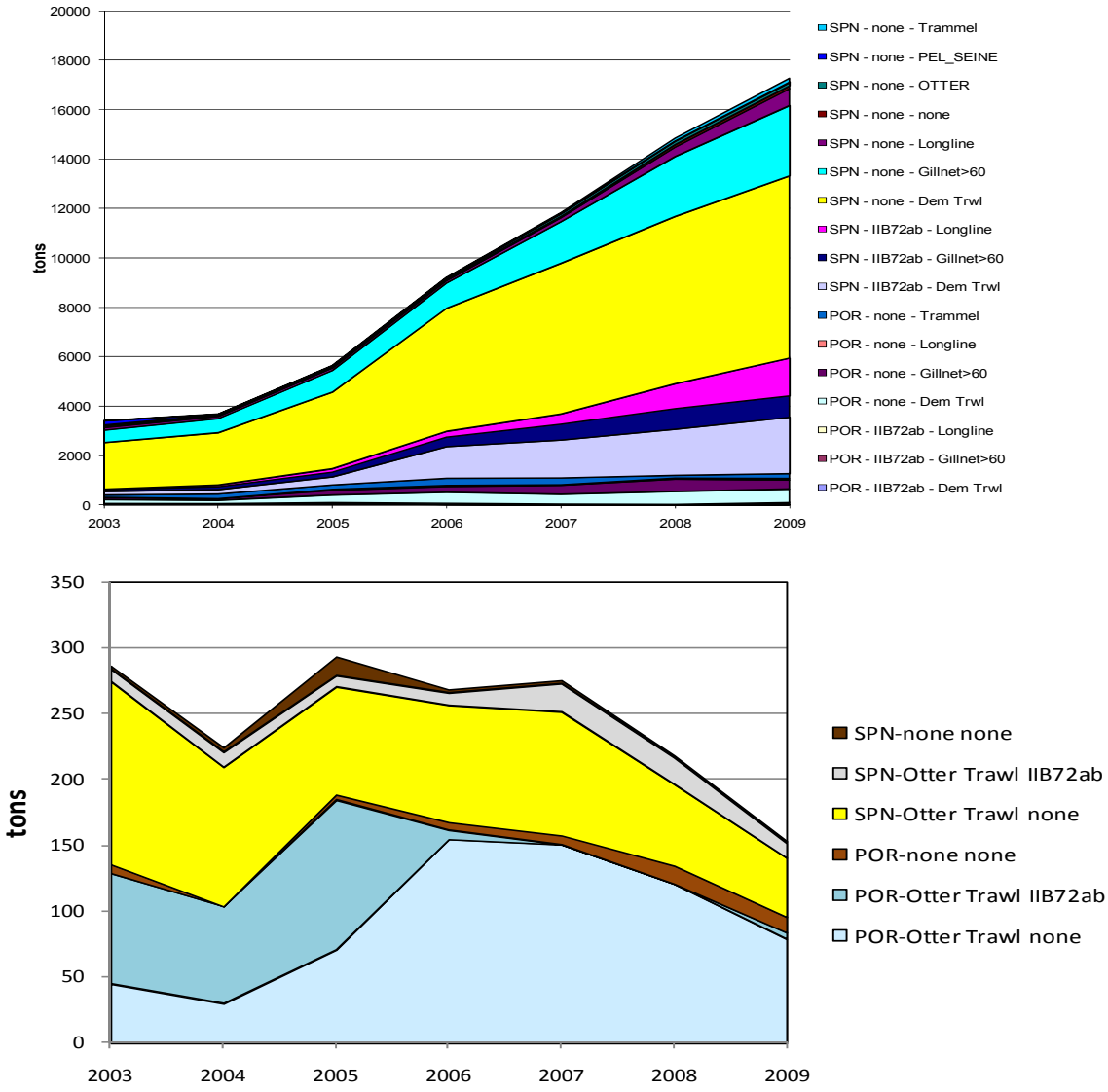

Figure 6.1 Trends in Hake (upper panel) and Nephrops (lower panel) landings in the period 2003-2009 (Source data: STECF SGMOS 10-05) Fleet segment designations :- regulated gears 3a (trawl), 3b (gill nets), 3c (longlines) and unregulated 3d (trammel nets). IIB72ab refers to the derogated (<5t/year) parts of regulated fleets.

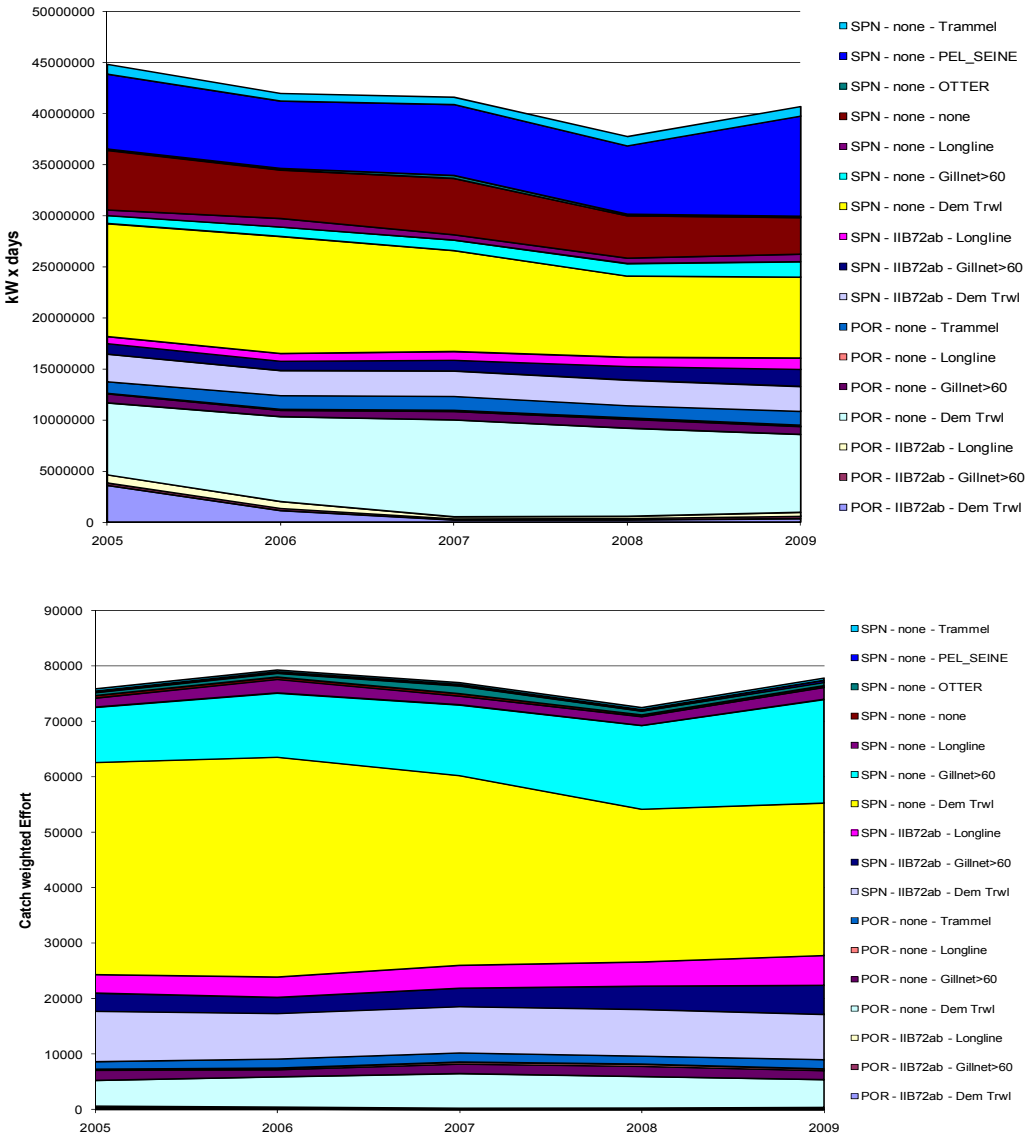

Figure 6.2 Hake effort (upper panel) and hake catch weighted effort (lower panel) trends in the period 2005-2009 (Sourcedata: STECF SGMOS 10-05 Fleet segment designations :- regulated gears 3a (trawl), 3b (gill nets), 3c (longlines) and unregulated 3d (trammel nets). IIB72ab refers to the derogated (<5t/year) parts of regulated fleets.)

Annex IIb of the annual Fishing Opportunities Regulation defines the gear segments subject to effort management regime according to Council Regulation (EC) No 2166/2005, establishing derogations under special conditions (vessels catching less than 5t of hake or 2.5t of Norway lobster). These segments include "*vessels of 10 metres'length overall or more carrying on board or deploying trawls, Danish seines or similar gears of mesh size equal to or larger than 32 mm and gill-nets of mesh size equal to or larger than 60 mm or bottom longlines*". In this report and in consistency with SGMOS 10-05, these gear segments are referred as regulated (either under effort control or with derogation) and all the others are considered unregulated.

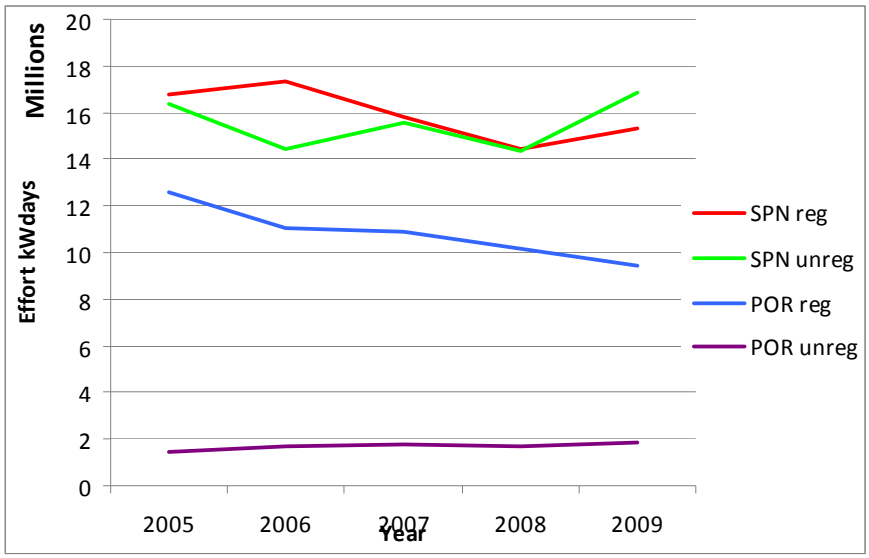

Figure 6.3 Trends in regulated and unregulated effort in the period 2005-2009 (Sourcedata: STECF SGMOS 10-05) The regulated component contains all effort in gear categories 3a - demersal trawl, mesh size >= 32mm, 3b - gillnets, mesh size >= 60mm, 3c – longliners. This includes those vessels operating under derogation IIB72AB

Figure 6.3 shows that, effort of regulated (combined with derogated) gears has slightly decreased since 2005 for both Spain and Portugal, while the effort from unregulated gears is still at the same level. During the period some vessels which originally were part of derogated fleet segments under IIB72ab moved into the regulated gear segments with effort control because they caught more hake in later years, passing the 5t of hake threshold as the stock expanded. Thus, the totals of regulated effort excluding derogated gears do not necessarily reflect change in fleet effort. Without individual boat data it is not possible to fully evaluate the effort effects of moving between segments under effort control and with derogation. The Spanish data show that, in 2009, the effort from the unregulated gears was as much as from the regulated gears, although these gears are supposedly not targeting hake or Nephrops but may catch these species as by-catch.

The proportion of hake catch by fleet has changed over the period of plan. Table 6.1 shows the estimates of catch in 2009 by fleet segment from the STECF effort and catch database (SGMOS 10-05) and the percentage contribution to that total. Regulated gears are separated into fully regulated and derogated vessels with catches of less than 5t per vessel. 71% of catch is taken by regulated fleets and 26% by derogated vessels. Almost all the 26% by the derogated vessels in the Spanish fleet spread across all three derogated gears. Unregulated gears take 4.5% of hake catches in 2009.

Table 6.1 Estimates of catch by fleet segment from the STECF effort and catch database (SGMOS 10-05) and the percentage contribution to the total. Regulated gears are separated into fully regulated and derogated segments (catches of less than 5t per vessel). Unregulated segments are for gears that catch some hake but are not subject to any regulation. **(Sourcedata: STECF SGMOS 10-05** Fleet segment designations :- regulated gears 3a (trawl), 3b (gill nets), 3c (longlines) and unregulated 3d (trammel nets). IIB72ab refers to the derogated (<5t/year) parts of regulated fleets.)

Country	Gear type	Regulation	2009 Landings	2009 Discards	2009 Catch	%of 2009 catch
Portugal	Dem Trwl	Derogated	10	9	19	0.1%
		Regulated	545	801	1346	6.6%
	Gillnet>60	Derogated	50	0	50	0.2%
		Regulated	368	0	368	1.8%
	Longline	Derogated	36	0	36	0.2%
		Regulated	54	0	54	0.3%
	Trammel	Unreg	200	0	200	1.0%
	Gill<60	Unreg	0	0	0	0.0%
	Pots	Unreg	3	0	3	0.0%
Spain	Dem Trwl	Derogated	2283	443	2726	13.5%
		Regulated	7370	1429	8799	43.5%
	Gillnet>60	Derogated	880	0	880	4.3%
		Regulated	2839	0	2839	14.0%
	Longline	Derogated	1525	0	1525	7.5%
		Regulated	692	0	692	3.4%
	Trammel	Unreg	159	0	159	0.8%
	Beam	Unreg	1	0	1	0.0%
	Dem_Seine	Unreg	0	0	0	0.0%
	Dredge	Unreg	0	0	0	0.0%
	Gill<60	Unreg	243	0	243	1.2%
	none	Unreg	108	0	108	0.5%
	Otter Trwl	Unreg	128	25	153	0.8%
	Pel Seine	Unreg	25	0	25	0.1%
	Pel Trawl	Unreg	0	0	0	0.0%
	Pots	Unreg	15	0	15	0.1%
Total	All gears	Regulated	11868	2230	14098	69.7%
		Derogated	4784	452	5236	25.9%
		Unreg	882	25	907	4.5%
		Total	17534	2707	20241	100.0%

6.2. Evaluation of the effects of the management plan on the stock

Southern Hake stock assessments (ICES 2010a, Figure 6.4) show that from 2006 the expected F reduction, according to the plan, has not been achieved. There has been an increase in SSB, mostly derived from strong year classes entering in the stock in 2005-2007 (Figure 6.4).

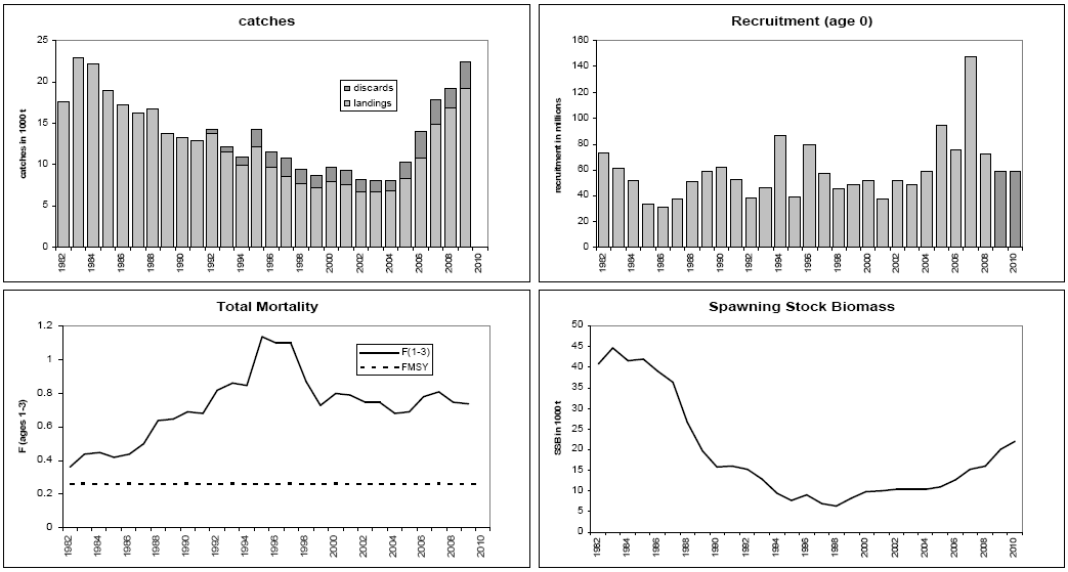

Figure 6.4 Southern hake 1982-2010 ICES assessment: change in catches, landings, Recruitment (age 0), Fishing mortality and Spawning Stock Biomass (SSB)

Figure 6.5 and 6.6 show the spatial and temporal distribution of hake recruits and adults in the surveys performed in Divisions VIIIc and IXa. The presence of stronger year classes and the increase of total abundance in recent years are clear, expanding to almost the whole area of distribution.

