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COMMISSION STAFF WORKING DOCUMENT

Accompanying document to the

Commission's proposal for a

COUNCIL REGULATION

establishing a long-term plan for the anchovy stock in the Bay of Biscay and the fisheries exploiting that stock

IMPACT ASSESSMENT

COM(2009)399 final
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PREFACE: CHANGES TO THE WORKING DOCUMENT FOLLOWING THE IA BOARD'S OPINION

This final version of the Impact Assessment report takes into account the opinion given by the Commission's Impact Assessment Board on 4th March, 2009. In particular:

– the scientific background of the proposal and its repercussions on the problem definition and objectives have been redrafted to make the report more user friendly;

– the use of economic instruments has been moved to the problem section and different operational elements and implementation measures, as well as the reasons for choosing the Harvest Control Rule based management system have been better explained;

– the explanation on how the recommended risk levels of the long-term plan would comply with the precautionary approach has been given and the differences between the sub-options and reasons for selecting the preferred option have been made clearer;

– the information on the anchovy fleets and the processing industry since the ban was introduced has been provided and clarity to the discussion of impacts has been added.

EXECUTIVE SUMMARY

The Impact Assessment concerns a draft proposal that would set long-term management objectives and implementing methods concerning a fishery for anchovy (*Engraulis encrasicolus*) in the Bay of Biscay. This short-lived pelagic species is of great socioeconomic importance for a number of ports and fishermen on the Cantabrian Coast of Spain and the French Atlantic Coast.

The scope of the proposal is of medium importance, covering up to 50 million EUR in terms of catch value. Approximately 300 vessels and some 3000 at-sea jobs and about 16,000 tonnes of fish catch for human consumption were involved in fishing for anchovy in 2004 before the fishery was closed. These figures illustrate the effect of the proposal, which is intended to deliver stability and sustainability to the fishery. Two fleets operating in the area are Spanish purse seiners and French purse seiners and pelagic trawlers.

The stock is susceptible to large inter-annual fluctuations in abundance caused mainly by variations in recruitment, driven by environmental factors. Recruitment of young fish into the fishery has been very low since 2001. Recruitment of the 2004 year class was particularly low, which resulted in a decline of the stock and led to the closure of the fishery in the second half of 2005. The fishery has remained closed ever since.

The proposal covers the conditions for re-opening the fishery, and its subsequent management, as a function of the size of the stock. It is intended by DG MARE as a further step in steering decision-making under the Common Fisheries Policy (CFP) towards a long-term framework that is compatible with international obligations and with the CFP objectives themselves. In spring 2009 the fishery is closed following scientific advice that estimates the stock's biomass as being below limit values (B_{lim}). Only when the fishery is safe to re-open, could a long-term plan be applicable to determine the rates of fishing that can take the stock from recovery to maximum sustainable yield. It is, however, important to stress that the proposal assessed in this report does not aim at achieving a high level of biomass but rather at finding the best way to manage the risk of the fishery needing to be closed again.

The impact assessment has been preceded by thorough scientific evaluation by relevant scientific and Stakeholder Committees.

Under the CFP several operational elements can be considered in achieving a sustainable management of a fishery. These are:

- setting a fixed TAC;
- introducing technical measures, including time/area closures to protect mature fish (spawners) and/or juvenile fish;
- introducing provisions on capacity and effort to adapt them to catch possibilities;
- incorporating economic instruments, i.e. market measures;
- encouraging a better cooperation between interested parties.

Due to specific needs of this short-lived species and given the fact the fishery has been closed for a number of years, putting a management plan in place was selected as the most feasible alternative to the current annual decision-making system. Effort control on pelagic species is ineffective and therefore a harvest rate based management approach to setting the TAC was selected as preferable in managing anchovy to an effort limiting regime. Complementary measures, like those described above, can be used to further improve the plan but they will not be discussed in this report. In order to include different components and to take into account both technical and capacity issues in the fishery, two main options and three additional sub-options have been tested:

- Option 1 – No policy change;
- Option 2 – Long-term plan with 3 alternative sub-options;

2.1. Rule A - a strategy with relatively higher TAC levels but higher collapse risks;

2.2. Rule B - a strategy with relatively lower TAC levels and lower collapse risks;

2.3. Rule C - a strategy being a compromise between options A and B.

Further analysis indicated that a system based on a TAC set mid-year according to the June scientific advice, with a harvest rule establishing the annual TAC level automatically would be the preferred management option for the stock. The system would also include provisions on a closure when biomass is below a certain threshold.

Details of consultation processes, options and impacts are provided.

Lead DG: DG MARE

Other involved services: DG ENV

Agenda planning reference: 2008/MARE/021

1. PROCEDURAL ISSUES AND CONSULTATION OF INTERESTED PARTIES

1.1. Organisation and Timing

This impact assessment concerns a proposal for a Council Regulation establishing a long-term plan for the stock of anchovy in the Bay of Biscay[3] and the fisheries exploiting that stock. Its development is foreseen in Agenda Planning (MARE/2008/021) and in the 2008 Annual Management Plan of the Directorate-General of Maritime Affairs and Fisheries under the specific objective "Conservation and Management of Fish Resources" (to propose and negotiate measures, including multi-annual management plans, for the conservation and management of Community fish stocks, joint stocks and stocks partly occurring in international waters, with a view to ensuring the exploitation of fish stocks at maximum sustainable yield levels, taking into account broader environmental, economic and social concerns and making the best use of harvested fish resources, especially by avoiding wasteful discard practices).

The reform of the Common Fisheries Policy set the basis in 2002 for implementing long-term plans rather than a short-term approach based on openly negotiable annual decisions. Management of resources based on long-term plans is best geared to ensure that the exploitation of living aquatic resources provides sustainable economic, environmental and social conditions.

The adoption of a proposal concerning a management plan for anchovy is one of the main outputs for 2008 that was planned in respect of the foregoing objective. The adoption of the proposal is foreseen in the first quarter of 2009.

DG MARE has discussed this legislative initiative with DG ENV, as the associated service primarily concerned. Much progress has been achieved through these consultations, particularly during the summer/autumn months of 2008. The outcome of these discussions has provided the essential elements for the inter-service dialogue and steering work under the formal impact assessment procedure reported here. The draft report has been endorsed by the group.

1.2. Consultation and expertise

The Commission has sought advice for the adoption of management measures for the stock from relevant scientific organisations. The impact assessment is prepared by DG MARE on the basis of scientific advice concerning long-term management, including environmental, social and economic analyses of the possible scenarios. Consultation with stakeholders has taken place with the relevant representative body, namely the South Western Waters Regional

[3] Reference is made to the stock of anchovy distributed in EC waters of ICES Subarea VIII.

Advisory Council (SWWRAC)[4]. This process started in 1999, was then set aside before being taken up again in 2007.

As early as in 1999 the Commission requested the Scientific, Technical and Economic Committee for Fisheries (STECF) to produce an extended risk analysis for the stock of anchovy taking into account the scientific analysis carried out by ICES[5] in respect of this stock. STECF's risk analysis showed, under different multi-annual management strategies, the consequences on the sustainability of the resource expressed in terms of risk of collapse and on the total annual yield. The evaluations included a test which looked at how the fishery operates under different factors in order to simulate different responses of the fleet to resource availability and assess its robustness (for example, whether the capacity of the fleet is adequate to benefit from, or show resilience to, fluctuations in the recruitment of young fish into the fishery). On that basis, the Commission sought to promote the idea of a long-term management for the stock among stakeholders. The latter, however, rejected this approach at that point in time, preferring to stick to year-to-year management decisions.

Given the poor situation of the stock, the Commission decided to push for the long term approach once again in 2007. In November of that year, DG MARE produced a consultation document setting out the possible elements of a Commission proposal. That document was then discussed with Member States, the scientific community and SWWRAC. All recommendations that the SWWRAC produced in this framework were thoroughly analyzed before being incorporated into the Commission's long-term management plan proposal for anchovy.

Accordingly, STECF provided the necessary scientific basis for the proposal. Two scientific meetings took place in 2008 with the aim to update the advice on management provided in 1999. Assuming the stock's recovery as a work hypothesis, they were to evaluate the economic impact for the fishing sector concerned stemming from high risk-high yield and low-risk lower yield strategies, as well as social impacts. The first meeting of the specific working group took place on 14-18 April in Hamburg and reported to STECF Spring plenary (Report STECF/SGBRE-08-01[6]). Managing pelagic species by effort control is generally considered ineffective. A management plan based on harvest rate approach to setting TAC was therefore considered by scientists as an alternative worth pursuing. The group evaluated two basic harvest control rules (HCR) and set the basis for an economic evaluation of the two management approach scenarios (in terms of the returns of the fisheries to the sector). Given

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[4] This body has been established as the main body to provide the Commission with feedback and input regarding the implementation of the Common Fisheries Policy in respect of south-western waters fish stocks. The SWW RAC advises the Commission on a consensus basis between the fisheries sector and the civil society organisations that compose its membership. The Commission has a permanent advisory committee in place (ACFA, the Advisory Committee on Fisheries and Aquaculture) dealing with cross-cutting issues. It was not consulted on this plan since the proposal concerns a specific regional issue for which SWW RAC is competent.

[5] ICES stands for International Council for the Exploration of the Sea. Since 1999 this international organisation is the main provider of independent scientific advice to the Commission for the development and implementation of the Common Fisheries Policy. ICES collates the expertise of fisheries scientists mostly working in the national fisheries laboratories of Member States and provides a systematic and standardised advice to the European Community and to Member States.

[6] STECF/SGBRE-08-01 Working Group Report On Long-term Management of Bay of Biscay Anchovy https://stecf.jrc.ec.europa.eu/docs?p_p_id=20&p_p_lifecycle=0&p_p_state=normal&p_p_mode=view&p_p_col_id=column-1&p_p_col_count=2&_20_struts_action=%2Fdocument_library%2Fview&_20_folderId=40341

paucity of data and shortage of time, the economic evaluation performed was considered preliminary. A second STECF group met in San Sebastian, Spain on 2–6 June, 2008. The group carried out further socio-economic evaluation of the management plan[7].

On its part, the SWWRAC delivered its views and recommendations on a management approach for anchovy by letter in July 2008[8], indicating

- a general support for regulating the exploitation rate of the stock and putting a management plan based on a harvesting rule in place;
- a preference for establishing such plan according to the scenario which consists of catching a constant proportion of the stock spawning biomass (Rule B, details in Annex 2), with a maximum TAC[9] of 33,000 t and an exploitation rate of 0.4.

The RAC also commented on the possible measures to further complement the plan, indicating:

- need for strict and rigorous control of the fishery, whereby Member States concerned would implement a weekly catch reporting system to be integrated into a control programme developed and coordinated by the European Fisheries Control Agency.
- scrutiny reservation on the issue of adapting fishing effort to catch possibilities was also expressed. The RAC hopes to be involved in drawing up adjustment plans with the Member States concerned.

Moreover, the SWWRAC suggested that it is possible that the anchovy biomass could have entered a phase of natural decline owing not to the effects of fishing, but rather to a combination of environmental factors. They suggested that if this assumption was to prove true, it would be better to conceptualise management of the fishery under a scenario in which high levels of biomass and a high level of recruitment are exceptional events. Such a scenario would necessarily imply new work for the scientists and would certainly have direct consequences for management of the anchovy fishery.

1.3. Dissemination of scientific advice and the results of consultations with stakeholders

The scientific advice from ICES[10] and from STECF[11] and the recommendations from the SWWRAC[12] are available on the websites of the respective committees. Moreover, brief summaries of STECF and RAC recommendations are given in Annex 3.

2. PROBLEM DEFINITION

2.1. Issue requiring action

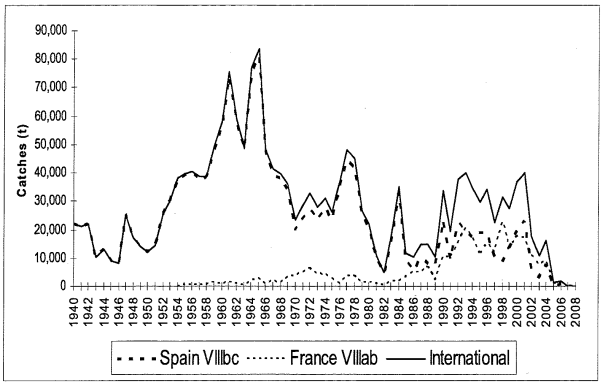
Since 1999, ICES and STECF have been regularly advising the Commission that restrictions in anchovy fishing were needed in light of the precautionary approach. The Council, however,

[7] www.ccr-s.eu/EN/download.asp?../Upload/EN/Agenda/DocsAnnexes/Report_2nd_STECF_Anchovy_Meeting.pdf
[8] http://www.ccr-s.eu/EN/avis.asp?id=17#bottom
[9] Total Allowable Catch.
[10] http://www.ices.dk/committe/acom/comwork/report/2008/2008/ane-bisc.pdf
[11] https://stecf.jrc.ec.europa.eu/
[12] http://www.ccr-s.eu

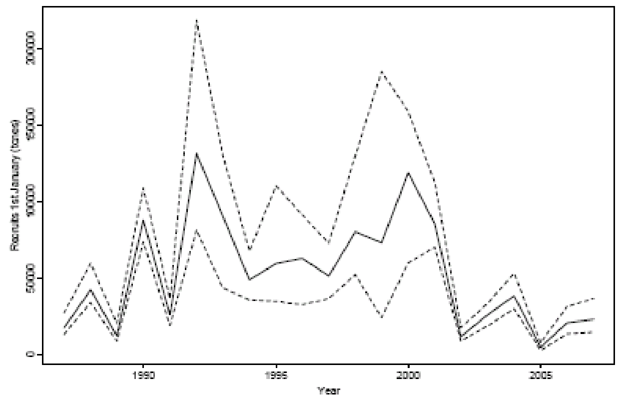
chose not to follow this scientific advice and decided on non-restrictive annual TACs. As a result the spawning biomass of the stock has gradually decreased, and with it, the ability of the resource to renew itself. This process led to the fishery's collapse in 2005, when the lowest ever levels of catches were recorded. The fishery has been closed ever since, which has afforded the stock some space to breathe. However, current levels are still weak and recruitment[13] of individuals into the fishery is strongly dependent on environmental conditions.

The graphs below illustrate a general decreasing trend in terms of catches, recruitment, spawning stock biomass (SSB) and harvest rate levels for the stock of anchovy in the Bay of Biscay:

Catches in tonnes



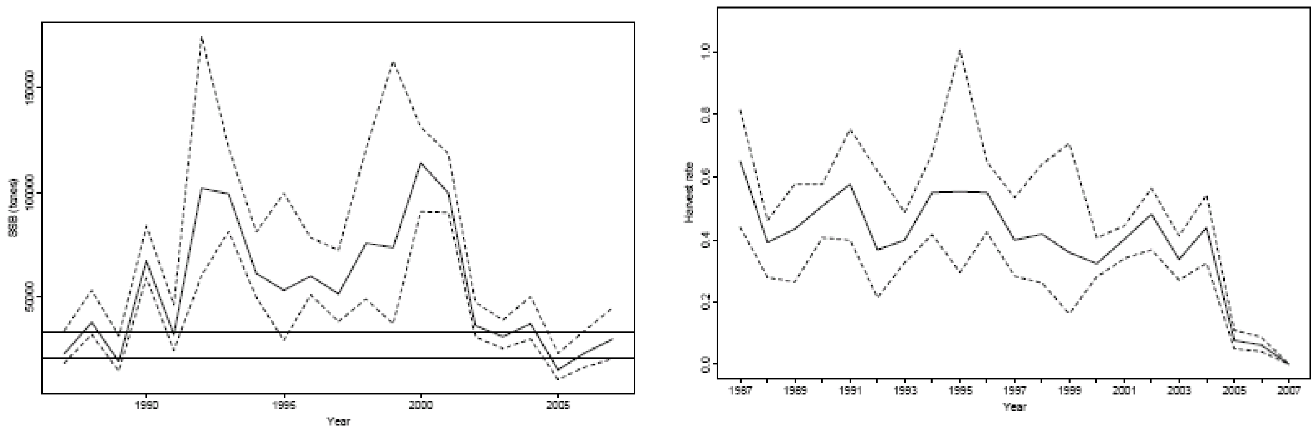
Recruitment in tonnes



Spawning stock biomass (SSB) in tonnes

Harvest rates (Catch/SSB)

13 Recruitment is the process by which fish enter the exploitable stock and become susceptible to fishing (age/growth related).



Source: ICES - From top left to bottom right posterior median (solid line) and 95% credible intervals (dotted lines) for the recruitment series (in tonnes), the spawning stock biomass and the harvest rates (Catch/SSB). The horizontal solid lines in the SSB graph correspond to the biological reference points Blim (21,000 tonnes) and Bpa (33,000 tonnes).

The graphs above illustrate the manner in which short-term management has led the stock to minimum levels and imposed the closure of the fishery. They demonstrate that the management based on annual TAC is not adequate to conserve this short-lived stock at exploitable levels. Anchovy is a species with a short lifespan and a high natural mortality of 1.2 (which means that average life expectancy of an anchovy is just 1.2 years). It is therefore susceptible to considerable fluctuations. A season of low recruitment will produce a high risk of a fall in the stock's spawning biomass to very low levels. This risk can be mitigated, but only if the rule is to establish the fishing possibilities as a set harvesting proportion of the stock. The rapid dynamics of this short-lived stock impose well-defined criteria to fix the formula under which the harvest rate can be determined so that the stock is rebuilt to MSY in the long-term.

Latest surveys indicate that since 2006 recruitment has shown a slightly increasing trend, however in 2007 it was still among the lowest of the historical series together with 1989, 2002, 2005 and 2006.

2.2. Underlying driving forces

The main long-term drivers of the fisheries management system are the biological limitations on the productivity of the stock. Reducing the stock size to a low level can (while maintaining high catches for a short period) lower the productive potential of the stock in the longer term or even cause the stock to collapse. In contrast, in short-term perspectives it can often be economic and social pressures which predominate and lead to decisions on fishing opportunities that can ultimately become unsustainable.

The point at which precautionary action must be taken to safeguard a fish stock is defined by limit reference points. For the stock of anchovy in the Bay of Biscay ICES estimated two important biomass target levels:

- The minimum acceptable stock biomass (B_{lim}), was set at 21,000 t. If the biomass falls below this level, the stock is in danger of a reduced reproductivity or even a stock collapse.
- The precautionary biomass level (B_{pa}) set for the stock at 33,000 t. This target level tells us where ideally we would like the stock levels to be.

Based on the most recent estimates of anchovy biomass levels (SSB), ICES classifies the stock as being at risk of reduced reproductive capacity. SSB in 2008 was estimated to have a 23% probability of being below safe target levels for the stock ($B_{lim,}$=21,000 t). Low recruitment since 2002 and almost complete recruitment failure of the 2004 year class are the primary causes of the low stock size. The recruitment at age 1 in 2008 was lower than in 2006 and 2007, and was the second lowest in the time-series. Anchovy is a short-lived species, with the fishable stock consisting primarily of one-year-old fish. The estimate of recruitment at age 1 is, therefore, a key factor in determining a TAC.

ICES recommends that the fishery should remain closed until the stock condition has improved. The stock condition can be re-evaluated when estimates of the 2009 SSB and 2008 year class are available based on the spring 2009 acoustic and egg surveys. This implies a closure of the fishery until at least June 2009. Once the fishery re-opens, an effective regime based on long-term targets and principles of sustainability should be put in place.

2.3. Industry/market management considerations

In the context of seeking ways to achieve improved management of fish stocks, the use of economic instruments should be considered as a necessary corollary of stock management. Under some conditions, such instruments may actually become the cornerstone of the management system itself. It is recognised that economic instruments can increase the efficiency and cost-effectiveness of environmental management, create incentives for investment and generate financial resources for preserving biodiversity.

If well designed and used within the right policy and enforcement framework, economic instruments such as fiscal instruments and charges, financial assistance or the introduction of property rights and liability systems can increase returns to activities that conserve valuable biological diversity while discouraging behaviour that is detrimental to species and ecosystems.

However, in this particular case, an approach to managing what represents an essentially fragile if not volatile fish stock based solely on this kind of instrument would not seem appropriate. This is a stock that needs a robust management regarding its harvest. Market forces alone, in a context where third-country imports are easily available to the processing and canning sector, are not guaranteed to provide the economic resilience that the harvesting fleets require. In addition, the current scope of measures taken under the CFP is limited in terms of the means of intervention available to the EU legislator to have a direct influence of the evolution of the markets and the actual returns of the fleets, focusing instead on fleet capacity adjustments through medium term-programmes with the support of structural funding available in the framework of the European Fisheries Fund (EFF)[14] .

To sum up, the use of economic instruments like fiscal incentives, trade protection measures and others could not by itself purport to ensure an adequate implementation of the Policy's management principles. Not least due to the sharing of responsibilities between the Community (policy development and general regulatory framework) and the Member States (implementation, enforcement vis-à-vis individuals), the system is not geared to ensure the CFP objectives in respect of the stocks and the fishermen that exploit them through these instruments alone. The Council is required to fix annually the fishing opportunities for this stock, even if it is as presently, to fix them at zero. TACs and quotas are thus the result of the

[14] http://europa.eu/scadplus/leg/en/lvb/l66004.htm

CFP's core business and cannot be dispensed with except where the Council should take a specific decision not to regulate this fishery. In such conditions, however, the system results in no limits to the freedom to fish.

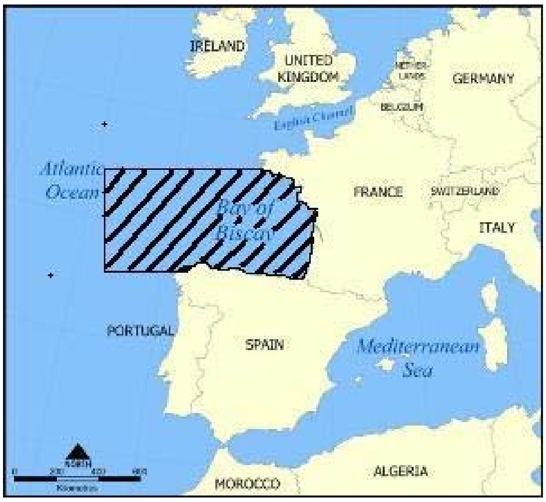
2.4. Effect on the sector

2.4.1. Identification of the sectors affected

Presently the fishery is closed. Usually two fleets operate on anchovy in the Bay of Biscay: Spanish purse seiners and a French fleet of both purse seiners and pelagic trawlers. The national fleets targeting anchovy are spatially and temporally well separated. The pattern of each fishery is considered well established. In general (1992-2004), most of Spanish landings (85 %) are usually caught in divisions VIIIc and VIIIb in spring, while 35 % of the French landings are caught in divisions VIIIb in the first half of the year and 65% in summer and autumn in division VIIIa.