Concerning the *Nephrops* stocks, FUs 25 and 31 (Division VIIIc) and FUs 26-27 (Division IXa) were already depleted at the inception of the plan and have not subsequently improved. ICES recommendation for these four FU was for zero catch throughout this period (ICES, 2010b-c).

The effort in FUs 28-29 and in FU 30 (Division IXa) has been reduced, mainly due to the change of objectives of the fleets targeting this species (Portuguese crustacean fleet and the Cadiz mixed demersal fleet) as a result of the increase in rose shrimp abundance. Biomass in FU 28-29 has estimated to have increased but in FU 30 is still at a low level (ICES, 2010c). ICES advice for FU 28-29, for 2003-2005, was also for zero catch, followed by a catch advice for 200 tons per year. Reported catches initially over 400 t at the start of the plan declined to around 120 tonnes in 2009 due to the shift in the target species for this fleet. For FU 30, ICES recommendation for the period 2003-2008 was the lowest recent catch (50t) changing for the average catch (200t in 2005-2007) for 2009-2010.

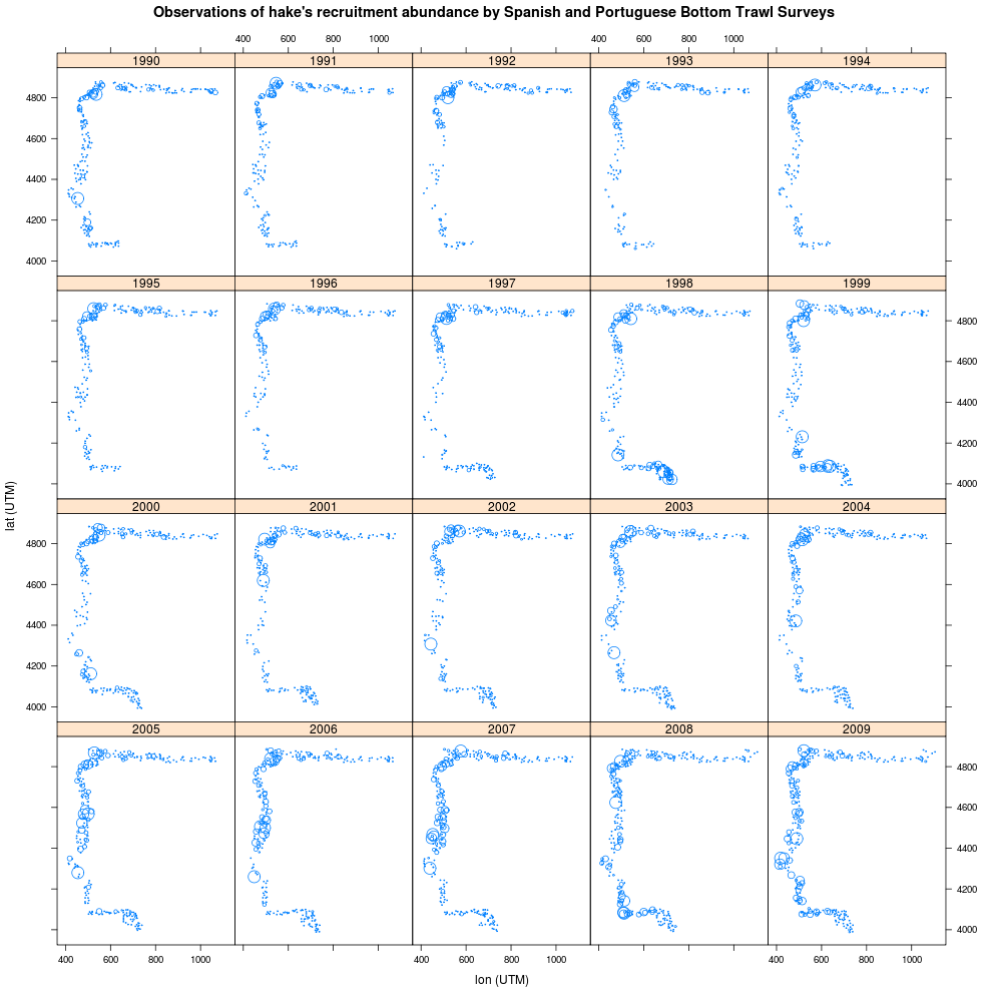

Figure 6.5 Southern hake recruitment abundance distribution in surveys in Divisions VIIIc and IXa (Source: IBTS surveys carried out by IEO and IPIMAR).

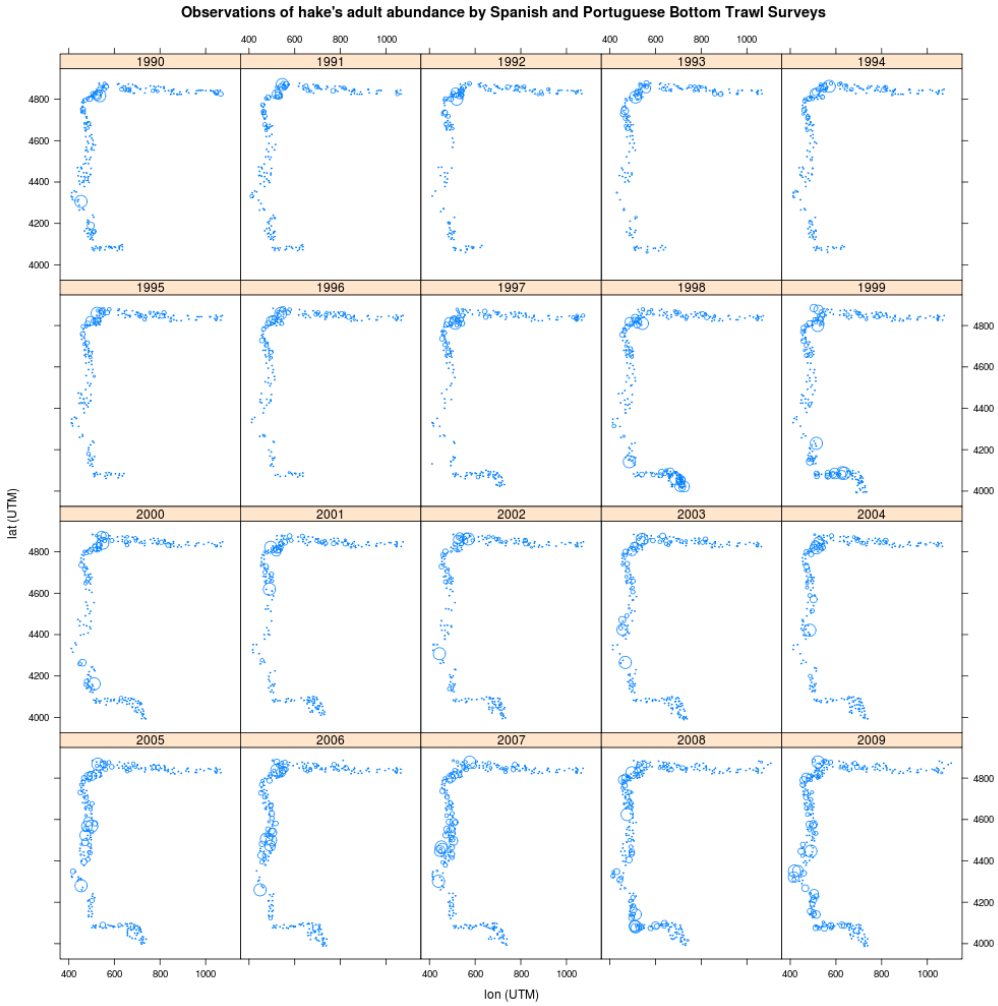

Figure 6.6 Southern hake adult abundance distribution in surveys in Divisions VIIIc and IXa (Source: IBTS surveys carried out by IEO and IPIMAR).

6.2.1. Reaching the targets of the plan

Concerning hake, the plan targets were to reach a SSB of 35 kt by 2015, equivalent to Bpa, and a fishing mortality of F = 0.27, equivalent to Fmax at 2004 assessment. In 2010 a new age-length model assessment was accepted by ICES. The new assessment changed the historic perception of the stock to some extent. The basis for Bpa has not been be reviewed in the light of last assessment, By comparison F_{max} is relatively easy to review, so the evaluation has been carried by ICES and the figure estimated from the last ICES assessment was F_{max}=0.26, which was also used in the simulations presented in Annex C. In the current assessment, recruitment appears to be largely independent of SSB and under these circumstances a low value of F_{max}, such as the one here, is thought to provide a good surrogate for F_{msy}.

However ICES (2010) warn that the early part of the time series is particularly uncertain due to the specific choice of model "*Gadget uses a forward projection to fit the model parameters and is sensitive to initial values (1982), consequently the starting years may have convergence problems and assessment results for*

those years should be considered with caution." Thus these early values at higher biomass should be treated with caution.

Achieving MSY (F) target

The biological simulations presented in this report (Cerviño et al., WD Annex C) show that Fmsy will not be achieved until 2018, even if the plan is implemented from 2011 onwards. Jardim et al. (2010) show that a higher F reduction and a higher TAC constraint are needed to reach Fmsy in 2015. The main reason is that F has remained high since 2006. It should be noted however, that if implementation of the plan continues to fail, the F target may not be reached even if a revised regime is put in place.

Biomass Target

In the original plan the objective was to achieve safe biological limits by 2015, defined as Bpa = 35kt. Currently Bpa is undefined so it is no longer possible to estimate whether or not the stock can be classified as inside or outside safe biological limits. However, current perceptions of stock and recruitment data suggest that safe biological limits may be at a much lower biomass than the previous estimates.

STECF is not currently able to propose new biomass limit and reference points but does consider that they need to be revised based on the new assessment of SSB and recruitment, in this context see the discussion of the ICES assessment above.

6.3. Evaluation of the effects of the management plan on the ecosystem.

Since the plan has not been effectively implemented, there is nothing to report regarding this issue. However, data from the ICES assessment working group show that the volume of discards has increased due the entry of strong year classes (ICES, 2010a).

7. SOCIAL AND ECONOMIC EFFECTS OF THE PLAN

7.1. Data and Calculation of Indicators

In order to characterise the social and economic state of the fleets exploiting the Southern Hake stock, the methodology presented in Da Rocha *et al*. (WD Annex D) was used.

DCF and SGMOS 10-05 data were used to compute each fleet's Hake dependency, crew, fuel, variable cost as a fraction of total value and yearly share on total hake landings. Tables 7.1 and 7.2 summarize this information. Price elasticity was estimated at -0.28, using Galician data.

Table 7.1. Number of vessels, hake landing shares and hake dependency by gear, special conditions (specon) and country. (Sourcedata: STECF SGMOS 10-05 Fleet segment designations :- regulated gears 3a (trawl), 3b (gill nets), 3c (longlines) and unregulated 3d (trammel nets). IIB72ab refers to the derogated (<5t/year) parts of regulated fleets.)

	number of vessels				hake landings share				hake dependency	
	2006	*2007*	*2008*	*2009*	*2006*	*2007*	*2008*	*2009*	*mean*	*std*
POR 3a IIB72ab	15	3	5	7	0,18%	0,02%	0,03%	0,06%	0,058	0,022
POR 3b IIB72ab	48	23	34	42	0,41%	0,24%	0,14%	0,29%	0,512	0,112
SPN 3a IIB72ab	20	23	24	25	13,61%	12,70%	12,31%	13,07%	0,336	0,117
SPN 3b IIB72ab	32	33	31	33	4,25%	5,47%	5,60%	5,04%	0,460	0,154
SPN 3c IIB72ab	89	91	96	104	2,44%	3,39%	6,63%	8,73%	0,839	0,098
POR 3a none	53	53	49	42	4,69%	3,26%	3,42%	3,12%	0,103	0,021
POR 3b none	41	47	41	38	2,49%	3,04%	3,29%	2,11%	0,765	0,033
POR 3c none	12	16	18	15	0,42%	0,14%	0,20%	0,31%	0,908	0,049
POR 3d none	228	225	255	248	3,25%	2,35%	0,82%	1,16%	0,180	0,077
SPN 3a none	64	69	67	63	52,82%	50,58%	44,60%	42,18%	0,351	0,099
SPN 3b none	81	95	104	97	13,04%	15,82%	18,04%	17,64%	0,634	0,170
SPn 3c none	43	50	54	61	1,05%	1,40%	2,57%	3,96%	0,903	0,035
SPn 3d none	451	474	454	430	1,34%	1,59%	2,35%	2,35%	0,087	0,041

Table 7.2. Fuel, crew and variable cost share on Total income by gear and country. Source: The 2009 Annual Economic Report on the European Fishing Fleet Report.

Portugal										
	D.Trawl and seiners 12m-24m				*D.Trawl and seiners 24m-40m*					
3a	**2003**	**2004**	**2005**	**2006**	**2003**	**2004**	**2005**	**2006**	*MEAN*	*STD*
Fuel per vessel	0,22	0,21	0,14	0,25	0,21	0,21	0,20	0,30	0,22	0,04
Crew share	0,54	0,30	0,26	0,40	0,31	0,25	0,24	0,23	0,32	0,11
Var cost	0,05	0,16	0,12	0,09	0,20	0,23	0,08	0,09	0,13	0,06
	Drift and fixed nets 12m-24m				*Drift and fixed nets 24m-40m*					
3b	**2003**	**2004**	**2005**	**2006**	**2003**	**2004**	**2005**	**2006**	*MEAN*	*STD*
Fuel per vessel				0,17				0,42	0,30	0,18
Crew share				0,31				0,09	0,20	0,16
Var cost				0,06				0,26	0,16	0,14
	Gears using hooks 12m-24m				*Gears using hooks 24m-40m*					
3c	**2003**	**2004**	**2005**	**2006**	**2003**	**2004**	**2005**	**2006**	*MEAN*	*STD*
Fuel per vessel		0,08		0,18	0,03	0,10			0,10	0,06
Crew share		0,33		0,82	0,21	0,21			0,39	0,29
Var cost		0,23		0,00	0,27	0,18			0,17	0,12
Spain										
	D.Trawl and seiners 12m-24m				*D.Trawl and seiners 24m-40m*					
3a	**2003**	**2004**	**2005**	**2006**	**2003**	**2004**	**2005**	**2006**	*MEAN*	*STD*
Fuel per vessel	0,17	0,22	0,30	0,27	0,16	0,20	0,25	0,27	0,23	0,05
Crew share	0,36	0,35	0,32	0,30	0,27	0,30	0,28	0,30	0,31	0,03
Var cost	0,15	0,15	0,15	0,24	0,37	0,31	0,29	0,24	0,24	0,08
	Drift and fixed nets 12m-24m				*Drift and fixed nets 24m-40m*					
3b	**2003**	**2004**	**2005**	**2006**	**2003**	**2004**	**2005**	**2006**	*MEAN*	*STD*
Fuel per vessel	0,05	0,06	0,06	0,09		0,51	0,40	0,53	0,24	0,23
Crew share	0,44	0,47	0,61	0,45		0,18	0,18	0,11	0,35	0,19
Var cost	0,14	0,11	0,06	0,16		0,10	0,12	0,09	0,11	0,03
	Gears using hooks 12m-24m				*Gears using hooks 24m-40m*					
3c	**2003**	**2004**	**2005**	**2006**	**2003**	**2004**	**2005**	**2006**	*MEAN*	*STD*
Fuel per vessel	0,09	0,10	0,14	0,16	0,11	0,11	0,19	0,22	0,14	0,05
Crew share	0,38	0,42	0,39	0,35	0,29	0,28	0,31	0,31	0,34	0,05
Var cost	0,38	0,28	0,24	0,22	0,42	0,26	0,30	0,39	0,31	0,08
Portugal and Spain										
	Pots and traps 0m -12m				*Gears using hooks 0m-12m*					
3d	**2003**	**2004**	**2005**	**2006**	**2003**	**2004**	**2005**	**2006**	*MEAN*	*STD*
Fuel per vessel				0,06	0,09	0,08	0,08	0,08	0,08	0,01
Crew share				0,14	0,29	0,24	0,28	0,31	0,25	0,07
Var cost				0,03	0,18	0,19	0,18	0,25	0,16	0,08

These data have been used within the economic model and applied to the projections given in the next section. The results of this combined biological and economic analysis are presented below.

8. THE ADDED VALUE OF THE MANAGEMENT PLAN

As it is considered that effectively the plan has not been implemented no alternative scenario without implementation is presented. However, for information we provide an alternative analysis showing what could be the situation if the plan had effectively been implemented, i.e. if F after 2006 had followed the plan. The results show that the plan could have provided a successful reduction in F without loss of yield. The plan would have allowed reaching F_{max} and the SSB target before the deadline (10 years) because of the good recruitments in 2004-2007 (Cerviño *et al*., WD Annex C)

Two simulations were performed for bio-economical analysis comparing the results of successful implementation and unsuccessful implementation followed by implementation from now:

- scenario 1 represents the trajectories if the Recovery Plan had been perfectly implemented since 2006;
- scenario 2 represents the trajectories associated to real landings between 2006-2010, and a perfect implementation of a Recovery Plan since 2011.