Figure 1 - Distribution of anchovy in the Bay of Biscay

(approximate area of distribution marked in black)



Spain owns 90% of the fishing rights on anchovy and the remaining 10% belongs to France. However, under several bilateral agreements concluded since 1991 between France and Spain, part of the Spanish quota has been transferred to France. Because of this and other political arrangements the actual catches of both countries have been quite similar and since the beginning of the 90's the percentage of catches by country has been almost equal (= 50%) (Figure 2)

2.4.2. Fleet characteristics

Spanish purse seine fleet

The Spanish fleet is composed of purse seiners (about 200 vessels) that operate at the south-eastern corner of the Bay of Biscay (in Divisions VIIIc and b), mainly in spring, when usually more than 80% of the Spanish annual catches take place. This fleet is composed of vessels from different Autonomous Communities of the North of Spain (Galicia, Asturias, Cantabria and Basque Country). However, most of the anchovy catches made by this fleet (about 90%) are landed in Basque Country ports due to their proximity to the anchovy fishing grounds. The bulk of this fleet switches to tuna fisheries during summer and then uses small anchovies as live bait. These catches are not landed but the observations collected from logbooks and fisherman interviews (up to 1999) indicate that they are supposed to be less than 5 % of the total Spanish catches. The Spanish fleet has not been active in subarea VIIIa since 2002.

French pelagic trawlers

The French anchovy fishery is mainly conducted by pair trawlers (72 vessels in 2004). The fishery normally starts at the beginning of the year in the centre of the Bay of Biscay. Progressively, the fishery moves south (generally in April). After a voluntary break of the pelagic fishery (bilateral agreement) in April and May, the fishery moves back north, and may reach the northern part of VIIIa in August or September. Later, the fishery returns to the centre of the bay. The major fishing areas are the north of the VIIIb in the first half of the year and VIIIa, mainly, during the second half. The French pelagic fleet does not fish in area VIIIc.

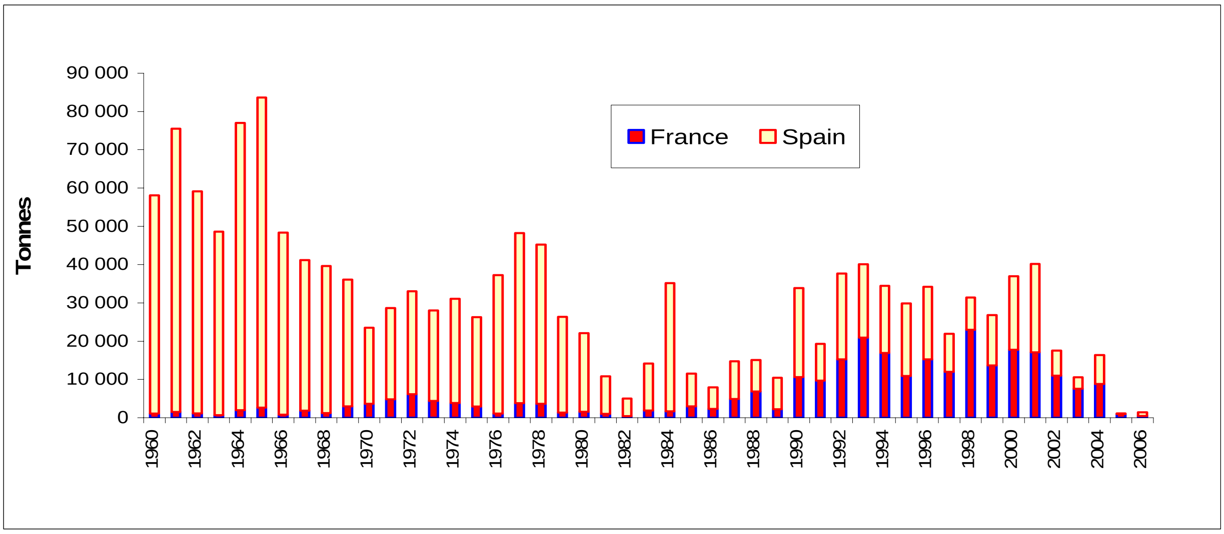
A specific characteristic of this fishery is its variability, meaning that many pelagic trawlers can catch a small amount of anchovy at least once a year. Therefore, the number of vessels that fish anchovy with a pelagic trawl can be very variable. A threshold of 50 tons is the consensus criterion to distinguish vessels that target anchovy from those that enter this fishery occasionally on an opportunistic basis.

French purse seiners

French purse seiners (24 vessels in 2004) target mainly sardine and catch anchovy on an opportunistic basis. They operate around their home harbour, in coastal waters. Some French purse seiners located in the Basque country fish mainly in spring in VIIIb and the ones from Brittany fish occasionally for anchovy during autumn in the north of the Bay of Biscay.

2.4.3. Evolution of the sector

Figure 2 - Historical evolution of the anchovy fishery since 1960



Source: STECF

The stock of anchovy in the Bay of Biscay has followed a downward trend since 1999. In 2005, spawning stock biomass and recruitment hit critical levels and the fishery was closed. As a result, catches and harvest rate levels followed the similar pattern.

The volume of landings has followed a decreasing trend from 37,000 tonnes in 2000 to 16,000 tonnes in 2004. During the same period the price increased with the effect of a relative constant landing value of around 50 million Euros. Apart from 2000 and 2001, the French pelagic trawlers and purse seines accounted for the biggest share of the landing value. The largest difference is evident in 2003 when the French landings amounted to 71 % of the total value of anchovy (Figure 2 and Table 2).

Table 2 - Anchovy landings and value

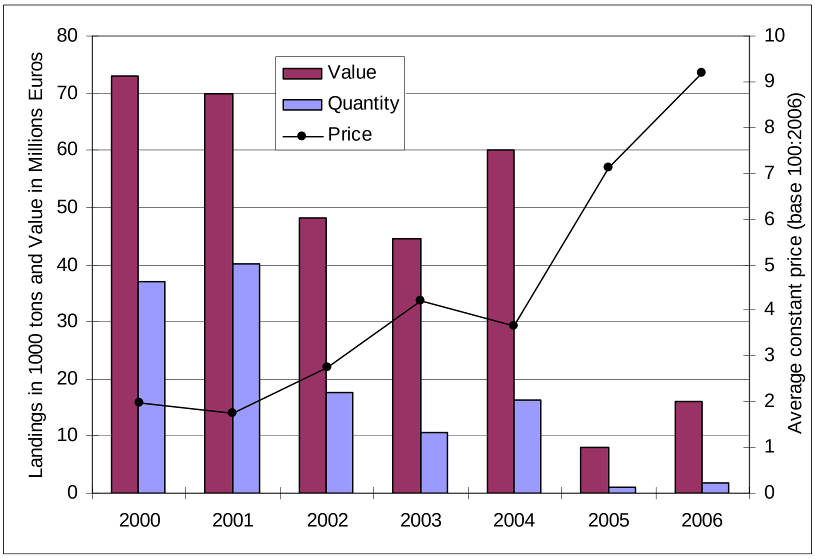
Year	**2000**	**2001**	**2002**	**2003**	**2004**
Spain					
Landings (tons)	19230	23052	6519	3002	7580
Value (1000 E)	30768	36883	19557	14109	23725
France					
Landings (tons)	17765	17097	10988	7593	8781
Value (1000 E)	28424	27355	32964	35687	27485
Total					
Landings (tons)	36995	40149	17507	10595	16361
Value (1000 E)	59192	64238	52521	49796	51210

Source: ICES. Average yearly prices

The market for anchovy is mainly concentrated in the Basque country. Even though the TAC is split between France and Spain, approximately 95 % of the French landings are sold on the Basque market. The Basque market is therefore considered to be representative of the whole market for anchovy.

The effect of decreasing volume of landings on the average price of anchovy is clearly evident. In 2005 the collapse of the anchovy fishery determined the highest prices per kg (Figure 3).

Figure 3 - Anchovy landings in Bay of Biscay: quantity, constant value and price



Source: STECF

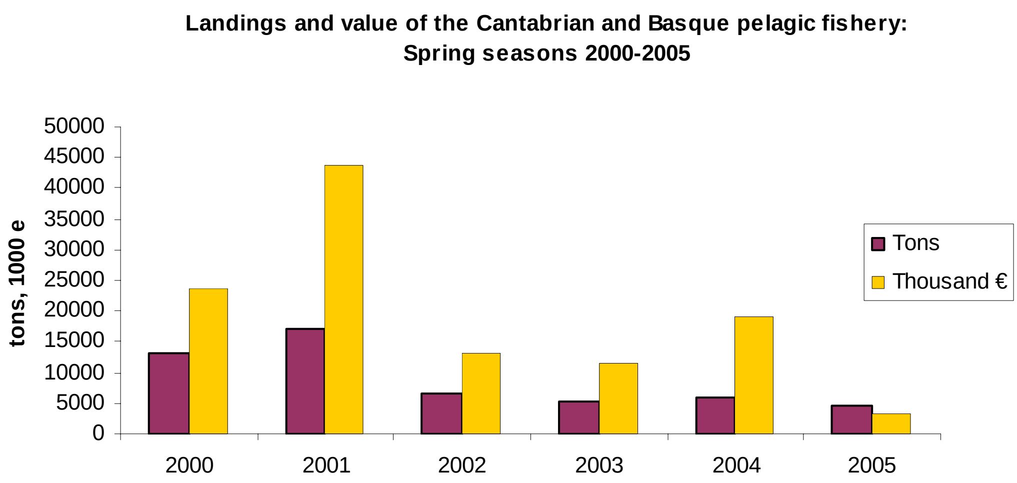
As regards the processing industry, in the absence of a supply of anchovies from a local fleet, the sector relies on imports from Europe (Croatia, Italy) and other non-European countries (Peru, Chile, and China). Good supply and availability of fish from those countries means that the sector does not appear to be negatively affected by the closure of the fishery.

2.4.4. Situation of the fleets before and after the closure

Spain

In spring, the economic value of the total landings of purse seines was historically linked to anchovy landings, with other species like sardines and horse mackerel representing lower economic value. A decreasing trend in total landings value can be seen in the period 2000-2005 (Figure 4). In 2005 the collapse of the anchovy fishery determined the lowest value of landings.

Figure 4 - Historical evolution of total landings and value of landings (data comprises landings from Cantabrian and Basque purse seines in spring seasons of the period 2000-2005)



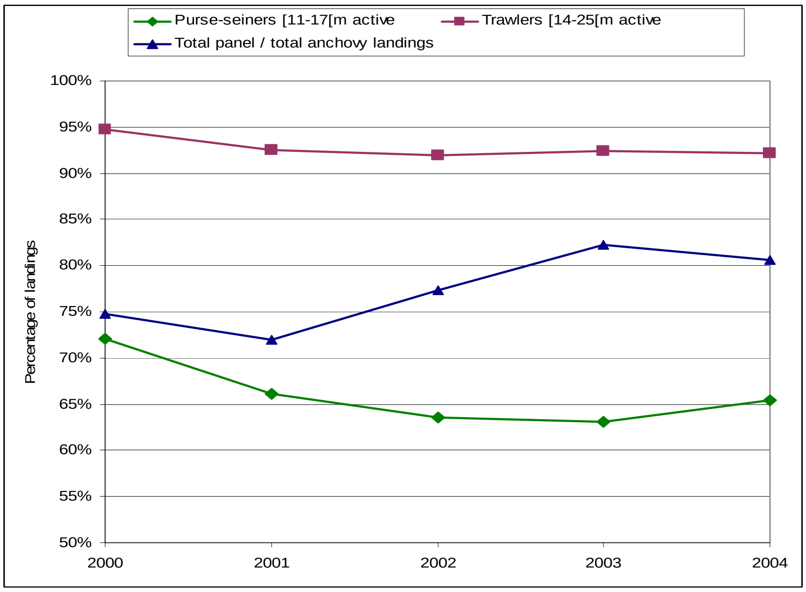
Source: IEO & AZTI`s CAFE Project database (EU contract no 022644).

The above graph illustrates the downward trend in the economic performance of the fleet in recent years, even before the closure of the fishery as of 2006. However, it was observed that on average, the loss of gross revenues caused by the closure of the anchovy fishery was partially covered by a raise of the gross revenues made from other species (i.e. bonito) targeted by the fleet. Between 2007 and 2008 the situation in the fleet worsened resulting in some loss of vessels particularly in the Basque Country of Spain, largely due to the very strong increase of the fuel costs.

France

Panels, defined as constant sets of vessels operating each year from 2000 to 2006 in the anchovy fishery, were examined taking into consideration their average degree of dependence of vessels on anchovy (defined as the percentage of anchovy gross revenues in the total gross revenues over the 2000-2004 period). 19 and 66 vessels belonging to the active purse-seiners and trawlers fleets respectively were selected in 2007. These vessels landed 66% and 93% of the anchovy total landings per categories (according to the gear used to harvest anchovy and their length size) over the 2000-2004 period respectively. As shown on Figure 5, the total of the landings of these two categories represents between 72% and 82% of the French landings.

Figure 5 - Percentage of panel landings and fleet landings relative to the total French anchovy landings



Source: DPMA-Ifremer

The catches of anchovy compared to the total catches for both fleets were estimated according to different degrees of dependence on anchovy. The main trend observed was a decrease in the total gross revenues for pelagic trawlers and purse seiners from 2002. A part of this decrease was due to the very low level of gross revenues made on anchovy (no catches for the purse seiners from 2004). The general trend observed[15] was that on average, the loss of gross revenues due to the anchovy closure was partially covered by a raise of the gross revenues made from the fleets' other species (i.e. sea bass, albacore, horse mackerel).

The evolution of average gross revenues per vessel varied according on their dependence on anchovy expressed in shares of the gross revenue. These dependency levels were: less than 1/3, between 1/3 and 2/3 and more than 2/3, respectively. For the active French trawlers with a dependence on anchovy representing more than 1/3 of the landings in value, the reduction in gross revenues in 2005 and 2006 compared to 2000 is around 25%. The decrease in value is more significant if compared to 2003 levels when it rises up to 40%. For vessels with a dependence on anchovy representing less than 1/3, the gross revenues did not decrease over the 2005-2006 period. The gross revenue tends to be homogenized for the whole fleet in 2005 and 2006 with a decrease of the vessel highly dependent on anchovy. The total decrease is around 15% compared to 2000 and 25% while comparing to 2003.

For French purse seiners, no vessel was dependent on anchovy at a level higher than 2/3 of the total gross revenues on the period 2000-2004. The mean gross revenues per vessel are quite different depending on the degree of dependence on anchovy. In that respect, there is a clear difference between the fleets operating in the Basque fishery in the first part of the year and a southern Brittany fishery conducted mainly in the second semester. A decrease in mean gross revenues can be identified between the period 2002 and 2006 but looking at the index, none of these categories faced a critical drop in gross revenues after the anchovy closure compared to 2000. The drop is significant in 2005 and 2006 compared to the period 2002-2004, especially for the less than 1/3 dependant vessels.

As regards landings composition evolution expressed in terms of gross revenue for the most important species it was evaluated by the STECF anchovy group according to fleets and degree of dependence to anchovy. The most dependant trawlers fleets partially compensated the decline in anchovy landings by a significant increase in sea bass landings and to a less extent by albacore and other species. The same trends on sea bass can be seen for the less dependant vessels (less than 1/3 of anchovy landings over the 2000-2004 period). For the purse-seiners, especially the less dependant vessels, the targeting of other species is less evident as no significant increase in other species landings was identified.

The years 2007 and 2008 registered a reduction in the number of pair trawlers (particularly in Saint Gilles Croix de Ville), largely due to the very strong increase of the fuel costs.

2.4.5. Legal basis for Community action

Council Regulation (EC) No 2371/2002 of 20 December 2002 on the Conservation and Sustainable Exploitation of Fisheries Resources under the Common Fisheries Policy[16] provides for the establishment of recovery plans for stocks outside safe biological limits (Article 5) and for management plans for fisheries exploiting stocks within safe biological limits (Article 6).

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[15] Refer to report section 2.3.1, figures 2.1.33 – 2.1.3.5.

[16] OJ L 358, 21.12.2002, pp. 59-80.

2.4.6. Necessity and subsidiarity

The proposal would fall under the exclusive competence of the Community and therefore the subsidiarity principle would not apply.

With regard to necessity, this proposal concerns the annual setting of TAC for a fish stock that is shared between two Member States, Spain and France, according to a fixed allocation. It is not possible for Member States to manage this issue by independent or devolved action. Fisheries management is an exclusive Community responsibility and therefore, it is necessary that this management action be implemented in Community legislation.

3. OBJECTIVES

3.1. General objectives

The closure of the fishery presently in force aims at protecting the remaining stock until a strong year class, or possibly a series of them, recruits to the stock. The recommendation of a closure consistently made by STECF since 2005 has implied in practice not allowing any catches until the stock recovers to levels above the limit Biomass (B_{lim}) of 21,000 t.

The Commission intends to make a proposal for a long-term plan for the anchovy to be implemented when the stock recovers to safe biological limits. The objective would be to establish the management framework for this stock, and fix targets so as to reach exploitation at high yields consistent with maximum sustainable yield (MSY).

Policy coherence concerning sustainability objectives should be maintained. The plan should conform to the objectives of the Common Fisheries Policy, as set out in Article 2 of Regulation (EC) No 2371/2002. In addition, such plan should contribute to the aims of the Implementation Plan agreed by the World Summit on Sustainable Development at Johannesburg in 2002, especially in respect of exploiting fish stocks according to their maximum sustainable yield[17]. This political objective has been the subject of a separate Commission Communication (Implementing sustainability in EU fisheries through maximum sustainable yield (COM (2006) final) and accompanying working document (SEC(2006) 868)[18].

3.2. Subsidiary objectives

As an ancillary objective the Commission should aim to establish, for the sector concerned, predictability for the annual legislative decisions on total allowable catch for the stock, and to provide stability to such decision-making. This objective is linked to the general objective of economic and social sustainability under the CFP.

Moreover the Commission should ensure that the decision-making on fishing possibilities for anchovy is based on best possible biological assessment of the stock. Such assessment would allow for a good forecast of the abundance of the fishery and therefore contribute to the general objective. Both operational objectives are considered realistic.

[17] www.un.org/esa/sustdev/documents/WSSD_POI_PD/English/POIToc.htm
[18] www.cc.cec/home/dgserv/sg/sgvista/i/sgv2/repo/repo.cfm?institution=COMM&doc_to_browse=SEC/2006/0868

4. POLICY OPTIONS

In order to effectively pursue the above objectives, the following options have been analysed and considered by DG MARE:

4.1. Option 1 - No policy change

This option implies keeping the current system as it stands, without defined management objectives, targets of criteria. Anchovy in the Bay of Biscay has been traditionally managed through annual TACs fixed by the Council of Ministers in December for the following year. Since 1989, the stock is annually assessed by ICES, based on direct surveying of the population conducted by Spain and France. Since 2005, the annual TAC includes a revision clause in July, after the spring surveys and the provision of scientific advice provided in June. This system allows for an in-year revision in order to tune-up catches for the second half of the year after the spring assessment; however it does not follow the defined longer term management objectives. Moreover, under present conditions, there is no legal framework establishing guidelines or restrictions on the annual setting of fishing opportunities concerning this stock and the risk of the stock being fished out again remains very high.

4.2. Option 2 - Long-term plan with three sub-options

This option involves setting annual TAC decisions by the Council under a precise discipline whereby the TAC levels are calculated according to a fixed formula, taking into account the state of the stock through its biological indicators. DG MARE agrees with scientific advice and stakeholders that in order to re-open the fishery, an establishment of a consistent, long-term strategy based on an appropriate harvesting rule should be considered.

Management through the establishment of TACs was selected by scientists at STECF for evaluation, as for pelagic species such systems have proven much preferable to regimes based on fishing effort limits (e.g. limiting the number of days a vessel is authorised to spend on the grounds). Moreover, a TAC based system would be embodied in the current management regime, and is thought to offer the best means to regulate fishing mortality.

Based on the above, the STECF working group on anchovy management considered the implications for the stock and the fishery of two main strategies:

- A strategy with relatively higher TAC levels but higher collapse risks and;
- A strategy with relatively lower TAC levels and less frequent collapse risks.

According to these strategies two basic harvest control rules (HCR), Rules A and B, were evaluated with respect to what proportion of the available stock could be harvested. Third HCR (Rule C) was then added by stakeholders as a compromise between the first two rules.

The anchovy group evaluated the impact of all three HCRs by simulation of the sustainability of the stock, catches, economic balance and social impact. The approach followed was such that, as far as evaluation of MSY is concerned, catches of around 23,000 tonnes are sustainable in the long-term. The socio-economic analysis was performed taking into account the biological uncertainty resulting from the stochastic 10-year projections of the stock and fishery. All rules were tested for harvest rates (γ values) in range between 0 and 1 (in steps of 0.1). They were also tested against the following constraints:

- with and without a TAC ceiling (TAC_{max}) of 33,000 tonnes, which is the historically fixed level of TAC set to this fishery; and

- with and without a minimum guaranteed TAC (TAC_{min}) of 7,000 tonnes, which corresponds to the smallest catch that allows the fishery to remain economically viable, as identified by the SWWRAC.

The following sub-option alternatives of a long-term plan were tested:

4.2.1. Rule A – Harvesting a constant proportion above an escapement Biomass (SSB) level

The first rule was based on catching a constant proportion (γ values) above an escapement stock spawning biomass level (i.e. anything above 33,000 t), according to a given formula (details, Annex 2). This strategy implies relatively higher TAC levels but also higher risks of stock and fishery collapse.

4.2.2. Rule B – Harvesting a constant proportion of the Biomass SSB

The second rule was based on catching a constant proportion (γ values) of the stock spawning biomass, which is all fish old enough to reproduce, according to a given formula (details, Annex 2). This strategy implies relatively lower TAC levels and less frequent risk of stock and fishery collapse.

In both cases TAC is applied from subsequent July to June next year. The biological reference points B_{lim} and B_{pa} correspond to 21,000 and 33,000 tones respectively.

4.2.3. Rule C – Harvesting a constant short term risk of 15% for Low R

A third possible rule identified by stakeholders was based on a constant short-term risk of 15% for low recruitment of new individuals to the stock (formula details, Annex 2).

This rule was proposed by the SWW RAC at a March 2008 meeting. It was seen at the time, as a compromise between short term risk and the harvest interests of the fleet. This rule can be considered a special case of rule A, where the threshold is 26,500 tonnes and the harvest rate γ = 0.766. Given the Sector interest, this rule was evaluated separately.

4.3. Complementary implementation elements for anchovy management

4.3.1. Incorporating autumn survey of juvenile abundance into anchovy stock assessment

Since 1989, the stock is annually assessed by the International Council for the Exploration of the Sea (ICES), based on direct surveying of the population conducted by Spain and France. Current ICES assessment covers the period from 1987 onwards.

The scientific monitoring of the population is based on two annual surveys carried out in spring on the spawning stock, namely, the Daily Egg Production Method (since 1987 with a gap in 1993) and the Acoustics surveys (regularly since 1989, although some surveys were also conducted in 1983, 1984 and some in the seventies). Both surveys provide spawning biomass and population at age estimates. The surveys have shown pronounced inter-annual variability of biomass according to the pulse of recruitments, since one year old anchovies can conform up to more than 75% of the spawning population. This has served to assess the level of the population during the major spring fishery and therefore to assess the level of exploitation. However, it has also showed that invariantly, the fishable anchovy stock predominantly consists of one-year-old fish with few exceptions in some years when 2 year old fish predominate. Accordingly, the estimate of recruitment at age 1 is a key factor in determining a TAC for the next year.