In both scenarios, it is assumed that once the Recovery Plan is over, a Long Term Management Plan (LTMP) is implemented and that in the LTMP, fishing mortality trajectories maximize the net present profits (Grafton, *et al*., 2007, Da Rocha *et al*., 2010). That is, after the recovery plan, the fishing mortalities are defined by solving

$$\max \sum_{t=0}^{\infty} \beta^t \left\{ A_p \sum_{i=1}^{fleets} s_t^i \frac{(1-\omega^i)}{\alpha^i} \left[\sum_a L_t^a(F_t) \right]^{1-\varepsilon} - \sum_{i=1}^{fleets} s_t^i \frac{w^i}{q^i} F_t - \sum_{i=1}^{fleets} n^i c_f^i \right\}$$

subject to the age structured model (Da Rocha *et al*., WD Annex D). Note that the economic and social benefits/losses between scenarios are evaluated in terms of the effects resulting from the delay in the implementation of both the recovery and the long term management plans. Figure 8.1 summarizes these differences.

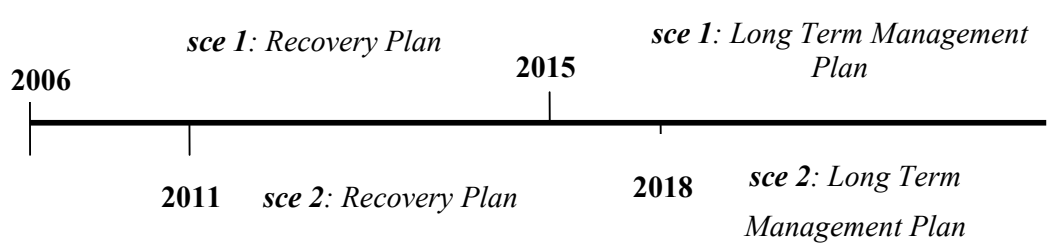

Figure 8.1: Dates in each scenario**.**

Figure 8.2 summarizes the deterministic trajectories of fishing mortality, SSB, Landings in Value and Operational profits for each scenario. In order to have a measure of the recovery plan optimality, the trajectories associated to the fishing mortalities that maximize the net present profits since 2006 are also computed. Finally, in table 8.1 are presented the economic indicators associated with the scenarios.

Table 8.1 Indicators from the simulated scenarios. Sce 1: F plan since 2006, sce 2: F plan since 2011. A third scenario is presented with the trajectories associated with the F's that maximizes net present profits since 2006 (optimal-drastic implementation).

	2006	2007	2008	2009	2010	2011	2012	2013	2014
					F				
sce 1	**0,83**	0,85	0,81	0,80	0,80	0,51	0,46	0,41	0,37
sce 2	0,40	0,32	0,26	0,26	0,26	0,26	0,26	0,26	0,26
opt F	0,10	0,19	0,24	0,25	0,22	0,22	0,21	0,23	0,20
					SSB (t)				
sce 1	12768	14957	17093	22407	22221	19044	21759	25341	29548
sce 2	12768	21845	35303	56048	72945	79939	79474	76151	72087
opt F	12768	28661	48786	70536	86349	93768	93170	91100	85076
					Hake Landings (t)				
sce 1	**11803**	14125	16540	19846	17922	10943	11445	11912	12467
sce 2	6833	9396	12129	18025	21410	22197	21619	20615	19584
opt F	2013	7655	14946	20708	21585	22474	20295	21877	17777
					Hake price				
sce 1	**4,30**	4,09	3,91	3,72	3,82	4,39	4,34	4,29	4,23
sce 2	5,01	4,58	4,27	3,82	3,64	3,60	3,63	3,68	3,73
opt F	7,06	4,85	4,02	3,67	3,63	3,59	3,69	3,62	3,83
					Fishing Income ('000 Eur)				
sce 1	**137236**	156166	174954	199474	185355	129961	134223	138142	142747
sce 2	92605	116456	139949	186128	210668	216211	212143	205009	197577
opt F	38426	100487	162652	205673	211905	218151	202712	213966	184279
					Gross Cash Flow = Operational Profits ('000 Eur)				
sce 1	**35422**	47071	62917	80577	70821	53300	59824	66112	72157
sce 2	**35361**	**57466**	**78098**	**110008**	**126966**	**130797**	**127986**	**123056**	**117920**
opt F	19199	55622	95100	124559	130484	134678	125322	131289	113208
					Fishing Running Cost ('000 Eur)				
sce 1	61082	62554	59610	58874	58874	37532	33853	30173	27229
sce 2	29437	23655	19134	19134	19134	19134	19134	19134	19134
opt F	7562	14205	17783	18061	16397	16522	15173	17033	14532
					Crew Share ('000 Eur)				
sce 1	40732	46541	52426	60022	55660	39128	40546	41857	43361
sce 2	27808	35335	42717	56985	64568	66280	65024	62819	60523
opt F	11666	30660	49769	63054	65025	66951	62218	65644	56540
					Value Added ('000 Eur)				
sce 1	**76154**	**93613**	115343	140599	126481	92428	100370	107969	115518
sce 2	63168	92801	120815	166993	191533	197077	193009	185875	178443
opt F	30865	86282	144869	187612	195508	201630	187540	196933	169748

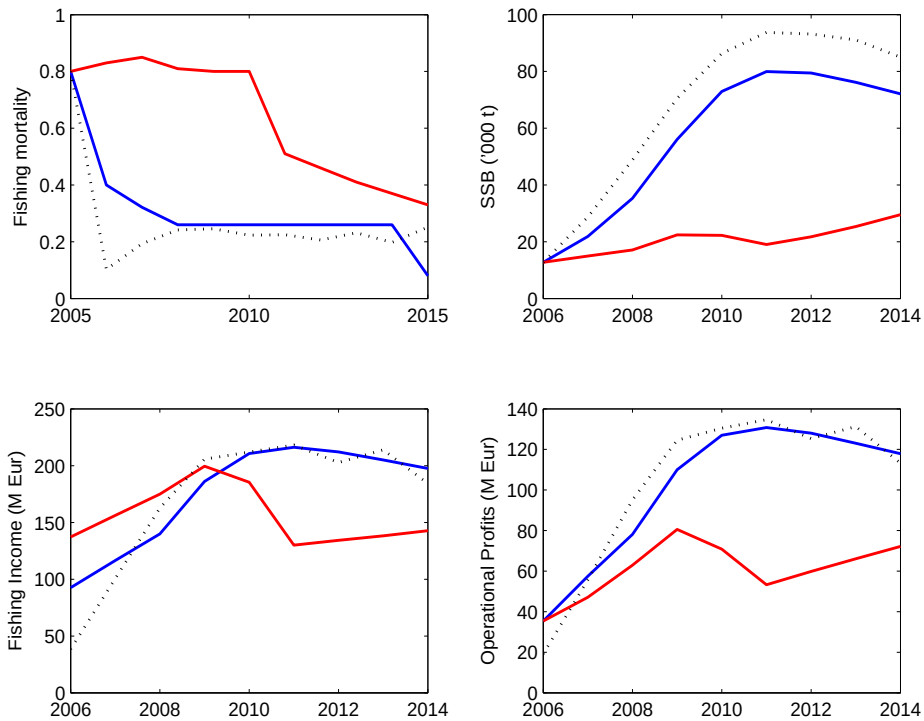

Figure 8.2. Comparative projections between F plan since 2006 / F plan since 2011. Fishing mortality, SSB, Yield in value and Operational Profits. Blue line represents the perfect implementation of the plan from 2006; and red line represents the plan implementation after 2011 (F 2010 was assumed to be equal than F 2009). Black dotted line represents the trajectories associated with the F's that maximizes net present profits since 2006 (optimal-drastic implementation).

Given these deterministic biological trajectories, 2000 replications were performed for the economic parameters. Each of these replications used the mean and standard deviation values reported in Tables 7.1 and 7.2 for simulating each fleet's hake dependency, crew fuel and variable cost share. For each replication, a different fixed cost was calibrated for each fleet. For every fixed cost, profit per vessel was computed. Figure 8.3, top panel, shows the accumulated net present profits in time T, $\sum_{t=0}^{T} \beta^t \sum_{i=1}^{fleets} n^i \pi_t^i$, associated with each scenario using a discount factor equal to 0.95. Figure 8.3, lower panel, shows the difference in the net present profits (in log units) between scenario 1 and 2, during 2006-2009 for each fleet. This difference is a measure of the potential loss associated to the delay on the plan implementation.

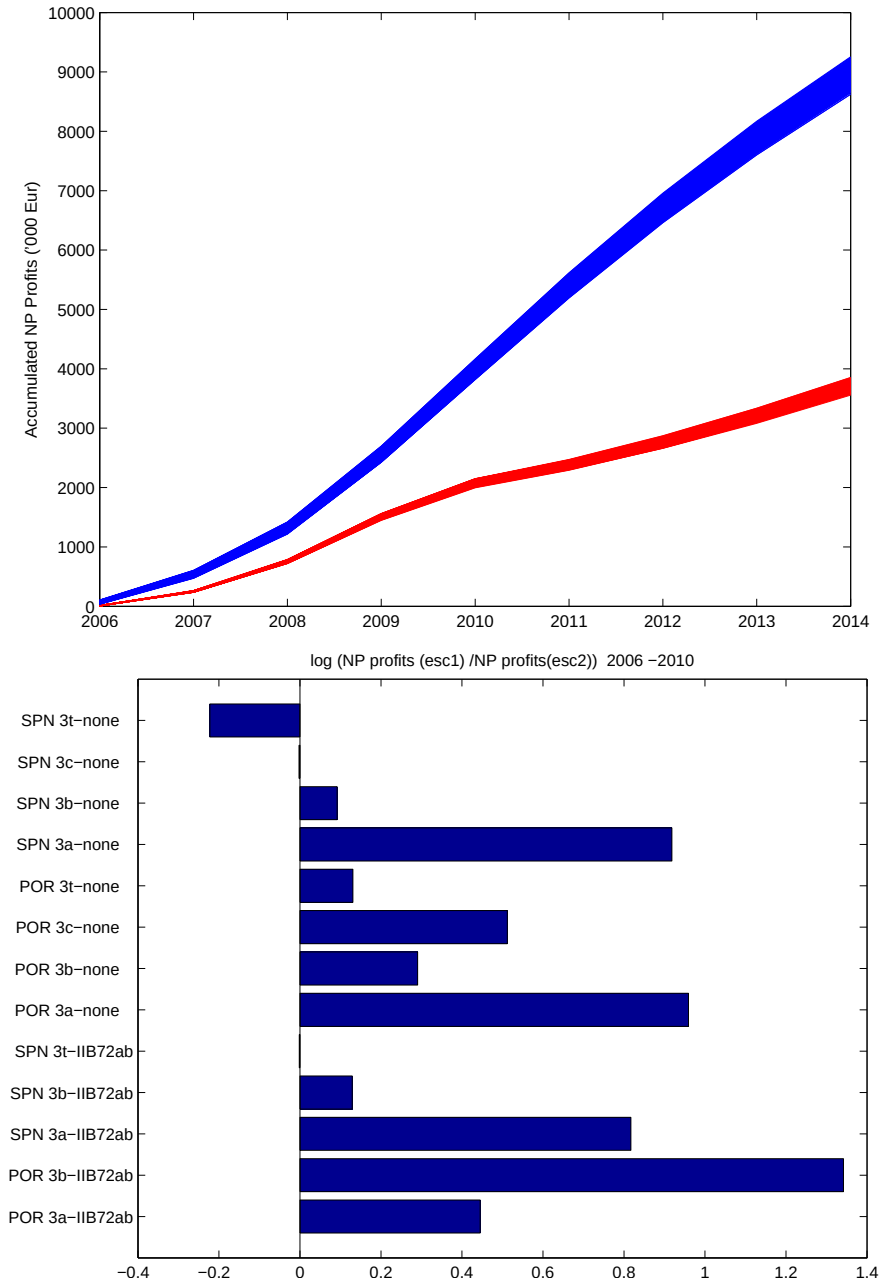

Figure 8.3. The top panel shows the comparative economic benefits between F plan since 2006 / F plan since 2011. Left panel shows the Accumulated Discounted Profits. Blue line represents the perfect implementation of the plan from 2006; and red line represents the plan implementation from 2011. The lower panel shows the difference in net present profits (in log units) by fleet between scenario 1 and 2.

Figure 8.4 shows, per each fleet, the accumulated net present profits per vessel $\sum_{t=0}^{T} \beta^t \pi_t^i$.

The main results of the simulations are:

i) The fishing mortalities trajectory for Scenario 1 (Recovery plan implemented since 2006) was close to the trajectory that maximizes the net present operational profits of the fleets.

ii) Implementing the recovery plan from 2006, would have increased the net present profits for the whole period.

iii) Moreover, after 2011 aggregate net present profits for all segments would always be higher if the plan had been implemented in 2006.

These results do depend on the assumptions of stability in the fleet behaviour (constant selectivity pattern). However, considering the need of reducing the mortality on hake, the selectivity pattern may change with time in response to fishing opportunities. Given the great differences in the hake dependency from the various fleets, the detail of the response shown in Figures 8.2, 3 and 4 may be different but the major trends should similar.

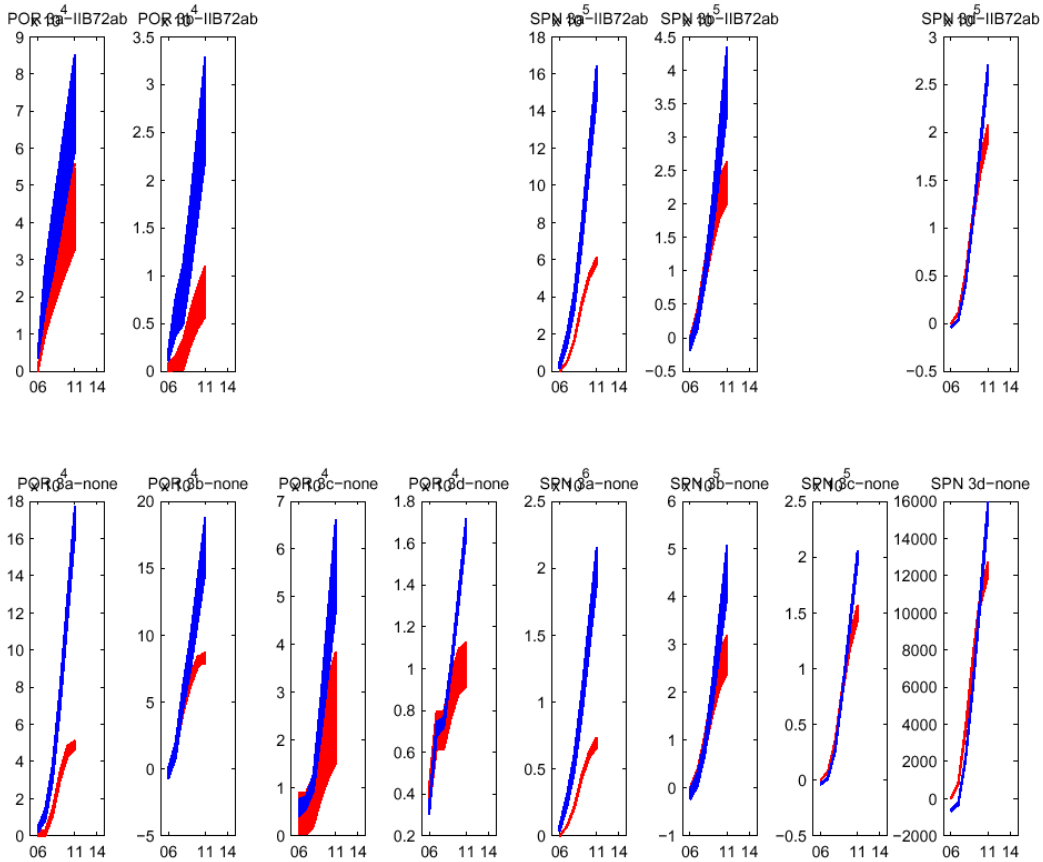

Figure 8.4. Accumulate discounted profits per vessel (1000 simulations). Blue line represents the perfect implementation of the plan from 2006; and red line represents the plan implementation since 2011.

9. PERFORMANCE EVALUATION OF THE PLAN

The performance of the plan is summarised as:

Effectiveness

The plan has not been effective due to failures in implementation. After four years F is nearly three times F_{max} (ICES, 2010), far from the plan expectations. TACs for hake have not been enforced; landings now exceed TACs by 2.2 times. While regulated fishing effort has declined, effective effort has increased as effort transferred to gears that catch more hake.

Utility

After four years no significant changes in fleet capacity have been observed.