Since 2005, the annual fishing opportunities regulation includes a revision clause of the anchovy TAC that applies in July, after the spring surveys and the provision of scientific advice in June. The system thus allows for an in-year revision in order to tune-up catches for the second half of the year after the spring assessment. This system, however, lacks an estimation of juvenile numbers during the autumn which would allow for a forecast of the abundance of the fishery during the first semester (winter-spring) of the following year.

The lack of a recruitment index before it enters the fishery has prevented ICES for all these years to produce projections of the population and catches for the anchovy fishery in the Bay of Biscay on which to base its advice. To overcome this situation several environmental recruitment indices have been explored and various acoustic surveys on juveniles in September-October have been started. The former are not used by ICES given their poor forecasting power, whereas the later (mainly JUVENA) is still too short and it is being currently tested about its predictive performance for the incoming recruitment.

5. ANALYSIS OF IMPACTS

5.1. Environmental impacts

Anchovy's short-lived life cycle identifies it as a species that can provide an indicator of the productivity of its medium; it flourishes on productive, upwelling areas where plankton abounds. Anchovy is a prey species for other pelagic and demersal species, as well as for cetaceans and birds. It is also a major source of food for ecologically and economically important predatory species such as tunas. Although the management considerations applied to this stock are quite focused on the species alone (since it is caught in a single-species fishery), anchovy's management is heavily dependent on environmental factors. The impact of the stock's status and evolution on the rest of the food chain and the status of the pelagic habitat as such are not analysed here. The following paragraphs are presented in the understanding that all environmental impacts must be approached with precautionary principles in mind, whereby a healthy stock will be a contributor to a healthy larger environment, but the discussion emphasises the analysis of the options' potential impacts on the stock.

Option 1 - No policy change

This report has already described how the current system of annual TAC decisions has resulted in harvesting rates that are too high and led to the depletion of the anchovy stock in the Bay of Biscay. Short-term economic considerations result in setting aside the precautionary approach that must apply to compensate uncertainty in the assessment. Accordingly, the stock is overfished, the spawning stock biomass falls well below precautionary levels and the stock collapses, entailing the fishery's closure.

In 2000 an STECF group evaluated long-term management approaches for anchovy[19] and indicated that under the current harvesting behaviour the risk that the stock biomass would fall under safe limits was of the order of 72% to 100% (probability of falling under B_{lim} at least once in 20 years). The report was based on the assumption that the current management

[19] Report of the Meeting to provide the Commission with scientific background in order to define a management strategy for the stock of anchovy in the Bay of Biscay (ICES Sub-area VIII) held in Brussels, 21-25 February 2000.

regime would continue, whereby an initial TAC is set on 1 January, and an in-year adjustment is made according to the results of the surveys available on 1 May.

In the absence of timely management decisions that reflect the state of the anchovy stock, the risk that the stock will decline to below the limit biomass value has been validated by experience.

Option 2 - Long-term plan

Bringing stocks under long-term plans approach remains at the core of the Commission's policy. Implementing such a plan would offer better protection to this vulnerable stock and bring catches in line with MSY. The basic feature of this option is to establish a harvest rule which determines the annual TAC automatically. In December, a provisional TAC would be set according to the chosen formula, then a mid-year revision according to the June scientific advice would further fine tune the TAC.

Two population models were implemented to test the HCRs under the three formulas tested. The biomass model that forms the basis for ICES advice was implemented as the base case. The analysis was based on the probability of stock biomass falling below B_{lim} and the probability of having to close the fishery within a ten years simulation model.

Performance of rules A and B (see annex 3 for formulas)

In summary, the evaluation made by STECF of the possible harvest control rules for this fishery showed that rules A and B behave in a closely similar way in terms of management results for the stock. In both cases, there is a direct correlation between catch levels and biological risk for the stock. Setting limits to the extent to which TACs may change from one year to the other carries different levels of risk since these constraints limit the response of the system to a change in stock status (where the scientific advice would plead for a 25% TAC cut, but the TAC constraint would only authorise a maximum cut of 15%, for example). In this sense, both rules performed similarly. Setting a minimum guaranteed TAC (of 7,000 t) increased the risks of fishery closure, whereas imposing a maximum TAC – in any event –of 33,000 tonnes results in lower catches, lower catch variability and lower probability of SSB falling below B_{lim} than the case where no ceiling was imposed (see Fig. AB.1, Annex 2).

Performance of Rule C

The essential difference in this rule compared to the previous two is the inclusion of a 15% risk factor for low recruitment. When running scenarios for various recruitment levels for the stock, this rule proved less efficient to maintain adequate exploitation levels when environmental factors play against the productivity of the stock. In simple terms, the rule does not provide sufficient guarantees when recruitment is poor that the harvesting is sustainable or can lead to recovery when needed. If a low recruitment scenario persists over a number of years, then catches would be on average less than 10,000 t while the associated risk of closure would be higher than 10%. Due to the high environmental risk associated with this scenario, Rule C was discarded at this stage.

The following conclusions can be drawn from looking at the environmental impact of the tested sub-options:

- The higher the exploitation rate the higher the catch, its variability and associated risk.
- Setting a maximum TAC reduces maximum attainable catch and decreases inter-annual variability in TACs (figure A.1 and B.1, Annex 2).

- For a given harvest rate a TAC ceiling of 33,000 t reduces catches, their variability and the associated risks. Setting a minimum TAC of 7,000 t does not alter mean catch or associated risk but increases the probability of closures.
- For the same risk level, expected catches are higher for the options where there is no upper TAC constraint (figure AB.1, Annex 2).
- Both rules A & B imply similar risk at equal mean annual catch (figure AB.2, Annex 2). However, Rule B may result in higher stability in TACs.

Moreover, the difference in estimated risk between models used in assessment suggests a need for some flexibility in the interpretation of the test results. Levels of less than 5% are normally considered precautionary. However, given the uncertainty in the estimates of risk, that threshold should not be considered an absolute, but rather a region around which the specific situation of the stock and the trends in its evolution should be considered when determining appropriate harvest levels. Due to the above, risks at and slightly above 5% are considered acceptable by STECF for this particular stock.

5.2. Socio-economic impacts

Option 1 - No policy change

Table below summarises the economic figures describing the current situation in socio-economic terms. The figures correspond to year 2004, before the closure of fishery, and relate to the three fleets involved in the Bay of Biscay anchovy fishery (i.e. Spanish purse seiners (SPS), French purse seiners (FPS) and French pelagic trawlers (FPT)). These were the basis for the socio-economic Status Quo.

Table 3 - Socio-Economic Status Quo (2004)

	SPS	FPS	FPT	TOTAL
Price of Anchovy /per ton			2,391	
Catches (tons)	7,580	1,756	7,025	16,361
Income per fleet (000 €)	18,123.28	4,198.96	16,795.84	39,118.08
Costs/ton harvested (ex. capital cost, 000 €)	8,409.10	1,948.29	14,351.66	24,709.06
Profits from fishing (000 €)	9,714.18	2,250.66	2,444.174	14,409.029
Number of vessels	211	31	54	296
Number of fishermen in fishery	2,954	186	313	3,453

Source: STECF anchovy working group

Putting aside the fact that the fishery remains closed for the time being, this zero option merely purports to continue managing this fishery on a contingent basis year after year. In these conditions, the fleet's economy cannot be adequately adapted to the trends of the stock. There is no predictability, except to assess a high risk of overfishing as decisions are taken on a short-term basis, thus leading to persistent or frequent closures. With a system like that in place, the business objectives of the operators cannot be adequately programmed and economies of scale cannot be implemented, nor a healthy integration between the harvesting and transformation sectors.

Option 2 - Long-term plan

Option 2 aims at ensuring long-term stability and profitability in the sector, with less risk of stock collapse and smaller TAC fluctuations between years. It is worth highlighting that this sector achieves good returns when they fish less (Figure 1.2, Annex 2) and the fact that the reduction in earnings happens much slower than reduction in catch quantity.

It is not possible to forecast economic impacts in absolute terms. Market prices for anchovy can fluctuate widely in response to variations in demand. However, the plan should, by setting well defined long-term targets and contributing to the stability of anchovy supplies, also contribute to the stability of the anchovy fishing industry and its markets.

For Rule A: If no upper TAC ceiling is imposed, risks between 5 - 10% of the stock falling below B_{lim}, which indicates low biomass and serious risk to stock's reproductive capacity, correspond to harvest rates $\gamma =$ 0.4 to 0.5 (with average catches between 19,000 and 22,000 t). When an upper TAC ceiling of 33,000 tonnes is imposed, similar risks are calculated if γ lies between 0.5 and 0.7, with average catches lower than 19,200 t. Thus, a wider range of harvest rates is available, but lower catches are to be expected if the ceiling is imposed.

For Rule B: The risk of the stock falling to low biomass levels lies between 5 and 10% in the absence of an upper TAC ceiling, when harvest rates are around γ =0.3. Average catches are then estimated at around 19,500 t. Where the upper TAC ceiling of 33,000 t applies, similar risks are estimated, with catch levels around 17,200 t.

The approach followed by scientists incorporated in the risk analysis not only the returns from the anchovy harvest, but the overall activity of the fleet. To do so, one estimate of returns from anchovy and other for the "rest" of the species was made. The estimate has been made by fleet and by semester (4 production function for each fleet).

The STECF anchovy working group attempted a socio-economic evaluation of different management strategies. To do so, results obtained from the biological side were analyzed in terms of the overall performance of the fishery, as well as the performance of each of the fleets involved in it. The parameters used in the analysis are described in Table 1.2, Annex 1.

The group also looked at the relationship between prices for anchovy and the set TAC levels for the stock. The analysis showed that the maximum value was obtained at a TAC level of 32,000 tonnes (Figure 1.2, Annex 1).

Detailed socio-economic impact assessment of the sub-options tested shows that:

- Overall discounted gross revenue is maximized when the harvest rate is increased. This is clearly so when a maximum TAC of 33,000 tonnes is set. This maximum TAC allows a better overall result compared to the cases where there is not such maximum.
- The highest overall discounted cash flow is maximized for low harvest rates but this could be a consequence of the "optimistic" expected availability of other species and that the price for them was kept constant. This "optimistic" assumption is especially important for Spain, given that it has not been possible to estimate a production function of other species by semester, which makes that the alternatives in the first semester are over estimated.

- The highest overall discounted cash flow decreases with the harvest rate, but this decrease is less pronounced when a maximum TAC of 33,000 tonnes is applied (see Annex 2).
- The economic risk is much lower when a TAC ceiling of 33,000 tonnes is applied, and also the risk increase is less marked in these two cases.
- The social indicator reflects the relationship between the average wage observed in the member state concerned and those observed in the fleets. Given that the capacity in this fishery in terms of number of vessels that operate in it is taken as fixed, the indicator only reflects the social consequences in this scenario. If the number of vessels changes, the social consequences may also be different.
- Social consequences are not taking into consideration employment other than employment as crew on-board. Employment directly or indirectly linked to the fishing activity was not taken into account.
- Deterministic and stochastic runs perform similarly in terms of income, even if the price function may apply to values outside the observed range of TAC used for its estimation. This is especially true when there is no maximum TAC.
- Cost parameters as well as production function for anchovy and other species has been estimated, but further work should be done on this basis to refine the estimations.
- Evolution of cost is a key factor in the economic performance of the fleets, but even if in the simulations we have tried to use the last available data, they have remained constant for simulation purposes.
- There are factors which could not be considered in this analysis but are likely to have influence in the economic performance of the HCR. Anchovy processing industry (which represents the most important demand for these fleets) could change their purchasing patterns as they have done while the fishery was closed, changing dramatically the price function structure.
- The processing industry is asking for a well supplied market (high TAC) and low prices. In that sense low TACs create a risk to the fleets of loosing their buyers. But high TACs also increase the risk of closing the fishery, and this discontinuity in the supply could also result in the processing industry turning to other markets.
- The effect of the allocation method of TAC into quota by countries on the national fleets was tested. Obviously the higher the allocation to Spain the lower the probability of negative cash flow for Spain and the higher for France. However, this is not an entirely straightforward conclusion, given the effect of other species on the economy of the fishery which can counter the effects of these changes.