Although large fluctuations in hake and fuel prices affected fleet profits, no significant fleet exit has been observed. Currently the fleets concerned remain profitable and therefore, given the definition of overcapacity from the EIAA model (Frost et al. 2009), the fleets affected by the management plan are not considered in an overcapacity situation.

As the plan has not been fully implemented, it is not possible to determine if it would contribute to adapting the fleet capacity to the fishing possibilities resulting from the management plan.

Efficiency (cost-effectiveness)

The cost of not having implemented the plan will be the difficulty of reaching F_{msy} by 2015 and eventually, the need of higher annual effort reduction for lowering F to F_{msy} levels.

Allowing the landings to exceed the agreed TAC by a factor of more than two, at a time when stable catches would have provided a substantial reduction in F, is a missed opportunity. The recruitment seen during last few years is unusually high, and not seen during the earlier years for which data are available. If recruitment declines again to previously observed levels then this will imply either a longer transition period or steep reduction in catch to reach F_{msy} than would have been the necessary if the plan had been implemented. This will result in lower profits than would have been the case.

The lack of plan implementation during the period 2006-2010 reduces net present profits by 20% relative to a scenario of full plan implementation since 2006.

Indicators

The indicators used were sufficiently useful to evaluate the multi-annual plan

Sustainability

Continued failure to implement the plan would imply likely reductions in SSB, reduction in catching opportunities and failure to reach F_{msy}.

10. CONCLUSIONS

Failure to implement the plan means that the Objectives of the Common Fisheries Policy have not been reached and probably will not be reached by the intended date of 2015. In consequence, the plan is not succeeding in achieving its stated objectives.

The main elements of the plan have had the greatest influence in failing to achieve the objectives are a lack of landing control and insufficient reduction of effective fishing effort in the fleets fishing hake and Nephrops.

Linking this plan with catches of other future plans for other species caught within a variety of fisheries is an approach that would provide better economic understanding of the consequences of a plan.

After four years of the starting date of the Recovery Plan, the data and knowledge of the fleet behaviour have increased and, in the future, it would be possible to manage the fishery considering the contribution of each fleet for the fishing mortalities of the different species,

The current failure to achieve F reductions needs to be addressed if there is to be any expectation of success for such a plan in the future. Revisions require evaluation of landings compliance and an effort reduction that is effective in reducing fishing mortality.

References

Cerviño, S., E. Jardim and J.M. da Rocha. 2010. The value of Southern hake recovery plan. I. What should have happened if it had been perfectly implemented and what will happen if is not implemented? Working Document for STECF- SGMOS 10-06b. Vigo, October 2010

Da Rocha, J. M., S. Cerviño and E. Jardim. 2010. The value of Southern hake recovery plan. II. How big was the economic loss associated to the delay in the implementation of the plan? Working Document for STECF- SGMOS 10-06b. Vigo, October 2010.

Frost, H., J.L. Andersen, A. Hoff and T. Thøgersen. 2009. The EIAA Model Methodology, Definitions and Model Outline. Report no. 200. Institute of Food and Resource Economics, Copenhagen.

ICES. 2010a. Advice June 2010. Section 7.4.1 Ecoregion: Bay of Biscay and Western Iberian Waters, Stock: Hake in Divisions VIIIc and IXa (Southern Hake). http://www.ices.dk/committe/acom/comwork/report/2010/2010/hke-soth.pdf

ICES. 2010b. Advice June 2010. Section 7.4.11 Ecoregion: Bay of Biscay and Western Iberian Waters, Stock: *Nephrops* in Division VIIIc (North Galicia and Cantabrian Sea, FU 25 and 31).
http://www.ices.dk/committe/acom/comwork/report/2010/2010/Neph-viiic.pdf

ICES. 2010c. Advice June 2010. Section 7.4.12 Ecoregion Bay of Biscay and Western Iberian Waters, Stock: *Nephrops* in Division IXa. http://www.ices.dk/committe/acom/comwork/report/2010/2010/Neph-ixa.pdf

Jardim, E., C. Silva, R. Alpoim, F. Cardador and M. Azevedo. 2010. Report on the Evaluation of HCR for the establishment of a management plan for the Iberian mixed fisheries of Hake, Anglerfish and *Nephrops* aiming to achieve Fmsy by 2015. ICES CM 2010/ACOM:54

ANNEX A: FRAMEWORK FOR THE EVALUATION OF MANAGEMENT PLANS

A review of the practical implementation of the management plan considering the actions taken and measures implemented at the Member State level.

1. DESIGN ISSUES

• What issues relating to the design of the plan can be identified. eg. differences and/or ambiguity in interpretation of the requirements and/or provisions of the plan, or different levels of implementation of the plan. Analysis should be conducted at the Member State level.

• Has the plan been updated in the light of new information since first implementation e.g. have reference points been updated in line with more recent advice?

• In the case of multi-species plans, are the procedures for setting the TACs for the different species likely to lead to imbalances in the TAC levels for the stocks concerned.

• Has the potential overlap with other management plans been adequately addressed?

2. ENFORCEMENT AND COMPLIANCE

• What level of compliance has been achieved (using the background information provided above - analysis should be conducted at MS and EU level – i.e. MS implementation may differ and have differing outcomes)?

3. ENVIRONMENTAL EFFECTS OF THE PLAN

3.1. Evaluation of the effects of the management plan on the fishery

• What has been the fishery response to the management plan? The response strategies of the fleets include possible shifts to other stocks or species, to other gears or metiers and other behavioural issues.

• What measures of the management plan are considered to have influenced the fishery response. Measures of the management plan will include

• Catch and effort limitations – either through TAC or effort management

• Technical measures – eg. Closed areas, gear restrictions, etc.

• Control and enforcement measures – eg. Entry and exit rules, allocation rights, etc.

• Capacity management measures

3.2. Evaluation of the effects of the management plan on the stock

This section should be adapted to any particular plan and stock. The terms of reference proposed hereafter are drawing on the generic aspects of the evaluation.

a) Evaluating the stock response to the changes in the fisheries resulting from the plan - is the plan delivering its own internal objectives with respect to the stock?

• What changes in the stock dynamics can be identified and to what extent are these consistent with (or attributable to) changes in the fishery imposed by the management plan?

For example can reductions in fishing mortality be identified in instances where fishing effort has been reduced.

b) Evaluating whether the values of target and other reference points referred to in the plan are consistent with current knowledge and the objective of achieving MSY by 2015.

• Are the reference points in the plan still sensible given the latest information on stock status and dynamics?

• Is the plan likely to achieve MSY by 2015? If not, why?

• Is there a need to revise the measures in the plan to make it more effective in achieving the objectives?

• Is STECF able to propose options for a better plan to achieve stock – specific objectives?

3.3. Evaluation of the effects of the management plan on the ecosystem.

• What impacts of the management plan on the ecosystem can be identified? Ecosystem impacts might include changes in discarding practices, by-catch rates, habitat degradation, etc.

4. SOCIAL AND ECONOMIC EFFECTS OF THE PLAN

4.1. Data and Calculation of Indicators

• If there is no explicit socio-economic objective defined by the management plan the evaluation should be against the general socio-economic objectives as stated in the CFP.

• Characterise the social and economic state of the fleets exploiting the stock or stocks concerned using appropriate indicators, i.e. those proposed in the plan these below proposed by STECF in the April 2009 plenary report,.

- *Value of landings* ~ revenue from sale of fish.
- *Gross Cash flow* ~ income minus all operational costs (excluding capital costs).
- *Break even revenue* ~ long term break even revenue. The income (revenue) level at which economic profit is zero.
- *Gross Profit* ~ income minus all costs, including capital costs.

- *Gross Value added* ~ contribution to gross national product (GNP). Income minus all expenses except capital costs and crew cost.
- *Fleet size and composition*
- *Employment*

• The implementation and enforcement costs should be estimated, if possible in order to assess their cost effectiveness e.g do the benefits outweigh the cost of implementation and enforcement.

5. WHAT HAS BEEN THE ADDED VALUE OF THE MANAGEMENT PLAN

The question "What is likely to have happened if the management plan had not been put in place?" should be addressed. This should include a comparison between the current state of the stock and fisheries compared to the situation that is likely to have occurred had the management plan not been implemented. The scenario representing the absence of the plan will constitute the baseline scenario, as advised by the desk officer.

• With specific reference to the items identified in section 2, identify the benefits/losses to the fishery and to the stock that have resulted from the management plan. Analysis to be based on indicators of stock status and exploitation rate

• With specific reference to the items identified in section 3, identify the economic and social benefits/losses that have resulted from the management plan. Analysis to be based on suitable social and economic indicators.

6. PERFORMANCE EVALUATION OF THE PLAN

Based on the above analyses please answer the following questions.

NB: the judgment provided on the following questions could be qualitative (at this stage) where data are not available. Similarly if other effects are detected they can be considered.

Effectiveness

• What have been the immediate results and medium term impacts for the stock addressed by the management plan? Have the objectives of the plan been achieved?

• What have been the immediate results and medium term impacts of the management plan on the environment and the ecosystem, for example by-catch, discards, non-target species?

• Have there been any side effects resulting from the plan? (for example, changes in behaviour that affect other fisheries, or environmental consequences, changes in the market).

• Has the implementation been affected by external factors such as global change, ecosystems effects, or other fisheries?

Utility

• What trends in fleet capacity (kW or GT) would have been expected from the implementation of the plan? What trends were actually observed?

• Are the fleets affected by the management plan in a situation of overcapacity?

• Did the management plan contribute to adapting the fleet capacity to the fishing possibilities resulting from the management plan?

Efficiency (cost-effectiveness)

• What have been the costs of this plan in terms of for example employment, gross revenue of the fleet?

• Have there been any effects on the broader industry (processing, transporting, auxiliary)?

• What have been economic benefit/loss during the period of implementation? STECF will require guidance on to whom this applies.

Indicators

• Were the indicators used sufficiently useful to evaluate the multi-annual plan?

Sustainability

From the experience so far,

• Is it possible to draw conclusions about the sustainability of the plan that differ from those envisaged by the initial impact assessment?

7. CONCLUSIONS

Based on the answers to previous questions, *please give us your global judgement on the plan*

• With regards to the utility and sustainability of the multi-annual plan and its contribution to the objectives of the Common Fisheries Policy.

• Is the plan succeeding in achieving its stated objectives

• Which elements of the plan have had the greatest influence in achieving the objectives.

• Are there any specific indicators that would be useful for a future evaluation of this multi-annual plan?

• Are there any additional data that should be collected in the future to help in evaluating the multi-annual plan?

• Should the plan be linked to other plans?

• Are there any elements of the plan that require revision? What are the proposals for revision?

ANNEX B COUNCIL REGULATION (EC) NO 2166/2005 OF 20 DECEMBER 2005.

Establishing measures for the recovery of the Southern hake and Norway lobster stocks in the Cantabrian Sea and Western Iberian peninsula and amending Regulation (EC) No 850/98 for the conservation of fishery resources through technical measures for the protection of juveniles of marine organisms

COUNCIL REGULATION (EC) No 2166/2005

of 20 December 2005

establishing measures for the recovery of the Southern hake and Norway lobster stocks in the Cantabrian Sea and Western Iberian peninsula and amending Regulation (EC) No 850/98 for the conservation of fishery resources through technical measures for the protection of juveniles of marine organisms

THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 37 thereof,

Having regard to the proposal from the Commission,

Having regard to the opinion of the European Parliament [1],

Whereas:

(1) Recent scientific advice from the International Council for the Exploration of the Sea (ICES) has indicated that the Southern hake and Norway lobster stocks in ICES Divisions VIIIc and IXa have been subjected to levels of mortality by fishing which have eroded the quantities of mature individuals in the sea to the extent that these stocks may not be able to replenish themselves by reproduction, and as result are threatened with collapse.

(2) Measures should be taken to establish multi-annual plans for the recovery of these stocks in conformity with Article 5 of Council Regulation (EC) No 2371/2002 of 20 December 2002 on the conservation and sustainable exploitation of fisheries resources under the Common Fisheries Policy [2].

(3) The objective of the plans should be to rebuild these stocks to safe biological limits within 10 years.

(4) The objective should be considered to be achieved when the stocks concerned are assessed by the Scientific, Technical and Economic Committee for Fisheries (STECF) to be within safe biological limits in the light of the most recent advice from ICES.

(5) In order to achieve that objective, the levels of the fishing mortality rates should be controlled so that the rates may be reduced from year to year.

(6) Such control of the fishing mortality rates can be achieved by establishing an appropriate method for the establishment of the level of Total Allowable Catches (TACs) of the stocks concerned, and a system including closed areas and limitations on kilowatt-days whereby fishing efforts on those stocks are restricted to levels at which the TACs may not be exceeded.

(7) Once recovery has been achieved, the Council should decide on a proposal from the Commission on follow-up measures in accordance with Article 6 of Regulation (EC) No 2371/2002.

(8) Control measures in addition to those laid down in Council Regulation (EEC) No 2847/93 of 12 October 1993 establishing a control system applicable to the common fisheries policy [3] should be included in order to ensure compliance with the measures laid down in this Regulation.

(9) The recovery of Norway lobster stocks requires certain areas of reproduction of the species to be protected from fishing. Therefore Regulation (EC) No 850/98 [4] should be amended accordingly,

[1] Opinion delivered on 14 April 2005 (Not yet published in the Official Journal).
[2] OJ L 358, 31.12.2002, p. 59.
[3] OJ L 261, 20.10.1993, p. 1. Regulation as last amended by Regulation (EC) No 768/2005 (OJ L 128, 21.5.2005, p. 1).
[4] OJ L 125, 27.4.1998, p. 1. Regulation as last amended by Regulation (EC) No 1568/2005 (OJ L 252, 28.9.2005, p. 2).

HAS ADOPTED THIS REGULATION:

CHAPTER I

SUBJECT MATTER AND OBJECTIVE

Article 1

Subject matter

This Regulation establishes a recovery plan for the following stocks (hereinafter referred to as the stocks concerned):

(a) the Southern hake stock which inhabits Divisions VIIIc and IXa, as delineated by the International Council for the Exploration of the Sea (ICES);

(b) the Norway lobster stock which inhabits ICES Division VIIIc;

(c) the Norway lobster stock which inhabits ICES Division IXa.

Article 2

Objective of the recovery plan

The recovery plan shall aim to rebuild the stocks concerned to within safe biological limits, in keeping with ICES information. This shall mean:

(a) as regards the stock referred to in Article 1(a), reaching a spawning stock biomass of 35 000 tonnes during two consecutive years, according to the available scientific reports, or increasing the quantities of mature individuals within a period of 10 years so that values are reached equal to or higher than 35 000 tonnes. This figure shall be adjusted in the light of new scientific data from the STECF;

(b) as regards the stocks referred to in Article 1(b) and (c), rebuilding the stocks to within safe biological limits within a period of 10 years.

Article 3

Evaluation of recovery measures

1. The Commission shall, on the basis of advice from ICES and STECF, evaluate the impact of the recovery measures on the stocks concerned and the fisheries on those stocks in the second year of application of this Regulation and in each of the following years.

2. Where the Commission finds, on the basis of the annual evaluation, that any of the stocks concerned have reached the objective set out in Article 2, the Council shall decide by qualified majority on a proposal from the Commission to replace, for that stock, the recovery plan provided for in this Regulation by a management plan in accordance with Article 6 of Regulation (EC) No 2371/2002.

3. Where the Commission finds, on the basis of the annual evaluation, that any of the stocks concerned do not show proper signs of recovery, the Council shall decide by qualified majority on a proposal from the Commission on additional and/or alternative measures in order to ensure recovery of the stock concerned.

CHAPTER II

TOTAL ALLOWABLE CATCHES

Article 4

Setting of TACs

1. Each year, the Council shall decide by qualified majority on the basis of a proposal from the Commission on a TAC for the following year for the stocks concerned.

2. The TAC for the stock referred to in Article 1(a) shall be set in accordance with Article 5.

3. The TACs for the stocks referred to in Article 1(b) and (c) shall be set in accordance with Article 6.

Article 5

Procedure for setting the TAC for the Southern hake stock

1. Where the fishing mortality rate for the stock referred to in Article 1(a) has been estimated by the STECF in the light of the most recent report of ICES to be above 0,3 per year, the TAC shall not exceed a level of catches which, according to a scientific evaluation carried out by the STECF in the light of the most recent report of ICES, will result in a reduction of 10 % in the fishing mortality rate in the year of its application as compared with the fishing mortality rate estimated for the preceding year.

2. Where the fishing mortality rate for the stock referred to in Article 1(a) has been estimated by the STECF in the light of the most recent report of ICES to be equal to or below 0,3 per year, the TAC shall be set at a level of catches which, according to a scientific evaluation carried out by the STECF in the light of the most recent report of ICES, will result in a fishing mortality rate of 0,27 per year in the year of its application.

3. Where STECF, in the light of the most recent report of ICES, is able to calculate a level of catches corresponding to the mortality rates specified in paragraphs 1 and 2 for only a part of ICES Divisions VIIIc and IXa, the TAC shall be set at a level that is compatible with both:

(a) the level of catch corresponding to the specified mortality rate in the area covered by the scientific advice, and

(b) maintaining a constant ratio of catches between that area covered by the scientific advice and the totality of Divisions VIIIc and IXa. The ratio shall be calculated on the basis of catches in the three years preceding the year in which the decision is taken.

The method of calculation used shall be that provided in the Annex to this Regulation.

Article 6

Procedure for setting the TACs for the Norway lobster stocks

Based on the latest scientific evaluation of the STECF, the TACs for the stocks referred to in Article 1(b) and (c) shall be set at a level that will result in the same relative change in its fishing mortality rate as the change in fishing mortality rate achieved for the stock referred to in Article 1(a) when applying Article 5.

Article 7

Constraints on variation in TACs

As from the first year of application of this Regulation, the following rules shall apply:

(a) where application of Article 5 or Article 6 would result in a TAC which exceeds the TAC of the preceding year by more than 15 %, the Council shall adopt a TAC which shall not be more than 15 % greater than the TAC of that year;

(b) where application of Article 5 or Article 6 would result in a TAC which is more than 15 % less than the TAC of the preceding year, the Council shall adopt a TAC which is not more than 15 % less than the TAC of that year.

CHAPTER III

FISHING EFFORT LIMITATION

Article 8

Effort limitation

1. The TACs referred to in Chapter II shall be complemented by a system of fishing effort limitation based on the geographical areas and groupings of fishing gear, and the associated conditions for the use of these fishing opportunities specified in Annex IVb to Council Regulation (EC) No 27/2005 of 22 December 2004 fixing for 2005 the fishing opportunities and associated conditions for certain fish stocks and groups of fish stocks, applicable in Community waters and, for Community vessels, in waters where catch limitations are required [1].

2. Each year, the Council shall decide by qualified majority on the basis of a proposal from the Commission on an adjustment to the maximum number of fishing days available for vessels subject to the system of fishing effort limitation referred to in paragraph 1. The adjustment shall be in the same proportion as the annual adjustment in fishing mortality that is estimated by ICES and STECF as being consistent with the application of the fishing mortality rates established according to the method described in Article 5.

3. By way of derogation from paragraphs 1 and 2, each Member State concerned may implement a different method of effort management in that part of Area IXa lying east of longitude 7°23′48″ W as measured according to the WGS84 standard. Such a method shall establish a reference level of fishing effort equal to the fishing effort deployed in the year 2005. For 2006 and subsequent years, the fishing effort shall be adjusted by an amount that shall be decided by qualified majority by the Council on the basis of a proposal by the Commission. This adjustment shall be proposed after considering the most recent advice from STECF in the light of the most recent report from ICES. In the absence of a decision by the Council, Member States concerned shall ensure that the fishing effort does not exceed the reference level.

4. Each Member State taking up the derogation in paragraph 3 may be requested by the Commission to provide a report on the implementation of any different method of effort management. The Commission will communicate this report to all other Member States.

5. For the purposes of paragraph 3, fishing effort shall be measured as the sum, in any calendar year, of the products across all relevant vessels of their installed engine power measured in kW and their number of days fishing in the area.

CHAPTER IV

MONITORING, INSPECTION AND SURVEILLANCE

Article 9

Margin of tolerance

1. By way of derogation from Article 5(2) of Commission Regulation (EEC) No 2807/83 of 22 September 1983 laying down detailed rules for recording information on Member States' catches of fish [2], the permitted margin of tolerance, in estimation of quantities of the stocks concerned, in kilograms retained on board of vessels shall be 8 % of the logbook figure. In the event that no conversion factor is laid down in Community legislation, the conversion factor adopted by the Member State whose flag the vessel is flying shall apply.

[1] OJ L 12, 14.1.2005, p. 1. Regulation as last amended by Regulation (EC) No 1936/2005 (OL L 311, 26.11.2005, p. 1).

[2] OJ L 276, 10.10.1983, p. 1. Regulation as last amended by Regulation (EC) No 1804/2005 (OL L 290, 4.11.2005, p. 10).

2. Paragraph 1 shall not apply if the quantity of the stocks concerned on board is less than 50 kg.

Article 10

Weighing of landings

The competent authorities of a Member State shall ensure that any quantity of the stock referred to in Article 1(a) exceeding 300 kg and/or 150 kg of the stocks referred to in Article 1(b) and/or (c) caught in any of the areas referred to in Article 1 shall be weighed using auction room scales before sale.

Article 11

Prior notification

The master of a Community fishing vessel that has been present in the areas referred to in Article 1 and who wishes to tranship any quantity of the stocks concerned that is retained on board, or to land any quantity of the stocks concerned in a port or a landing location of a third country, shall provide the competent authorities of the flag Member State with the following information at least 24 hours prior to transhipping or to landing in a third country:

— the name of the port or landing location,

— the estimated time of arrival at that port or landing location,

— the quantities in kilograms live weight of all species of which more than 50 kg is retained onboard.

This notification may also be made by a representative of the master of the fishing vessel.

Article 12

Separate stowage of Southern hake and Norway lobster

1. When quantities of the stock referred to in Article 1(a) greater than 50 kg are stowed on board a vessel, it shall be prohibited to retain on board a Community fishing vessel in a container any quantity of the stocks referred to in Article 1 mixed with any other species of marine organisms.

2. The masters of Community fishing vessels shall give Member States' inspectors such assistance as will enable the quantities declared in the logbook and the catches of the stocks concerned that are retained on board to be cross-checked.

Article 13

Transport of Southern hake and Norway lobster

1. The competent authorities of a Member State may require that any quantity of the stock referred to in Article 1(a) exceeding 300 kg or the stocks referred to in Article 1(b) and/or (c) exceeding 150 kg caught in any of the geographical areas referred to in Article 1 and first landed in that Member State is weighed before being transported elsewhere from the port of first landing.

2. By way of derogation from Article 13 of Regulation (EEC) No 2847/93, quantities of the stock referred to in Article 1(a) exceeding 300 kg which are transported to a place other than that of landing or import shall be accompanied by a copy of one of the declarations provided for in Article 8(1) of Regulation (EEC) No 2847/93 pertaining to the quantities of these species transported. The exemption provided for in Article 13(4)(b) of Regulation (EEC) No 2847/93 shall not apply.

Article 14

Specific monitoring programme

By way of derogation from Article 34c(1) of Regulation (EEC) No 2847/93, the specific monitoring programme for the stocks concerned may last for more than two years from its date of entry into force.

CHAPTER V

AMENDMENTS TO REGULATION (EC) NO 850/98

Article 15

Restrictions on fishing for Norway lobster

The following Article shall be inserted in Regulation (EC) No 850/98:

'Article 29b

Restrictions on fishing for Norway lobster

1. During the periods set out below fishing with:

(i) bottom trawls or similar towed nets operating in contact with the bottom of the sea, and

(ii) creels shall be prohibited in the geographical areas bounded by rhumb lines joining the following positions as measured according to the WGS84 standard:

(a) from 1 June to 31 August:

latitude 42°23′ N, longitude 08°57′ W

latitude 42°00′ N, longitude 08°57′ W

latitude 42°00′ N, longitude 09°14′ W

latitude 42°04′ N, longitude 09°14′ W

latitude 42°09′ N, longitude 09°09′ W

latitude 42°12′ N, longitude 09°09′ W

latitude 42°23′ N, longitude 09°15′ W

latitude 42°23′ N, longitude 08°57′ W;

(b) from 1 May to 31 August:

latitude 37°45′ N, longitude 09°00′ W

latitude 38°10′ N, longitude 09°00′ W

latitude 38°10′ N, longitude 09°15′ W

latitude 37°45′ N, longitude 09°20′ W.

2. By way of derogation from the prohibition laid down in paragraph 1, fishing with bottom trawls or similar towed nets operating in contact with the bottom of the sea in the geographical areas and during the period set out in paragraph 1(b) shall be authorised provided that the by-catch of Norway lobster does not exceed 2 % of the total weight of the catch.

3. By way of derogation from the prohibition laid down in paragraph 1, fishing with creels that do not catch Norway lobster shall be authorised in the geographical areas and during the period set out in paragraph 1(b).

4. In the geographical areas and outside the periods referred to in paragraph 1, the by-catch of Norway lobster may not exceed 5 % of the total weight of the catch.

5. In the geographical areas and outside the periods set out in paragraph 1, Member States shall ensure that the fishing effort levels of vessels fishing with bottom trawls or similar towed nets operating in contact with the bottom of the sea do not exceed the levels of fishing effort carried out by the vessels of the Member State concerned during the same periods and in the same geographical areas in 2004.

6. Member States shall communicate to the Commission their measures to fulfil the obligation laid down in paragraph 5. If the Commission finds that the measures of a Member State do not fulfil that obligation, it may propose amendments to those measures. In the absence of agreement on measures between the Commission and the Member State concerned, the Commission may adopt measures in accordance with the procedure referred to in Article 30(2) of Regulation (EC) No 2371/2002 (*).

(*) OJ L 358, 31.12.2002, p. 59.'

Article 16

Report on the recovery plan

The Commission shall submit a report to the European Parliament and the Council setting out the conclusions relating to the application of the recovery plan for the stocks concerned, including available socioeconomic data linked to the plan. This report shall be submitted by 17 January 2010.

CHAPTER VI

FINAL PROVISIONS

Article 17

Entry into force

This Regulation shall enter into force on the 20th day following its publication in the *Official Journal of the European Union*.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels, 20 December 2005.

For the Council

The President

M. BECKETT

ANNEX

Method for calculating a TAC for Divisions VIIIc and IXa for Southern Hake in the event that a scientific catch forecast is only available for part of the area

If scientific advice for catches from a subarea within Divisions VIIIc and IXa corresponding to the fishing mortality rate specified in Article 5 is x tonnes, the average catch from the same subarea in the three previous years is y tonnes, and the average catch from all of Divisions VIIIc and IXa in the previous three years is z tonnes, the TAC shall be calculated as zx/y tonnes.

ANNEX C: THE VALUE OF SOUTHERN HAKE RECOVERY PLAN. WHAT SHOULD HAVE HAPPENED IF IT WAS PERFECTLY IMPLEMENTED AND WHAT WILL HAPPEN IF IS NOT IMPLEMENTED?

Santiago Cerviño[1], Ernesto Jardim[2] and José María da Rocha[3]

[1] IEO

[2] IPIMAR

[3] University of Vigo (Spain)

Abstract

Introduction

The current plan in defined in Council Reg. CE 2166/2005, and it was implemented in 2006. The plan considers Southern hake and Norway lobster which inhabit in ICES Div VIIIc and IXa. The objective of the plan is to rebuild the stocks concerned to within safe biological limits in 10 years. For hake this means 35 000 t of SSB by 2016

As instruments to achieve the above objectives

- set TAC according with 10 % annual reduction in F until reach F=0.27.
- +-15% constrain on TAC regarding previous year TAC
- Effort limitation: reductions of days at see equivalent to F reduction

In the last STECF-SGMOS scooping meting (SGMOS Report, 2010) it was agreed to perform some simulations to assess the added value of the plan. The way we may do that is simulating what could have happened if the plan was not implemented. However the Southern hake recovery plan was not really implemented. Although the main plan instrument to get the goals is the F reduction, this did not happen and the F continues high in 2006-2009, being near three times Fmax (WGHMM, 2010), far from the plan expectations. To overcome this difficulty we decided to perform the simulations in the opposite way.

The aims of this simulation exercise are two: (1) to evaluate what had happened if the plan were implemented since 2006 and (2) evaluate what will happen if the plan is not implemented in the future.

Material and methods

Information used was coming from the WGHMM 2010 assessment results. GADGET software do not allows projections when there are small complications (e.g. TAC

constrains) like those in the current recovery plan. To implement that HCR a transformation of WGHMM results to age structured was implemented. These transformed results were checked to be consistent with the original ones (ICES INRB-IPIMAR REPORT 2010).

Three simulations were performed; one starting in 2006 assuming F recovery plan since then; another starting in 2010 assuming F recovery plan since then; and another starting in 2010 assuming F sq since then. The 3 were projected until 2030 when stability (with constant recruitment) was achieved. Initial conditions were set from GADGET transformed results for 2006-2010. Recruitment was set according with the geometric mean of years 1989-2008 with the exception of years 2006, 07 and 08 in 2006 projection, that were set according to the WGHMM 2010 results, i.e. 116740, 225110 and 111870 thousand respectively. M, weights, selection pattern and maturity were set equal in both simulations as the mean of years 2006-09, as described in next table.

Age	N 2006	N 2010	M	S land	S disc	W land	W disc	Mat	W pop
0	116740	90578	0.4	0.00	0.03	0.12	0.02	0.02	0.00
1	88764	59039	0.4	0.28	0.41	0.22	0.08	0.28	0.05
2	20607	27646	0.4	0.97	0.20	0.45	0.29	0.69	0.29
3	4241	14382	0.4	1.07	0.07	1.06	0.76	0.84	0.85
4	1294	1956	0.4	1.07	0.03	1.96	1.49	0.90	1.70
5	371	598	0.4	1.07	0.01	3.04	2.43	0.92	2.74
6	203	126	0.4	1.07	0.01	4.21	3.50	0.93	3.90
7	83	30	0.4	1.07	0.00	5.40	4.63	0.94	5.09
8	50	15	0.4	1.07	0.00	7.21	6.20	0.94	6.93

Table 1. Input values for projections.

The first year on projections were performed differently in both simulations. In 2006 projection, were a perfect implementation of the plan is implemented F in 2006 was set according with the plan. In 2010 projection, F in 2010 was set equal than F in 2009 (0.80), similar than the mean of last 3 years (0.82). The reason for this decision is that if the plan was not applied in recent years there is no reason to believe that is going to be applied in this year.

Discards ratio for projections was the same than those in 2009, quite similar than the mean in 2007-09. Constant selection pattern was assumed for both, landings and discards.

The plan targets were 35 kt of SSB in 2015, equivalent to Bpa, and an F = 0.27, equivalent to Fmax (WGHMM, 2004). Although the basis for Bpa cannot be reviewed in the light of last assessment, there are not strong reasons to think that an alternative SSB target could be more realistic. Fmax is easy to be reviewed, so the figure estimated with the last data was 0.25, that was used in this simulation as F target.

Results and discussion

Comparative projections between F plan since 2006 against F plan since 2010

Figure 1 summarizes the deterministic trajectories of simulations to assess what had happened if the plan was implemented.

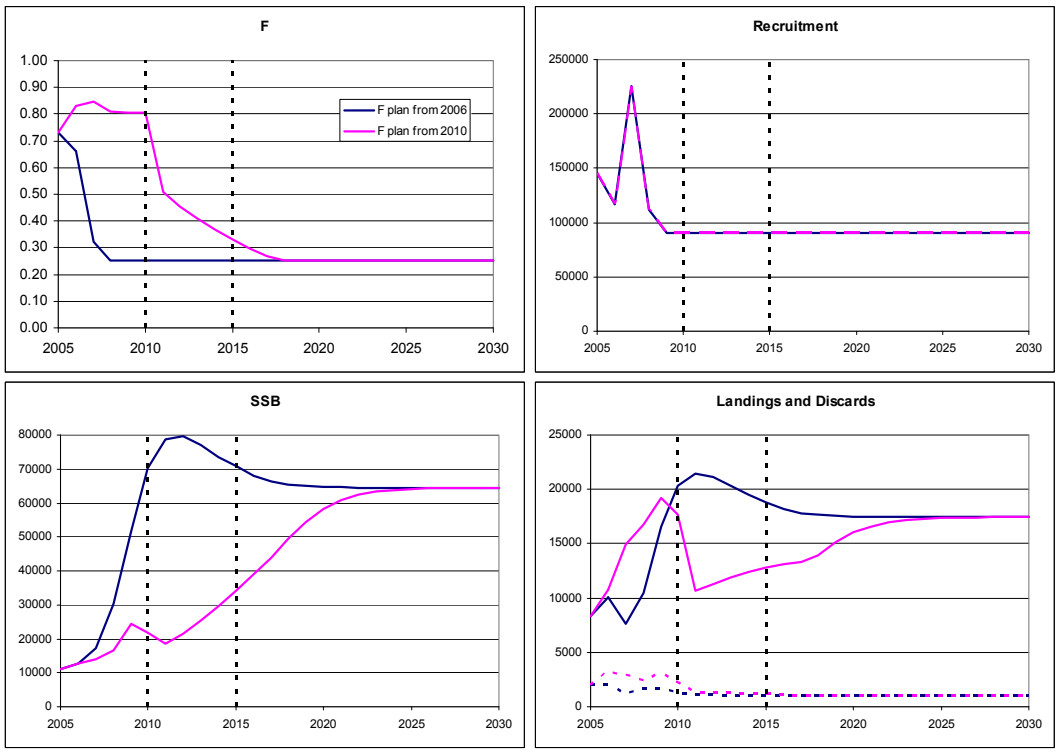

Figure 1. Comparative projections between F plan since 2006 / F plan since 2011. Fishing mortality, recruitment, SSB, landings and discards. Blue line represents the perfect implementation of the plan from 2006; and pink line represents the plan implementation after 2011 (F 2010 was assumed to be equal than F 2009). Vertical dashed lines (in 2010 and 2015) were set as references for comparison for these years.