The model assumption that the total TAC will always be caught is probably unrealistic. It would be more appropriate to take into account the economic incentives for vessels to reallocate effort between species. However, to achieve this aim, a full feedback bio-economic model, which takes into account both the economic behaviour of vessels and the biological consequences, is required. It should be noted that, at present, such a model is unavailable.

Since the management plan would not introduce new procedures, an administrative burden for both the sector and national administrations, is likely to remain unchanged. The proposal has therefore no implication for the Community budget. Moreover, a long-term plan with clear sustainability criteria may allow the fishery, if effectively implemented, to qualify for certification under independent "eco-label" criteria. This could be helpful in product marketing terms, and in improving the perception of the sector as a responsible industry.

5.3. Impacts on international relations

The stock is distributed almost wholly within EC waters and is not subject to unregulated exploitation by third-country vessels. Catches and fish stock management will not be affected by such third-country activities.

5.4. Impact summary

	Option 1 – no policy change	Option 3 - long-term plan
Positive impacts	Greater flexibility in decision-making.	Decision-making constrained to result in attainment of sustainability objectives. Increased TAC stability.
Negative impacts	Long-term sustainability not assured as an objective.	TAC variation constrains may in some circumstances, not allow sufficiently rigorous measures to be adopted, in others, will not allow the industry to reap full/immediate benefit from a surge in the stock.
Direct impacts	Unknown, but likely to result in higher-risk management approaches.	Reduction in estimated risks of closure. Existence of a predictable management regime with identified targets allows the industry to adapt its strategies to become profitable.
Indirect impacts	Negative economic, social and environmental impacts due to possible reduction of stocks' biomass to unsafe levels leading to reduced fishing opportunities in the long-term.	Longer-term approaches in harvesting strategies spread stability in associated processing sector, with economic and social gains.
Economic impacts	Short-term: No change in catches and profits. Long-term: Possible negative impacts due to increased risk of fishing above safe levels which may again lead to closing the fishery. This would result in loss of profitability of the fishing industry.	Short-term: If the plan applies, it will be on a re-opened fishery for a stock that is in a recovery phase. Initial gains will be small and will need to be kept low throughout the recovery phase. Increases will likely be gradual. However, the operation of the plan may reactivate investments. Long-term: Achieving the targets means rebuilding the stock to Maximum sustainable yield, ie the level at which the industry is the most profitable and the stock in the healthiest state.
Social impacts	Short-term: No change. Long-term: Possible stock collapse following TAC allocations based on *ad hoc* decisions resulting in cuts in employment in the sector.	Short-term: No change expected during stock recovery phase. Long-term: Job creation and stable employment can be expected from profitable fishing activities if the stock is managed according to MSY.
Environmental impacts	Short-term Continued management based on short-term interests may finish off a stock which is such vulnerable state. It may not recover	Short-term: Positive impact on the conservation of species due to improved decision making on management.

(the anchoveta stocks in South America, which collapsed in the 70s took about 20 years to come back).	
Long-term: Even if the stock did not collapse completely, this short-term approach carries an inherent high risk that the stock biomass will fall below safe levels again, thus adverse effect on biodiversity.	Long-term: Improved management of the stock leading to improved state of the stock benefiting biodiversity.

6. Comparing the Options

6.1. Should a long-term plan be implemented?

Various options have been considered internally by scientific agencies. The resulting scientific advice, and stakeholder contributions agreed that implementing a long-term strategy based on a harvesting rule according to a formula that depends on survey results and is arithmetically calculated seems the best solution for anchovy. A similar approach was taken for sandeel in the North Sea in 2005, and there are also precedents in capelin management. Rule B, which implies harvesting a constant proportion of the anchovy biomass, has been selected as appropriate and beneficial by both DG MARE and stakeholders. This rule is consistent with the objectives of the Common Fisheries Policy and the Johannesburg World Summit on Sustainable Development to rebuild fish stocks to MSY by 2015. In any event, long-term plans must be regularly reviewed and if appropriate revised in light of an assessment of their effectiveness and in light of the evolution of the scientific knowledge relevant for the management of the fishery in question.

The choice to implement such a plan can be compared with continuing under present conditions.

Comparing Option 1 and Option 2

Option 1: No policy change - annual ad-hoc decision making

	Qualitative description	Quantitative description
Economic impact		
Short-term costs to relevant enterprises	Unknown, not predictable. Likely pressure to set fishing opportunities above sustainable levels.	*Ad hoc* decisions affecting entire catches from the stock affect the resilience of the fishing companies by forcing them to contingency management.
Long-term costs to relevant enterprises	Unknown, not predictable. Likely that pressure to set fishing opportunities above sustainable levels can result in stock depletion below maximum sustainable yield levels.	*Ad hoc* decisions affecting long-term productivity of the whole stock, i.e. up to ca. 50M€/yr.
Social impact		
	Unknown, not predictable. Flexibility is retained at a decision-making level.	No set long-term management targets lead to high risks with regards to employment and profitability in a sector.
Environmental impact		

	Unknown, not predictable. Pressures to increase catches in the short term tend to lead to stock depletions.	TAC decisions under the CFP have been taken on average at about 40% above sustainable levels.

Option 2: Implementation of long-term plan

	Qualitative description	Quantitative description
Economic impact		
Short-term costs to relevant enterprises	Short-term impacts can be mitigated by a limit on changes to TACs so long as stock levels remain good.	Not quantified, but should be low.
Long-term costs to relevant enterprises	Long-term costs should be kept at a low level by maintaining stocks and catches at high and stable levels.	By exploiting the stock at maximum sustainable yield, costs should be low and the economic resource rent kept at a high level, close to current values.
Social impact		
	The long-term plan should minimise short-term disruptions and ensure high and stable incomes and employment for the long-term.	Maintenance of employment and incomes at close to current levels (in proportion to a Bay of Biscay stock).
Environmental impact		
	The plan should lead to safe and near-optimal exploitation of the stock, with a small risk of stock collapse and including precautionary elements.	Exploitation of the stock in conformity with the precautionary approach and MSY objectives in the Johannesburg Implementation Plan.

DG MARE considers that retaining an annual decision-making system unconstrained by considerations of sustainability would be a high-risk approach for the sector in the longer term. It is consistent with the precautionary approach to implement a sound management practice in advance to ensure that once the stock has recovered, the conditions will not change for the worse again (in this fish stock, or in others nearby). Therefore DG MARE considers the implementation of a long-term plan to be desirable.

6.2. Which sub-option of the long-term plan (Option 2) should be retained?

In order to evaluate different harvest control rules for risks between 0.05 and 0.1, an assessment with two scenarios was carried out:

1) scenario with a maximum TAC ceiling (TAC_{max}) at 33,000 t; and

2) scenario without a maximum TAC ceiling.

TAC $_{max}$ of 33,000t	Rule A		Rule B	
	No TAC_{min}	With TAC_{min} 7,000 t	No TAC_{min}	With TAC_{min} 7,000 t
Harvest rate	0.5 – 0.7	0.5 – 0.7	0.3-0.4	0.3 – 0.4
$P(SSB < B_{lim})$	0.06 - 0.10	0.05 - 0.08	0.07-0.10	0.06 - 0.098
P(closure)	0.08 – 0.11	0.24	0.08-0.11	0.18 – 0.21
Catch	17,700 – 19,400	17,200 – 19,400	17,400-19,100	17,000 -19,200
Variation in Catch	11,000 – 11,700	11,800 – 12,400	9,600-10,600	10,000 – 11,200
Optimum harvest rate (HR) for income	0.6-1	0.6-1	0.4-1	0.4-1
Optimum HR for cash flow	0.1-0.3	0.1-0.3	0.1-0.2	0.1-0.2

No TAC $_{max}$	Rule A		Rule B	
	No TAC_{min}	With TAC_{min} 7,000 t	No TAC_{min}	With TAC_{min} 7,000 t
Harvest rate	0.4 – 0.5	0.5	0.3	0.3
$P(SSB < B_{lim})$	0.05 - 0.08	0.08	0.06	0.06
P(closure)	0.07 – 0.10	0.29	0.08	0.19
Catch	19,000 – 22,500	21,700	19,000- 19,400	19,200
Variation in Catch	18,000 – 22,500	23,700-23,400	14,800	15,100- 5,400
Optimum HR for GR	0.4-0.5-0.6	0.4-0.5-0.6	0.4-0.5-0.6	0.4-0.5-0.6
Optimum HR for cash flow	0.1-0.3	0.1-0.3	0.1-0.2	0.1-0.2

Rule A: Risks between 5% than 10% for the stock to fall below B_{lim} in any year of the 10 years projected population were found for harvest rates of around 0.4 and 0.5 for cases without a maximum TAC ceiling. For those cases the average catches were estimated at between 18,500 and 22,000 t. The similar risks are found for harvest rates between 0.5 and 0.7 for cases with 33,000 t maximum TAC ceiling. These cases come with average catches estimated at lower than 19,200 t).

Rule B: Risks between 5% than 10% for the stock to fall below B_{lim} in any year of the 10 years projected population were found at harvest rate of around 0.3, with average catches around 19,500 t for those cases without maximum TAC ceiling, while catches are around 17,500 t for those cases with maximum TAC ceiling of 33,000 t.

A comparison of Rule A and B shows that both rules imply quite similar biological risk at equal mean annual catch. However, Rule B is likely to result in more stability in TACs and therefore was selected by both stakeholders and DG MARE as a preferred option.

As a general rule, ICES and STECF seek management to keep fish stocks above B_{pa}, which according to their definition corresponds to reduce the probability of a stock falling below B_{lim} below 5%. Given high annual variability and low recruitment of the stock of anchovy, the scientists believe that this target cannot be achieved for this particular stock and recommend that risk of stock biomass falling to unsafe levels of or slightly above 5% is acceptable. A harvest rate of 0.4 as suggested by SWWRAC, which would generate risks reaching 10% and above, was considered by DG MARE not precautionary enough for the stock. The scientific evaluation (details Annex 2) indicates that applying Rule B with maximum TAC set at 33,000 t and harvest rate of 0.3 would keep risk of stock biomass falling below unsafe levels (SSB below B_{lim}) and the danger of a fishery closure below the recommended 10%. The Rule is believed to ensure an average annual catch of around 17,200 t which would guarantee a viable and stable income for the sector in a long-term.

	Rule A	Rule B
Economic impact		
Short-term costs to relevant enterprises	Comparable average annual catch likely above levels from 2004.	Comparable average annual catch likely above levels from 2004.
Long-term costs to relevant enterprises	Higher TAC fluctuations between years causing variable profitability in the sector.	Lower TAC fluctuations between years resulting in constant profitability for the sector.
Social impact		
	Short-term: No negative impact on employment. New rules are clear and easy to follow. Long-term: Higher TAC fluctuations leading to possible changes in employment and greater uncertainty in the sector.	Short-term: No negative impact on employment. New rules are clear and easy to follow. Long-term: Lower TAC fluctuations assuring stable employment in the sector.
Environmental impact		
	Similar risk of stock collapse	Similar risk of stock collapse and

	and closure of fishery.	closure of fishery.

Should an autumn survey of juvenile abundance be incorporated into anchovy stock assessment?

DG MARE supports the views expressed by the SWWRAC and believes that the results of the autumn recruitment survey should be incorporated into the decision-making process to ensure that TAC set in early winter takes into account the natural mortality exerted on the newly recruits during the rest of the season and thus, can predict the available biomass for the next year. The proposal for a long-term plan would set the rule whereby fishing would be permitted from July of year N to June of the year N+1 depending on the biomass available in June, which is estimated following the spring scientific research trips. Once the JUVENA survey of juvenile fish commences, the TAC would once again be set every year, for a calendar year (from January to December).