Fishing mortality plot (figure 1 upper-left panel) shows that a perfect implementation of the plan would allow reaching the target in 2008. This is mainly caused by the strong F reduction in 2007 (from 0.66 in 2006 to 0.32 in 2007, instead of 0.59) induced by the TAC constrain. Otherwise, the simulation from 2010 starts with F equals to 0.80, similar that the estimated Fs, between 2005 and 2010. In this case, although the TAC

constrain also forces a heavy F reduction in 2011 (from0.80 to 0.51 instead of 0.72), this is not enough to allow reaching the F target (0.25) until 2018.

Recruitment plot (Figure 1, upper-right panel) shows the same trajectory for both simulations. After 2009 a geometric mean (90 578 thousand) was implemented. Between 2005 and 2008 the assessment results were implemented (WGHMM 2010). Notice that these results are well over the mean. These good recruitments were the responsible of the SSB improvement in recent years under such a high Fs.

SSB plot (figure 1 lower-left panel) shows that a perfect plan implementation since the beginning (2006) should allow to reach plan target (35 Kt) in 2009. This simulation shows a SSB peak in 2012 near 80 Kt; afterwards decreases until the equilibrium. This peak is caused by the good recruitments aforementioned. The simulation from 2010 (pink line) shows a decrease of SSB in 2011 and afterwards an increase until reach more than 35 Kt in 2016. SSB in 2010 could have reached 70 Kt if the plan were perfectly implemented (Table 2), this lack of implementation just allow to reach 22 Kt in 2010. In 2015 the differences are reduced although two times higher if the plan was implemented (71 against 34 Kt).

Landings plot (Figure 1, lower-right panel, continuous line). The no implementation of the plan, with higher Fs, produces an increase of yields between 2006-09above those produced by a perfect plan implementation. This is caused by the higher Fs; the cost is the slower SSB recovery but also the future yields. In 2010 yield trends crossed each other getting afterwards higher yield with lower Fs (perfect plan implementation). 20 vs 17.5 Kt in 2010; 21.5 vs 10.5 in 2011; 19 vs 13 in 2015; reaching equal yield (17.5 Kt) after 2015. The lost of yield is more important between 2010 and 2020 with a mean difference of about 6Kt.

Discards plot (Figure 1, lower-right panel, dashed line) shows higher discards when the plan was not accomplished. Before 2010 these discards are about two times higher. After 2010 these differences decreases until 2015 when both are quite similar.

Table 2 summarize some key results from the three simulations in 2010, 2015 and 2030.

	2010		**2015**			**2030 (equilibrium)**		
	proj 06 F plan	**Proj 10 F plan**	**proj 06 F plan**	**Proj 10 F plan**	**proj 10 Fsq**	**proj 06 F plan**	**Proj 10 F plan**	**proj 10 Fsq**
F	0.25	0.80	0.25	0.33	0.80	0.25	0.25	0.80
SSB	70260	21887	70877	34114	14013	64462	64451	13878
Landi	20302	17651	18846	12836	11910	17441	17438	11837
Disc	1359	2199	1039	1173	1868	1037	1037	1867

Table 2. Comparison of references for F, SSB, landings and discards among the three projections ("proj 06 F plan", "Proj 10 F plan", "proj 10 Fsq") in the current year (2010) and the last year of the recovery plan (2015).

Comparative projections between F plan since 2011 against F sq since 2011

Figure 2 summarizes the deterministic trajectories of simulations to assess what will happen if plan will not be implemented.

Fishing mortality plot (figure 2 upper-left panel) shows both trends. In these case, the non implementation of the plan was simulated assuming F = F 2009 for until 2030. The r**ecruitment** (Figure 2, upper-right panel) was constant and the same for both simulations.

SSB plot (figure 2 lower-left panel) shows that continue with this overfishing, the SSB should decreases until reach equilibrium after 2015 with 14 Kt, less than half than those produced by the plan. This high F does not drive the stock to strong depletion or collapse because a constant recruitment, independent of SSB, was simulated all the time.

Landings (Figure 2, lower-right panel, continuous line) are higher with higher Fs from 2011 to 2013, but afterwards the yield decreases stabilising at 12 Kt, far away from the 17.5 Kt at Fmax. **Discards** are always higher with higher Fs (Figure 2, lower-right panel, dashed line), a 50% higher at the beginning reaching a 80% at equilibrium (table 2).

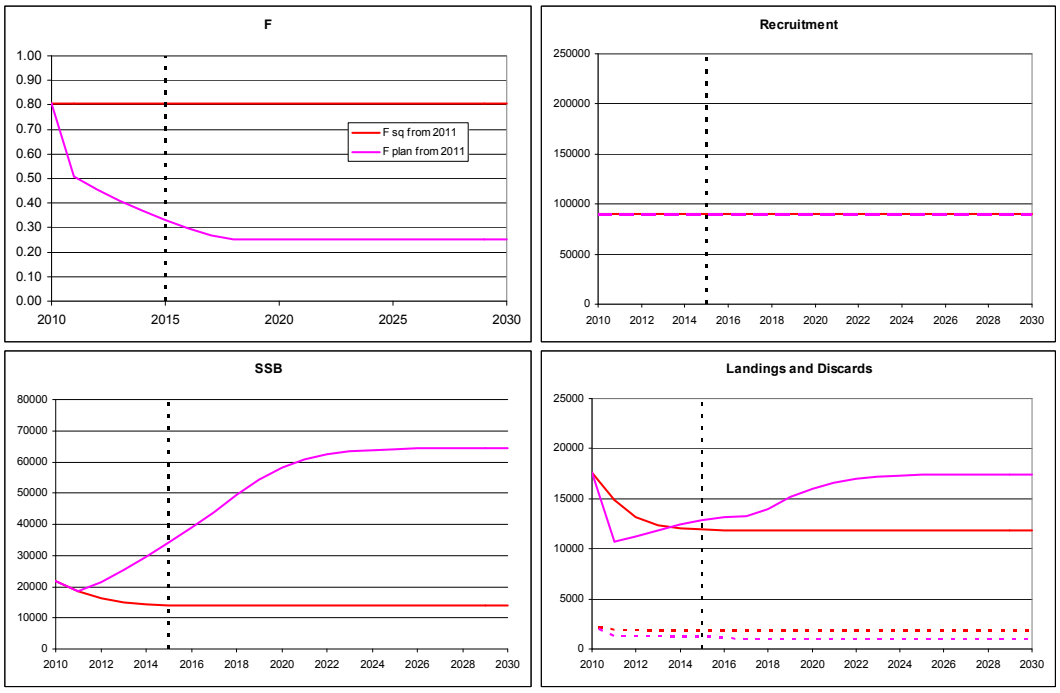

Figure 2. Comparative projections between F plan since 2010 (pink line) and F sq since 2010 (red line). Fishing mortality, recruitment, SSB, landings and discards. F 2010 was assumed to be equal than F 2009). Vertical dashed lines in 2015 were set as references for comparison.

Conclusions

This simulation exercise has some limitations we should consider before extract conclusion able to understand what could have happen if the plan was implemented after 2006 and what may happen if not implemented in the future. These are mainly: (1) the projections were performed deterministically; (2) no alternative scenarios were considered, particularly with recruitment were only a geometric mean was implemented. Both affect the absolute number provided by the simulation although in comparative terms this limitation may be partially relaxed; (3) there is not historical information about Southern hake dynamics at high abundance levels. The Fmax equilibrium projections produce SSBs over 70 Kt well above the historical maximum.

.

The cost of not having implemented the plan are:

1. the difficulties to reach Fmsy in 2015. And eventually the need of reducing the effort to reduce F to reach this goal.
2. The difficulty to reach SSB recovery. Given the unexpected good recruitments in 2004-07, the SSB goal may have been achieved well before initial expectations.
3. The lost of yield in future years and higher discards

The cost of not implementing the plan in the future are:

1. Avoid the recovery in terms of SSB, with a increase in the risk of collapse if future recruitments decreases
2. Lost in terms of yield and discards.

References

Council Reg. CE 2166/2005

ICES INRB-IPIMAR REPORT 2010

STECF-SGMOS scooping

WGHMM 2010

WGHMM 2004

ANNEX D THE VALUE OF SOUTHERN HAKE RECOVERY PLAN. PT. II. HOW BIG WAS THE ECONOMIC LOSS ASSOCIATED TO THE DELAY IN THE IMPLEMENTATION OF THE PLAN?

José María Da Rocha[1], Santiago Cerviño[2] and Ernesto Jardim[3]

[1] Universidad de Vigo, Facultad CC. Económicas, Campus Universitario Lagoas-Marcosende, C.P. 36200 Vigo, Spain.

[2] Instituto Español de Oceanografía, C. O. de Vigo, Cabo Estai-Canido, 36200 Vigo, Spain.

[3] IPIMAR, Av. Brasilia, 1449-006, Lisbon, Portugal.

Abstract

Current Southern hake and Nephrops recovery plan was enforced in 2006. The plan aimed to reduce F for saving biological limits in 10 years. However, the plan was not implemented; F remains relatively stable and well over the plan F target (Fmax). One of the request for the plan assessment is the added value of the plan. This is implemented simulating what should have happen if the plan had not been implemented. Since the plan had not been actually implemented, we propose an alternative analysis were what we show is what had happened if the plan had been implemented, i.e. if F after 2006 follows the plan. Our results show that i) The fishing mortalities trajectory for Scenario 1 (Recovery plan implemented since 2006) was close to the trajectory that maximizes the net present operational profits of the fleets; ii) Implementing the recovery plan from 2006, would have increased the net present profits for the whole period. iii) Moreover, after 2011 aggregate net present profits for all segments would always be higher if the plan had been implemented in 2006.

Introduction

The current plan was defined in Council Reg. CE 2166/2005, and implemented in 2006. The plan abranged the Southern hake and Norway lobster from the ICES Div VIIIc and IXa. The objective of the plan was rebuilding stocks to within safe biological limits in 10 years, being set this limit for hake in 35 000 t of SSB by 2016. As instruments to achieve the above objectives

- Set TAC according with 10 % annual reduction in F until reach F=0.27.
- +-15% constrain on TAC regarding previous year TAC
- Effort limitation: reductions of days at see equivalent to F reduction

In the last STECF-SGMOS scooping meting (SGMOS Report, 2010) it was agreed to assess the economic and social impact of the plan. However the Southern hake recovery plan was not really implemented. Figure 1 shows the first four years of plan implementation during which effort and Fishing mortality have been stable and far from

plan expectations[2]. As a consequence hake landings were higher than the recommended TAC.

The main objective of this paper is evaluating what would had been the economic impact of the plan if implemented as designed. That is, if Fishing mortality did decrease, landings were equal to the TACs, and total effort reduction was proportional to F reductions.

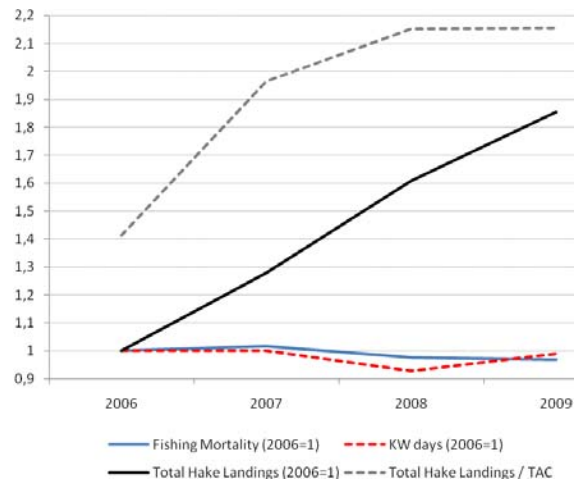

Figure 1. Fishing mortality, (kW*days at sea), landings in weight and landings over TAC.

Material and methods

Let us assume that the each fleet, *i,* is composed by n^i homogeneous vessels that target *j=1,…, J,* species. Landings of each representative vessel, l_t^j, are assumed to be proportional to the vessel fishing effort, e_t. We assume that there is a fixed operation cost, c_f, and fishing effort cost (fuel plus other variable running cost), w. Moreover, we consider that crew cost is a fraction ω^i of total landings in value. Therefore, the one period profit per vessel is equal to:

$$\pi_t^i = (1-\omega^i)\sum_{j=1}^{J} pr^j l_t^j(e_t) - w^i e_t - c_f^i .$$

Assuming that the species composition of landing is constant,

$$pr^{hake} l_t^{hake}(f_t) = \alpha^i \sum_{j=1}^{J} pr^j l_t^j(e_t)$$

and a linear relationship between effort and landings mortality, $f_t = q\ e_t$,[3] we can write vessel profits as a function of hake fishing mortality

[2] See SGMOS 10-06b for a full description of effort trends.

[3] Between 2006-2009, In the Southern Stock of Hake total effort was (more or less) constant and average c.p.u.e. increased. The biological model estimated a (more or less) constant Fishing mortality between 2006 and 2009. This suggests a linear relationship between F's and effort. Moreover, assuming a liner relationship between F's and effort, the model produces c.p.u.e. that increase between 2006-2009.

$$\pi_t^i = \frac{pr^{hake}}{\alpha^i} l_t^{hake}(f_t)(1-\omega^i) - \frac{w^i}{q^i} f_t - c_f^i ,$$

where α^i is the hake dependency and q is the catchability parameter. Finally, using that

$$l_t^{hake}(f_t) = \frac{s_t^i}{n^i} L_t^{hake}(F_t)$$

profits per vessel can be written as a function of total hake landings

$$\pi_t^i = \frac{s_t^i}{n^i}\left[\frac{pr^{hake}(1-\omega^i)}{\alpha^i}\sum_a L_t^a(F_t) - \frac{w^i}{q^i} F_t\right] - c_f^i .$$

If we assume that price of hake is given by $pr^{hake} = A_p\left[\sum_a L_t^a(F_t)\right]^{-\varepsilon}$

we can write each fleet's profits as

$$\pi_t^i = \frac{s_t^i}{n^i}\left\{\frac{A_p(1-\omega^i)}{\alpha^i}\left[\sum_a L_t^a(F_t)\right]^{1-\varepsilon} - \frac{w^i}{q^i} F_t\right\} - c_f^i$$

Therefore, fishery profits are equal to

$$\sum_{i=1}^{fleets} n^i \pi_t^i = A_p \sum_{i=1}^{fleets} s_t^i \frac{(1-\omega^i)}{\alpha^i}\left[\sum_a L_t^a(F_t)\right]^{1-\varepsilon} - \sum_{i=1}^{fleets} s_t^i \frac{w^i}{q^i} F_t - \sum_{i=1}^{fleets} n^i c_f^i$$

where $\sum_{i=1}^{fleets} s_t^i \frac{(1-\omega^i)}{\alpha^i}$ and $\sum_{i=1}^{fleets} s_t^i \frac{w^i}{q^i}$ are respectively the average landings margin (total income after crew share) and the average cost per fishing mortality unit (fuel plus other running cost).

Note that the key variable for computing total profits is $\sum_{i=1}^{fleets} n^i c_f^i$. Although this information is not available, it can be guessed assuming that profits between 2006 and 2009 were non-negative. Therefore, fleet fixed costs can be obtained by solving

$$c_f^i = \min \frac{s_t^i}{n_t^i}\left\{\frac{pr^{hake}(1-\omega^i)}{\alpha^i} L_t^{hake} - \frac{w^i}{q^i} F_t\right\} \forall t = 2006,...,2009$$

Note, that for calculating the fixed cost per vessel, c_f^i, we need to calibrate 6 parameters:

- Crew share ω^i and $\frac{w^i}{q}$ running cost (fuel plus other running cost) per fishing mortality unit.
- Hake dependency, α^i, and hake price, pr^{hake}.
- The share of each fleet on total landings, s_t^i, and the number of vessels in each fleet, n^i.

Using DCF data and SGMOS 10-05 database (see appendix 1) we compute each fleet's Hake dependency, crew, fuel and variable cost as a fraction of total value; and yearly share on total hake landings. Finally, using Galician data we estimate that the price elasticity, ε is equal to -0.28. Tables 1 and 2 summarize this information.

	number of vessels				hake landings share				hake dependency	
	2006	*2007*	*2008*	*2009*	*2006*	*2007*	*2008*	*2009*	*mean*	*std*
POR 3a IIB72ab	15	3	5	7	0,18%	0,02%	0,03%	0,06%	0,058	0,022
POR 3b IIB72ab	48	23	34	42	0,41%	0,24%	0,14%	0,29%	0,512	0,112
SPN 3a IIB72ab	20	23	24	25	13,61%	12,70%	12,31%	13,07%	0,336	0,117
SPN 3b IIB72ab	32	33	31	33	4,25%	5,47%	5,60%	5,04%	0,460	0,154
SPN 3c IIB72ab	89	91	96	104	2,44%	3,39%	6,63%	8,73%	0,839	0,098
POR 3a none	53	53	49	42	4,69%	3,26%	3,42%	3,12%	0,103	0,021
POR 3b none	41	47	41	38	2,49%	3,04%	3,29%	2,11%	0,765	0,033
POR 3c none	12	16	18	15	0,42%	0,14%	0,20%	0,31%	0,908	0,049
POR 3d none	228	225	255	248	3,25%	2,35%	0,82%	1,16%	0,180	0,077
SPN 3a none	64	69	67	63	52,82%	50,58%	44,60%	42,18%	0,351	0,099
SPN 3b none	81	95	104	97	13,04%	15,82%	18,04%	17,64%	0,634	0,170
SPn 3c none	43	50	54	61	1,05%	1,40%	2,57%	3,96%	0,903	0,035
SPn 3d none	451	474	454	430	1,34%	1,59%	2,35%	2,35%	0,087	0,041

Table1a: Number of vessels, hake landing shares and hake dependency by gear, special conditions (specon) and country. Source: SGMOS 10-05 data base.

	fuel		*crew*		*var*	
	mean	*std*	*mean*	*std*	*mean*	*std*
POR 3a	0,218	0,043	0,317	0,105	0,129	0,064
POR 3b	0,299	0,178	0,201	0,162	0,160	0,136
POR 3c	0,098	0,063	0,390	0,289	0,170	0,119
POR 3t	0,077	0,012	0,252	0,069	0,164	0,081
SPN 3a	0,230	0,051	0,311	0,030	0,237	0,083
SPN 3b	0,244	0,226	0,350	0,190	0,112	0,033
SPN 3c	0,139	0,047	0,341	0,050	0,310	0,075
SPN 3t	0,077	0,012	0,252	0,069	0,164	0,081

Source: DCF data

Table 1b: Fuel, crew and variable cost share on Total income by gear and country.

Source: The 2009 Annual Economic Report on the European Fishing Fleet Report.

Hake Landings (t)	**11803**
hake price (Eur)	4,30
price elasticity	*-2,803*
Aprice	*59,546*
Value Hake (M Eur)	**50,75**
1/hake dependency	*2,704*
landins margin	1,869
Fishing Income (M Eur)	**137,24**
Crew share (M Eur)	**42,40**
crew share ratio	*0,309*
Fuel Cost (M Eur)	**30,33**
fuel cost ratio	*0,221*
Variable Cost (M Eur)	**28,55**
variable cost ratio	*0,208*
Total Running Cost (M Eur)	**58,87**
F0	0,823
Cost per unit of effort (M Eur)	73,593
Value Added (M Eur)	**78,36**
Gross Cash Flow (M Eur)	**35,96**
% over Fishing Income	*0,262*
Long Run reference point	
Discount factor (beta)	*0,95*
F maximizes NP Profits	**0,223**
% Fmax	*0,856*

Table 2: Calibration.

Two simulations were performed:

- scenario 1 represents the trajectories if the Recovery plan had been perfectly implemented since 2006;
- scenario 2 represents the trajectories associated to real landings between 2006-2010, and a perfect implementation of a Recovery Plan since 2011.

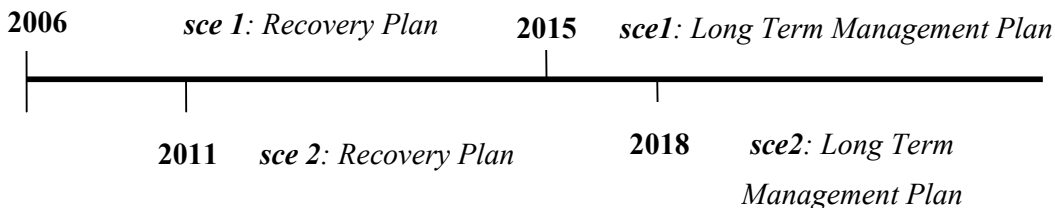

Figure 2: Dates in each scenario.

In both scenarios, we assume that once the Recovery Plan is over, a Long Term Management Plan (LTMP) is implemented. We assume that in the LTMP fishing mortality trajectories maximize the net present profits (see Grafton, Kompas and Hilborn (2007), Da Rocha, Cerviño and Gutierrez (2010)). That is, after the recovery plan we define fishing mortalities by solving

$$\max \sum_{t=0}^{\infty} \beta^t \left\{ A_p \sum_{i=1}^{fleets} s_t^i \frac{(1-\omega^i)}{\alpha^i} \left[\sum_a L_t^a(F_t) \right]^{1-\varepsilon} - \sum_{i=1}^{fleets} s_t^i \frac{w^i}{q^i} F_t - \sum_{i=1}^{fleets} n^i c_f^i \right\}$$

subject to the age structured model (Appendix 3). Note, that the main difference between scenarios is the delay in the implementation of both the recovery and the long term management plans. Figure 2 summarizes these differences.

Results and discussion

Figure 3 summarizes the deterministic trajectories of fishing mortality, SSB, Landings in Value and Operational profits for each scenario. In order to have a measure of the recovery plan optimality, we also compute the trajectories associated to the fishing mortalities that maximize the net present profits since 2006.

Given these deterministic biological trajectories, 2000 replications were performed for the economic parameters. Each one of these replications used the mean and standard deviation values reported in Tables 1 and 2 for simulating each fleet's hake dependency, crew fuel and variable cost share. For each replication, a different fixed cost was calibrated for each fleet. For every fixed cost, profit per vessel was computed. Figure 4, left panel, shows the accumulated net present profits in time $T, \sum_{t=0}^{T} \beta^t \sum_{i=1}^{fleets} n^i \pi_t^i$, associated with each scenario using a discount factor equal to 0.95. Figure 5, right panel, shows the difference in the net present profits (in log units) between scenario 1 and 2, during 2006-2009 for each fleet. This difference is a measure of the potential loss associated to the delay on the plan implementation. Finally in appendix 3 we reported economic indicators associated with the scenarios.

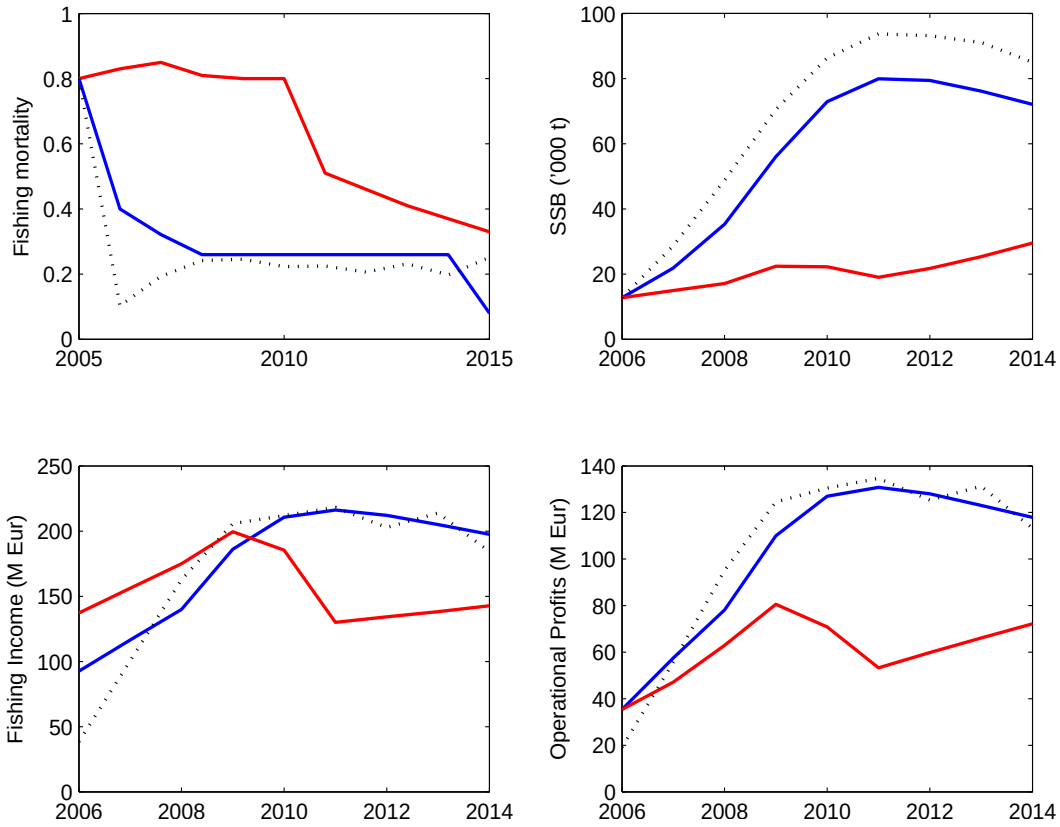

Figure 3. Comparative projections between F plan since 2006 / F plan since 2011. Fishing mortality, SSB, Yield in value and Operational Profits. Blue line represents the perfect implementation of the plan from 2006; and red line represents the plan implementation after 2011 (F 2010 was assumed to be equal than F 2009). Black dotted line represents the trajectories associated with the F's that maximizes net present profits since 2006 (optimal-drastic implementation).

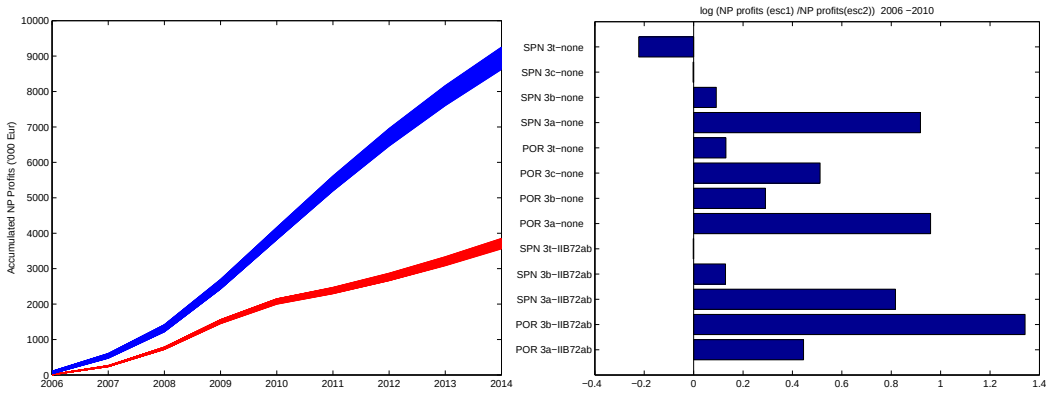

Figure 4. The left panel shows the comparative economic benefits between F plan since 2006 / F plan since 2011. Left panel shows the Accumulated Discounted Profits. Blue line represents the perfect implementation of the plan from 2006; and red line represents the plan implementation from 2011. Right panel shows the difference in net present profits (in log units) between scenario 1 and 2.

The main results of the simulations are:

i) The fishing mortalities trajectory for Scenario 1 (Recovery plan implemented since 2006) was close to the trajectory that maximizes the net present operational profits of the fleets.
ii) Implementing the recovery plan from 2006, would have increased the net present profits for the whole period.
iii) Moreover, after 2011 aggregate net present profits for all segments would always be higher if the plan had been implemented in 2006.

This simulation exercise has some limitations we should consider. These are mainly: (1) the projections were performed deterministically; (2) no alternative scenarios were considered, particularly with recruitment were only a geometric mean was implemented. Both affect the absolute number provided by the simulation although in comparative terms this limitation may be partially relaxed; (3) there is not historical information about Southern hake dynamics at high abundance levels.

Moreover, these results do depend on the assumptions of stability in the fleet behaviour (constant selectivity pattern). However, considering the need of reducing the mortality on hake, the selectivity pattern may change with time in response to fishing opportunities. Given the great differences in the hake dependency from the various fleets, the general response shown in figures 5.2, 3 and 4 may be different.

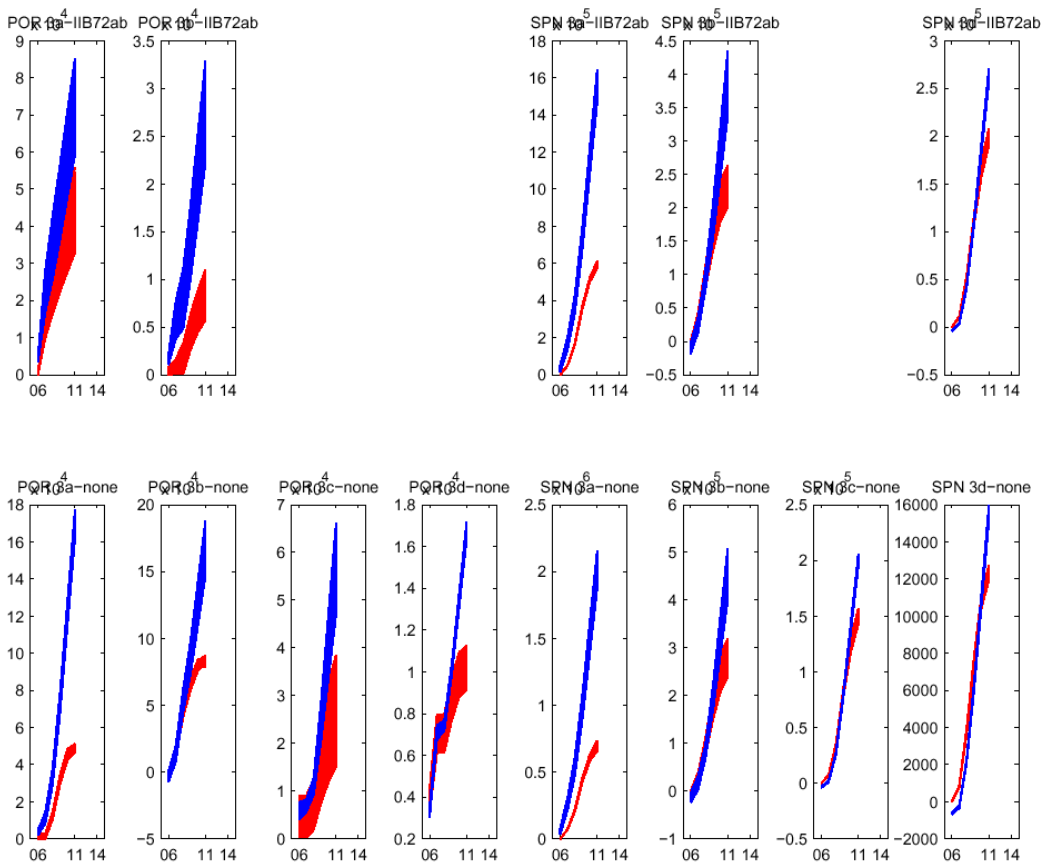

Figure 5. Accumulate discounted profits per vessel (1000 simulations). Blue line represents the perfect implementation of the plan from 2006; and red line represents the plan implementation since 2011.

References

Cerviño, S., E. Jardim and J.M. da Rocha. 2010. The value of Southern hake recovery plan. I. What should have happened if it had been perfectly implemented and what will happen if is not implemented? Working Document for STECF- SGMOS 10-06b. Vigo, October 2010

Da Rocha, J.M., Cerviño, S., and M.J. Gutierrez, 2010. An endogenous bioeconomic optimization algorithm to evaluate recovery plans: an application to southern hake. ICES Journal of Marine Science 67.

Frost, H., J.L. Andersen, A. Hoff and T. Thøgersen. 2009. The EIAA Model Methodology, Definitions and Model Outline. Report no. 200. Institute of Food and Resource Economics, Copenhagen.

Grafton, R.Q., Kompas, T. and R. W. Hilborn, (2007), Economics of Overexploitation Revisited. Science 318, 1601.