7. MONITORING AND EVALUATION

The indicators of successful operation of this plan are that:

Biologically

- Stock biomass is maintained at a level that allows its sustainable exploitation (SSB above B_{lim} with low risk of it falling below that level), on the basis of scientific advice;
- Stock is managed in accordance with the principle of MSY aiming at a long-term stability of resources.

Socio-economically

- Catch levels, as measured by ICES and STECF, remain close to the target values established in the plan, while aiming at stability and profitability for the fishing sector;
- TACs and quotas established according to the plan are respected and area-misreporting is eliminated;
- Discarding and misreporting do not increase in a period of increased stock abundance and is taken into account in the TAC-setting process.

Further evaluation criteria: are that:

- Uncertainties and bias in the fishery and biological system remain within the bounds of those tested; and
- Assumptions made in the simulation testing phase are still valid.

A harvest control rule-based system designed in such a way and applied rigorously should safeguard against stock depletion. However as simulations are based on past stock dynamics, and cannot guarantee future developments, it is a normal condition of most management plans that harvest rates be re-evaluated on a regular basis. Moreover, the proposed plan would set a minimum spawning biomass level based on scientific advice from STECF and ICES, below which the fishery should remain closed. An evaluation clause would be included in the proposal to ensure that this value can be amended, if appropriate in the light of new scientific information and advice.

The indicators should be monitored annually in order to detect any deficiencies in the operation of the plan. At three-yearly intervals, a comprehensive review of the plan should be implemented.

The monitoring arrangements concerning the state of the stock are common for this and other stocks in the area. Collection of scientific data as regards landings and survey data from research vessels are co-funded by the European Community. Data are collected, analysed and evaluated by the ICES and formal advice is provided by STECF.

Should advice from STECF and ICES indicate that the plan is not reaching its objectives, a review process would be initiated by DG MARE.

The proposal would interlink with the provisions of the new Control Regulation, which is planned to be adopted by the Commission later this year.

The fishery would be subject to cross-national coordination of inspection activities established by the Community Fisheries Control Agency (CFCA). Regional control measures established by the Member States concerned, i.e. a weekly catch reporting system, should be integrated into a control programme coordinated by the Agency. Additionally, inspectors from DG MARE will follow-up and review the implementation of fisheries control measures by the relevant Member States. Any detected overshooting of the TAC and subsequent remedial action would be subject to the general provisions applicable in this case, including deductions from next year's TAC. The problem of discards in the fishery will be subject to provisions of the new Discards Regulation; DG MARE is currently working on.

ANNEX 1 – GENERAL INFORMATION ABOUT ANCHOVY STOCK, FISHERY AND FLEET

Table 1.1 - Biological reference points for anchovy in Bay of Biscay

Current biological reference points for the stock were defined by ICES ACFM in October 2003 and have been unchanged ever since:

	Type	***Value***	***Technical basis***
Precautionary approach	B_{lim}	21 000 t	$\mathbf{B}_{lim}$: $\mathbf{B}_{loss}$ = 21 000 t (1989 SSB)
	B_{pa}	33 000 t	$\mathbf{B}_{pa} = \mathbf{B}_{loss}$ x exp(1.645σ)
	F_{lim}	-	Not defined.
	F_{pa}	1.0–1.2	$\mathbf{F}_{pa}$: = F for 50% spawning potential ratio, i.e. the F at which the SSB/R is half of what it would have been in the absence of fishing.
Targets	F_y	-	Not defined.

Source: STECF 2008

Figure 1.1 - Diagram representing the annual TAC allocation process by Country and Semester

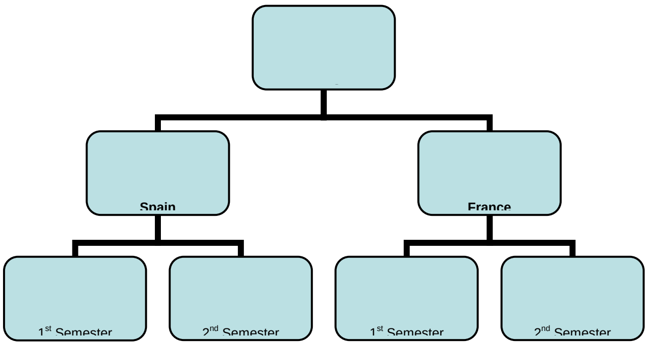


Table 1.2 - Economic model: parameter estimates

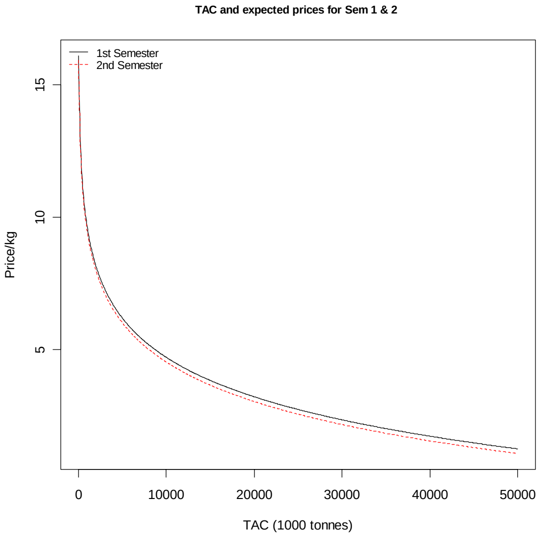
NAME	Comments	SPS	FPS	FPT
r	Discount rate	0,05	0,05	0,05
$\overline{E}$	Maximum time per year	1	1	1
POR_MS_1	Percentage of the anchovy quota by fleet	1	0,058113357	0,941886643
Fuel Cost	Fuel Expenditure in a by year and vessel	82000	22539,43073	98478,29681
Bait Cost	Bait Expenditure in a by year and vessel	0	0	0
Ice Cost	Ice Expenditure in a by year and vessel	0	0	0
Food Cost	Food Expenditure in a by year and vessel	0	0	0

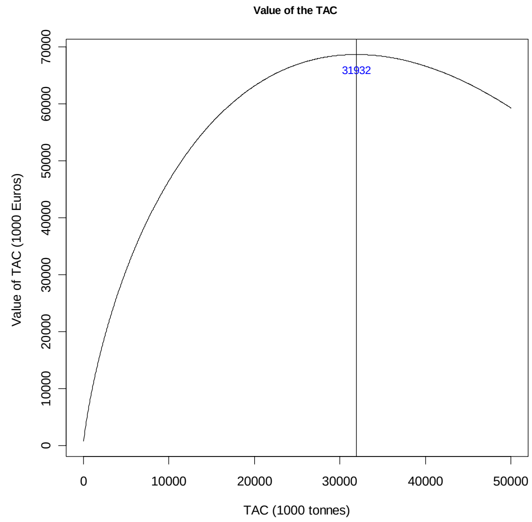
Gear Cost	Gear Expenditure in a by year and vessel	6046	0	0
SS Cost	SS Expenditure in a by year and vessel	35867	0	0
Other Variable Costs	Other Expenditure in a by year and vessel	20689	9431,266669	11194,12629
Landing Cost	% of Income	0,025	0,061548167	0,051355711
Fixed Costs	Fixed Costs	56753	73101,28468	121511,7238
q_{a1}	Catchability first semester anchovy	0,0024505	0,0008672	0,0026516
α_{a1}	Elasticity of Number of vessels Sem1	1	1	1
β_{a1}	Elasticity of SSB Sem1	1	1	1
γ_{a1}	Elasticity of Time to anchovy Sem1	1	1	1
q_{a2}	Catchability second semester anchovy	0,0038713	0,005077	0,008321
α_{a2}	Elasticity of Number of vessels Sem2	1	1	1
β_{a2}	Elasticity of SSB Sem2	1	1	1
γ_{a2}	Elasticity of Time to anchovy Sem2	1	1	1
NB_1	Number of vessels sem 1	200	31	71
NB_2	Number of vessels sem 2	200	31	71
k_o	Catchability other species	253,11	NA	NA
α_0	Elasticity Number of vessels others	1	1	1
γ_0	Elasticity of Time to others	1	1	1
P_0	Price of other species	2,35	NA	NA
FTE	Average Full time employmet	13	5,886027507	5,554762189
W	Alternative wage	19802	20600	20600
$\overline{E}_1$	Maximum Time Semester 1 (months)	0,5	0,5	0,5
Vessel Share	% of RTBS	0,5	0,499550603	0,518781068
% Quota by fleet	Percentage of the MS Quota by fleet	1	0,101527086	0,898472914
SSV	SS Paid by the vessel in Ä by year and vessel	0	22310,42551	21054,79593
SSC	SS Paid by the vessel in Ä by year and vessel	0	19982,47262	18857,86011
k_{01}	Catchability “other species” 1st sem	NA	281,745	271,221
k_{02}	Catchability “other specie” 2nd sem	NA	704,406	293,877
P_{01}	Price of “other species” 1st sem	NA	0,98	2
P_{02}	Price of “other species” 2nd sem	NA	0,61	2,18

Source: STECF

Figure 1.2 - Estimated prices and the corresponding value of the TAC

Based on data from France and Spain, an annual price for anchovy according to fishing semester for the international fishery, as estimated by STECF working group is as follows:





Source: STECF

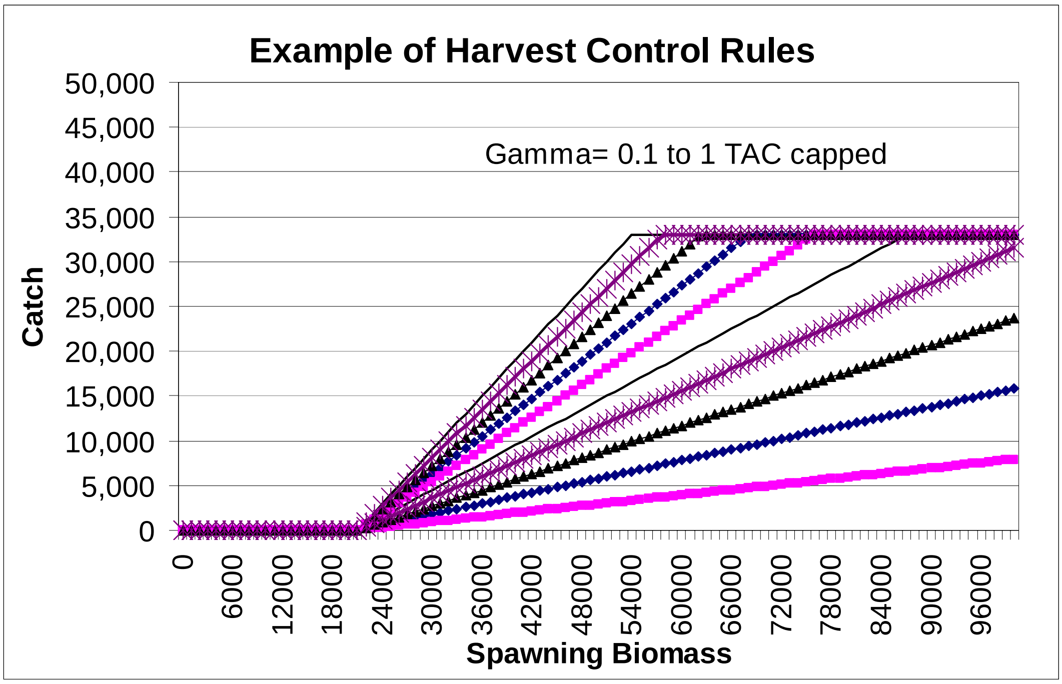
The highest catch value was at TAC levels of around 23,000 tonnes.