Appendix 1: Data sources

	Fishing Income ('000 €)				Hake Landings in value ('000 €)			
Segment	*2006*	*2007*	*2008*	*2009*	*2006*	*2007*	*2008*	*2009*
POR 3a IIB72ab	1846,6	372,2	300,8	533,8	56,1	12,6	16,8	42,0
POR 3b IIB72ab	215,7	192,2	214,6	482,6	128,7	121,8	88,2	210,0
SPN 3a IIB72ab	13371,7	20663,2	20521,7	17107,3	4230,6	6426,0	7841,4	9588,6
SPN 3b IIB72ab	4421,6	5069,3	6106,7	5680,5	1320,0	2767,8	3565,8	3696,0
SPN 3c IIB72ab	1020,2	1934,4	4452,8	6703,5	759,0	1713,6	4225,2	6405,0
POR 3a none	14038,0	20957,2	21636,9	17493,1	1458,6	1650,6	2175,6	2289,0
POR 3b none	973,6	1929,0	2552,3	2079,7	775,5	1537,2	2095,8	1545,6
POR 3c none	138,7	85,4	141,6	247,0	132,0	71,4	126,0	226,8
POR 3t none	3711,0	12629,4	3940,4	4579,7	1009,8	1188,6	525,0	852,6
SPN 3a none	53880,1	78289,0	74376,1	59060,2	16420,8	25594,8	28408,8	30954,0
SPN 3b none	9776,4	11248,9	15160,0	16583,5	4052,4	8005,2	11491,2	12944,4
SPN 3c none	361,8	779,6	1694,9	2998,2	326,7	709,8	1638,0	2906,4
SPN 3t none	7510,3	11556,5	10794,2	13758,1	415,8	802,2	1495,2	1722,0

Source: SGMOS 10-05

Landings and fleet partition

Fleet is partitioning by

- Country:
  - Portugal (POR) and
  - Spain (SPN),
- Gear:
  - bottom trawler mesh sizes >32 mm (a),
  - gillnet > 60 mm (b),
  - bottom longline and
  - other (c),and trammel nets(t) and
- Special conditions:
  - not subject to effort limitation (IIb72ab),
  - subject to effort limitations (none)

SGMOS 10-05 database was used to compute landings (in weight) and the number of vessels by gear, specon and country. To compute the hake dependency we consider the Landings of HKE, ANG, BSF, WHB, RAJ, WRF, MAC, COE, SOL, NEP, JAX and Sum of all other species (SAO) (see Landings_and_prices_by_species.xls)

To compute the fishing income we use Portuguese prices from Tables A4.19.1-19.4 reported in "The 2009 Annual Economic Report on the European Fishing Fleet".

Hake (HKE)	from Table A4.8.1, Demersal trawl and demersal seiner 12m - 24m.
Anglerfishes Nei (ANF)	from Table A4.8.1, Demersal trawl and demersal seiner 12m - 24m.
Black scabbardfish (BSF)	from Table A4.19.3, Gears using hooks 12m - 24m.
Blue whiting (WHB)	from Table A4.19.1, Demersal trawl and demersal seiner 12m - 24m.
Raja rays nei (RAJ)	from Table A4.19.1, Demersal trawl and demersal seiner over 40m.
Wreckfish (WRF)	from Table A4.19.3, Gears using hooks 12m - 24m.
Chub mackerel (MAC)	from Table A4.19.2, Pelagic trawl and demersal seiner 12m - 24m.
European conger (COE)	from Table A4.19.3, Gears using hooks 0m - 12m.
Common sole (SOL)	from Table A4.19.4, Drift nets and fixed nets 12m - 24m.

Norway lobster (NEP)	from Table A4.19.1, Demersal trawl and demersal seiner over 24 - 40m.
Atlantic horse mackerel (JAX)	from Table A4.19.1, Demersal trawl and demersal seiner 12m - 24m.

Economic Parameters

For calculating crew share (Crew / Total Income), fuel share (Fuel / Total Income) and variable cost share (Var Cost / Total Income) we use Tables A3.20.1-20,3 and Tables A3. 6.1-6.3 from "The 2009 Annual Economic Report on the European Fishing Fleet" (see Economic_Parameters_DCF_2009.xls). We also compute the operational profits (1-crew share-fuel share-variable cost share) in order to check, for each fleet segment, if fishing is profitable or not.

Portugal										
	D.Trawl and seiners 12m-24m				*D.Trawl and seiners 24m-40m*					
3a	**2003**	**2004**	**2005**	**2006**	**2003**	**2004**	**2005**	**2006**	*MEAN*	*STD*
Fuel per vessel	0,22	0,21	0,14	0,25	0,21	0,21	0,20	0,30	0,22	0,04
Crew share	0,54	0,30	0,26	0,40	0,31	0,25	0,24	0,23	0,32	0,11
Var cost	0,05	0,16	0,12	0,09	0,20	0,23	0,08	0,09	0,13	0,06
	Drift and fixed nets 12m-24m				*Drift and fixed nets 24m-40m*					
3b	**2003**	**2004**	**2005**	**2006**	**2003**	**2004**	**2005**	**2006**	*MEAN*	*STD*
Fuel per vessel				0,17				0,42	0,30	0,18
Crew share				0,31				0,09	0,20	0,16
Var cost				0,06				0,26	0,16	0,14
	Gears using hooks 12m-24m				*Gears using hooks 24m-40m*					
3c	**2003**	**2004**	**2005**	**2006**	**2003**	**2004**	**2005**	**2006**	*MEAN*	*STD*
Fuel per vessel		0,08		0,18	0,03	0,10			0,10	0,06
Crew share		0,33		0,82	0,21	0,21			0,39	0,29
Var cost		0,23		0,00	0,27	0,18			0,17	0,12
Spain										
	D.Trawl and seiners 12m-24m				*D.Trawl and seiners 24m-40m*					
3a	**2003**	**2004**	**2005**	**2006**	**2003**	**2004**	**2005**	**2006**	*MEAN*	*STD*
Fuel per vessel	0,17	0,22	0,30	0,27	0,16	0,20	0,25	0,27	0,23	0,05
Crew share	0,36	0,35	0,32	0,30	0,27	0,30	0,28	0,30	0,31	0,03
Var cost	0,15	0,15	0,15	0,24	0,37	0,31	0,29	0,24	0,24	0,08
	Drift and fixed nets 12m-24m				*Drift and fixed nets 24m-40m*					
3b	**2003**	**2004**	**2005**	**2006**	**2003**	**2004**	**2005**	**2006**	*MEAN*	*STD*
Fuel per vessel	0,05	0,06	0,06	0,09		0,51	0,40	0,53	0,24	0,23
Crew share	0,44	0,47	0,61	0,45		0,18	0,18	0,11	0,35	0,19
Var cost	0,14	0,11	0,06	0,16		0,10	0,12	0,09	0,11	0,03
	Gears using hooks 12m-24m				*Gears using hooks 24m-40m*					
3c	**2003**	**2004**	**2005**	**2006**	**2003**	**2004**	**2005**	**2006**	*MEAN*	*STD*
Fuel per vessel	0,09	0,10	0,14	0,16	0,11	0,11	0,19	0,22	0,14	0,05
Crew share	0,38	0,42	0,39	0,35	0,29	0,28	0,31	0,31	0,34	0,05
Var cost	0,38	0,28	0,24	0,22	0,42	0,26	0,30	0,39	0,31	0,08
Portugal and Spain										
	Pots and traps 0m -12m				*Gears using hooks 0m-12m*					
3t	**2003**	**2004**	**2005**	**2006**	**2003**	**2004**	**2005**	**2006**	*MEAN*	*STD*
Fuel per vessel				0,06	0,09	0,08	0,08	0,08	0,08	0,01
Crew share				0,14	0,29	0,24	0,28	0,31	0,25	0,07
Var cost				0,03	0,18	0,19	0,18	0,25	0,16	0,08

Portugal										
	D.Trawl and seiners 12m-24m				*D.Trawl and seiners 24m-40m*					
3a	**2003**	**2004**	**2005**	**2006**	**2003**	**2004**	**2005**	**2006**	*MEAN*	*STD*
operational profits	0,19	0,32	0,48	0,25	0,28	0,31	0,48	0,39	0,34	0,10
	Drift and fixed nets 12m-24m				*Drift and fixed nets 24m-40m*					
3b	**2003**	**2004**	**2005**	**2006**	**2003**	**2004**	**2005**	**2006**	*MEAN*	*STD*
operational profits				0,45				0,23	0,34	0,15
	Gears using hooks 12m-24m				*Gears using hooks 24m-40m*					
3c	**2003**	**2004**	**2005**	**2006**	**2003**	**2004**	**2005**	**2006**	*MEAN*	*STD*
operational profits		0,36		0,00	0,49	0,51			0,34	0,24
Spain										
	D.Trawl and seiners 12m-24m				*D.Trawl and seiners 24m-40m*					
3a	**2003**	**2004**	**2005**	**2006**	**2003**	**2004**	**2005**	**2006**	*MEAN*	*STD*
operational profits	0,32	0,28	0,23	0,18	0,20	0,19	0,18	0,18	0,22	0,05
	Drift and fixed nets 12m-24m				*Drift and fixed nets 24m-40m*					
3b	**2003**	**2004**	**2005**	**2006**	**2003**	**2004**	**2005**	**2006**	*MEAN*	*STD*
operational profits	0,38	0,35	0,27	0,30	1,00	0,21	0,29	0,27	0,38	0,25
	Gears using hooks 12m-24m				*Gears using hooks 24m-40m*					
3c	**2003**	**2004**	**2005**	**2006**	**2003**	**2004**	**2005**	**2006**	*MEAN*	*STD*
operational profits	0,15	0,21	0,23	0,28	0,17	0,35	0,21	0,08	0,21	0,08
Portugal and Spain										
	Pots and traps 0m -12m				*Gears using hooks 0m-12m*					
3t	**2003**	**2004**	**2005**	**2006**	**2003**	**2004**	**2005**	**2006**	*MEAN*	*STD*
operational profits				0,22	0,56	0,50	0,54	0,64	0,49	0,16

Operational profits=(1-crew share-fuel share-variable cost share)

Finally, we did not compute each fleet's employment provided the unlikelihood of the available data, i.e., the "The 2009 Annual Economic Report on the European Fishing Fleet", reported for the Portuguese D.Trawl and seiners 12m-24m 267 employments for 48 vessels in 2005 and 848 for 26 vessels in 2006, or for Spanish D.Trawl and seiners 24m-40m fleet reported 8273 employments in 2005 and 1216 in 2006.

Appendix 2

Age structured model information comes from ICES WGHMM 2010 assessment results. Initial conditions were set from GADGET transformed results for 2006-2010 (see Cerviño *et al* 2010).

Age	N 2006	M	S land	S disc	W land	W disc	Mat	W pop
0	116740	0.4	0.00	0.03	0.12	0.02	0.02	0.00
1	88764	0.4	0.28	0.41	0.22	0.08	0.28	0.05
2	20607	0.4	0.97	0.20	0.45	0.29	0.69	0.29
3	4241	0.4	1.07	0.07	1.06	0.76	0.84	0.85
4	1294	0.4	1.07	0.03	1.96	1.49	0.90	1.70
5	371	0.4	1.07	0.01	3.04	2.43	0.92	2.74
6	203	0.4	1.07	0.01	4.21	3.50	0.93	3.90
7	83	0.4	1.07	0.00	5.40	4.63	0.94	5.09
8	50	0.4	1.07	0.00	7.21	6.20	0.94	6.93

Table 3. Age structured model

Appendix 3: Economic Indicators

Following the EIAA methodology l (Frost et al. 2009), Value Added is defined as

$$\sum_{i=1}^{fleets} n^i \pi_t^i = A_p \sum_{i=1}^{fleets} s_t^i \frac{1}{\alpha^i} \left[\sum_a L_t^a(F_t) \right]^{1-\varepsilon} - \sum_{i=1}^{fleets} s_t^i \frac{w^i}{q^i} F_t$$

and cash flow is equal to

$$\sum_{i=1}^{fleets} n^i \pi_t^i = A_p \sum_{i=1}^{fleets} s_t^i \frac{(1-\omega^i)}{\alpha^i} \left[\sum_a L_t^a(F_t) \right]^{1-\varepsilon} - \sum_{i=1}^{fleets} s_t^i \frac{w^i}{q^i} F_t \, .$$

	2006	2007	2008	2009	2010	2011	2012	2013	2014
					F				
sce 1	**0,83**	0,85	0,81	0,80	0,80	0,51	0,46	0,41	0,37
sce 2	0,40	0,32	0,26	0,26	0,26	0,26	0,26	0,26	0,26
opt F	0,10	0,19	0,24	0,25	0,22	0,22	0,21	0,23	0,20
					SSB (t)				
sce 1	12768	14957	17093	22407	22221	19044	21759	25341	29548
sce 2	12768	21845	35303	56048	72945	79939	79474	76151	72087
opt F	12768	28661	48786	70536	86349	93768	93170	91100	85076
					Hake Landings (t)				
sce 1	**11803**	14125	16540	19846	17922	10943	11445	11912	12467
sce 2	6833	9396	12129	18025	21410	22197	21619	20615	19584
opt F	2013	7655	14946	20708	21585	22474	20295	21877	17777
					Hake price				
sce 1	**4,30**	4,09	3,91	3,72	3,82	4,39	4,34	4,29	4,23
sce 2	5,01	4,58	4,27	3,82	3,64	3,60	3,63	3,68	3,73
opt F	7,06	4,85	4,02	3,67	3,63	3,59	3,69	3,62	3,83
					Fishing Income ('000 Eur)				
sce 1	**137236**	156166	174954	199474	185355	129961	134223	138142	142747
sce 2	92605	116456	139949	186128	210668	216211	212143	205009	197577
opt F	38426	100487	162652	205673	211905	218151	202712	213966	184279
					Gross Cash Flow = Operational Profits ('000 Eur)				
sce 1	**35422**	47071	62917	80577	70821	53300	59824	66112	72157
sce 2	**35361**	**57466**	**78098**	**110008**	**126966**	**130797**	**127986**	**123056**	**117920**
opt F	19199	55622	95100	124559	130484	134678	125322	131289	113208

					Fishing Running Cost ('000 Eur)				
sce 1	61082	62554	59610	58874	58874	37532	33853	30173	27229
sce 2	29437	23655	19134	19134	19134	19134	19134	19134	19134
opt F	7562	14205	17783	18061	16397	16522	15173	17033	14532
					Crew Share ('000 Eur)				
sce 1	40732	46541	52426	60022	55660	39128	40546	41857	43361
sce 2	27808	35335	42717	56985	64568	66280	65024	62819	60523
opt F	11666	30660	49769	63054	65025	66951	62218	65644	56540
					Value Added ('000 Eur)				
sce 1	**76154**	**93613**	115343	140599	126481	92428	100370	107969	115518
sce 2	63168	92801	120815	166993	191533	197077	193009	185875	178443
opt F	30865	86282	144869	187612	195508	201630	187540	196933	169748

ANNEX E DECLARATIONS OF EXPERTS

Declarations of invited experts are published on the STECF web site on https://stecf.jrc.ec.europa.eu/home together with the final report.

European Commission

EUR 24631 EN – Joint Research Centre – Institute for the Protection and Security of the Citizen

Title: Scientific, Technical and Economic Committee for Fisheries. Report on the meeting on Multi-annual Plan Evaluations Impact Assessments: d) Evaluation of multi-annual plan for hake and Nephrops in areas VIIIc and IXa

Author(s): John Simmonds, Heleen Bartelings, Jörg Berkenhagen,,Jose Maria Da Rocha Alvarez, Margit Eero, Leyre Goti, Joakim Hjelm, Tore Jakobsen, Sven Kupschus, David Miller, Arina Motova, Rasmus Nielsen Tom Peatman, Tiit Raid, Robert Scott, Cristina Silva, Valentin Trujillo, Willy Vanhee and Christopher Zimmermann

Luxembourg: Publications Office of the European Union
2010 – 61 pp. 21 x 29.7 cm
EUR – Scientific and Technical Research series – ISSN 1831-9424
ISBN 978-92-79-18745-2
doi:10.2788/56371

Abstract

This report is one five parts of the report of SG MOS 10-06, the STECF sub group on management objectives and strategies dealing with historic Evaluations of and future Impact Assessments of multi-annual plans for fisheries. In total five separate reports are prepared by STECF-SGMOS 10-06 WGs, the first, scoping meeting report STECF-SGMOS 10-06a. contained preparatory work, the other four report the individual assessments:-

STECF-SGMOS 10-06b Report of the Impact Assessments for North Sea plaice and sole multiannual management.

STECF-SGMOS 10-06c Report of the Impact Assessments for Western Channel sole multiannual management.

STECF-SGMOS 10-06d. Report of the Evaluations of Southern hake and Nephrops Multi-annual plan

STECF-SG MOS 10-06e. Report of the Evaluations of Baltic cod Multi-annual plan

This report describes an evaluation of the performance of the multi-annual plan for fisheries of southern hake and Nephrops in ICES sub divisions VIIIc an IXa.

How to obtain EU publications

Our priced publications are available from EU Bookshop (http://bookshop.europa.eu), where you can place an order with the sales agent of your choice.

The Publications Office has a worldwide network of sales agents. You can obtain their contact details by sending a fax to (352) 29 29-42758.

The mission of the JRC is to provide customer-driven scientific and technical support for the conception, development, implementation and monitoring of EU policies. As a service of the European Commission, the JRC functions as a reference centre of science and technology for the Union. Close to the policy-making process, it serves the common interest of the Member States, while being independent of special interests, whether private or national.

JRC
EUROPEAN COMMISSION

The Scientific, Technical and Economic Committee for Fisheries (STECF) has been established by the European Commission. The STECF is being consulted at regular intervals on matters pertaining to the conservation and management of living aquatic resources, including biological, economic, environmental, social and technical considerations.

LB-NA-24631-EN-N

Publications Office

ISBN 978-92-79-18745-2

9 789279 187452