ANNEX 2 – HARVEST CONTROL RULES TESTED

The following Harvest Control Rules (HCR) were tested by the anchovy working group:

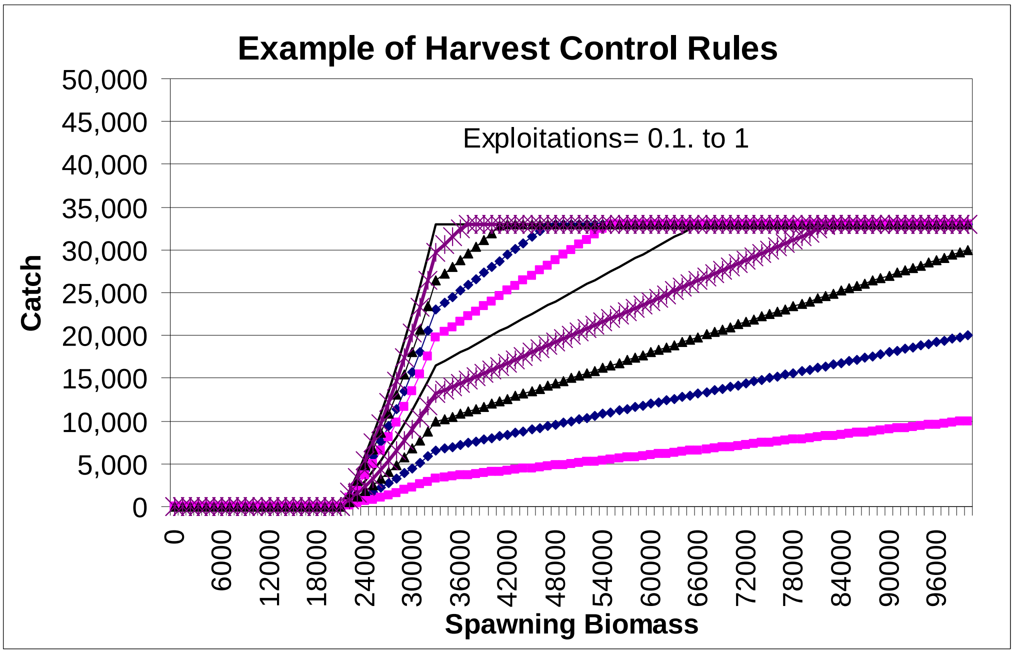
Rule A: constant proportion above an escapement Biomass (SSB) level

$$TAC_y = \begin{cases} 0 & \text{if } S\hat{S}B_{y\text{-}1} \leq B_{\lim} \\ \gamma(S\hat{S}B_{y-1} - B_{\lim}) & \text{if } S\hat{S}B_{y\text{-}1} > B_{\lim} \end{cases}$$



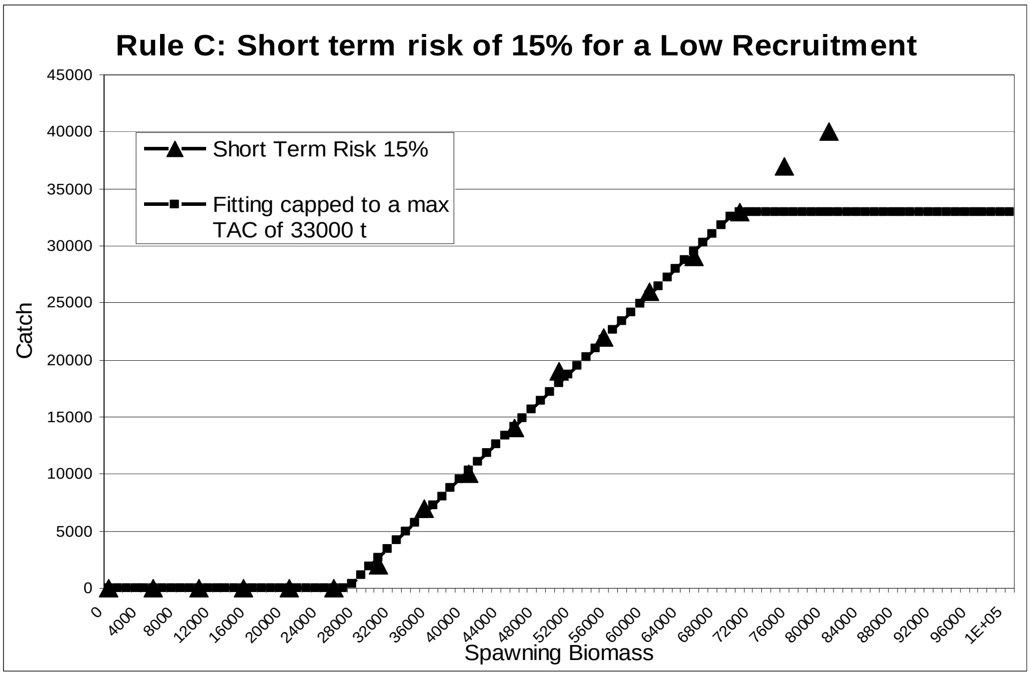
Rule B - Harvesting a constant proportion of the Biomass SSB

$$TAC_y = \begin{cases} 0 & \text{if } S\hat{S}B_{y\text{-}1} \leq B_{lim} \\ \gamma \dfrac{(S\hat{S}B_{y-1} - B_{lim})}{(B_{pa} - B_{lim})} S\hat{S}B_{y-1} & \text{if } B_{lim} < S\hat{S}B_{y\text{-}1} < B_{pa} \\ \gamma\ S\hat{S}B_{y-1} & \text{if } S\hat{S}B_{y\text{-}1} \geq B_{pa} \end{cases}$$



Rule C: Fishermen election: Constant short term risk of 15% for Low R

$$TAC_y = \begin{cases} 0 & \text{if } S\hat{S}B_{y\text{-}1} \le 26500 \\ 0.766(S\hat{S}B_{y-1} - 26500) & \text{if } S\hat{S}B_{y\text{-}1} > 26500 \end{cases}$$


Rule C: Short term risk of 15% for a Low Recruitment
Short Term Risk 15%
Fitting capped to a max TAC of 33000 t
Catch
Spawning Biomass
0
5000
10000
15000
20000
25000
30000
35000
40000
45000
4000
8000
12000
16000
20000
24000
28000
32000
36000
40000
44000
48000
52000
56000
60000
64000
68000
72000
76000
80000
84000
88000
92000
96000
1E+05

Tables of performance statistics for the different harvest control rules (HCR) and by population models

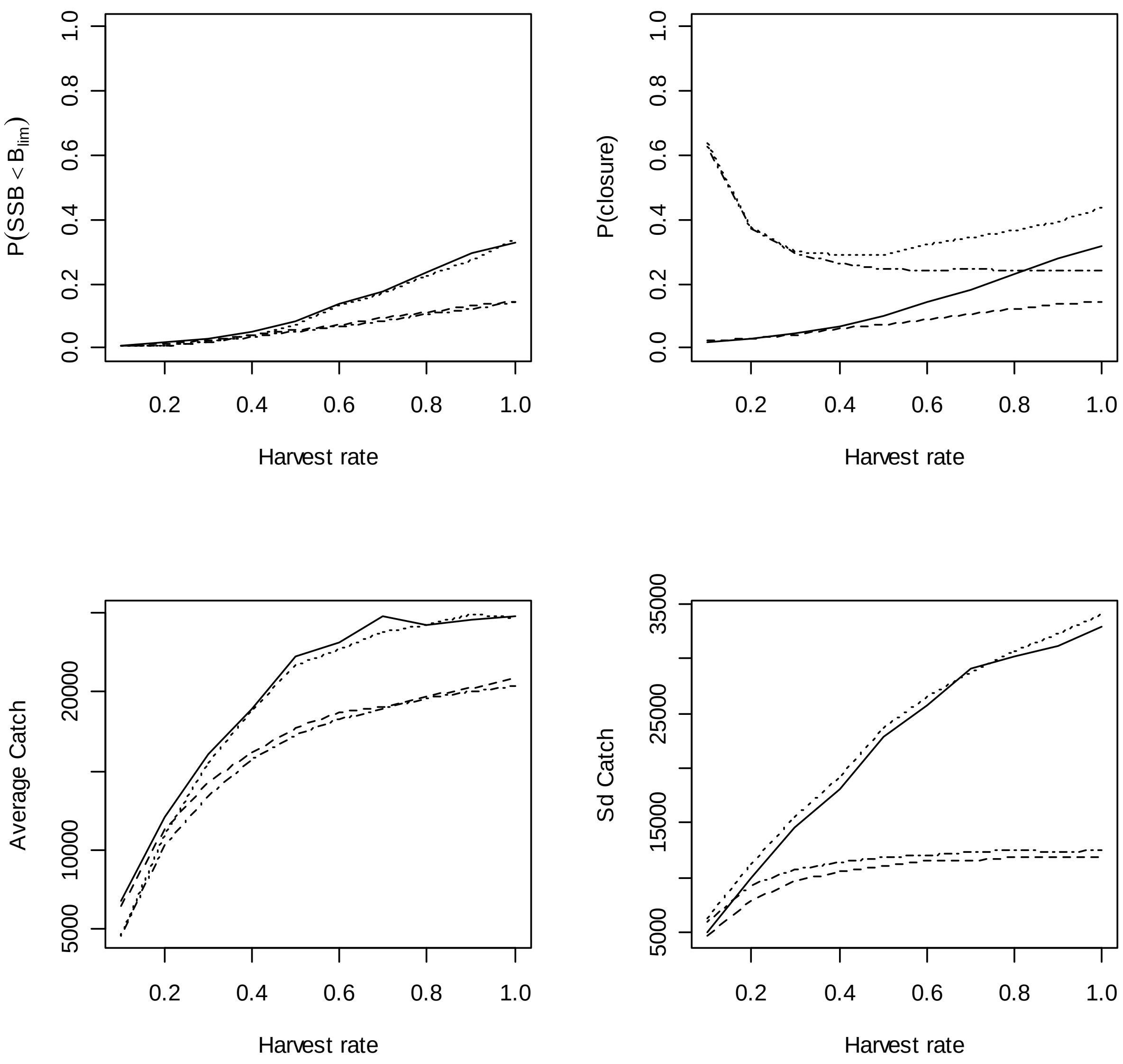
Table A.1 - Summary results of the performance of Harvest Control Rule A

HCR	Allocat % Spain	SR	HR	TAC_{max}	TAC_{min}	Median SSB_{last}	P(SSB<B_{lim})	P(SSB<B_{lim} once)	P(closure)	P(closure once)	Average catch	Average sd catch
Rule A	cte	ricker	0.1	no	no	81911	0.009	0.055	0.021	0.157	6762	5081
Rule A	cte	ricker	0.2	no	no	70772	0.017	0.115	0.029	0.205	12049	9929
Rule A	cte	ricker	0.3	no	no	61088	0.029	0.186	0.047	0.303	16057	14640
Rule A	cte	ricker	0.4	no	no	55529	0.052	0.293	0.066	0.402	18998	18075
Rule A	cte	ricker	0.5	no	no	48509	0.082	0.446	0.102	0.552	22230	22847
Rule A	cte	ricker	0.6	no	no	44332	0.137	0.631	0.146	0.698	23193	25740
Rule A	cte	ricker	0.7	no	no	39955	0.174	0.722	0.179	0.765	24845	28996
Rule A	cte	ricker	0.8	no	no	35967	0.236	0.819	0.230	0.854	24265	30160
Rule A	cte	ricker	0.9	no	no	32033	0.293	0.890	0.278	0.913	24592	31107
Rule A	cte	ricker	1	no	no	28303	0.331	0.932	0.315	0.935	24854	32952
Rule A	cte	ricker	0.1	33000	no	80266	0.010	0.068	0.023	0.173	6416	4745
Rule A	cte	ricker	0.2	33000	no	70658	0.013	0.090	0.029	0.216	11313	7935
Rule A	cte	ricker	0.3	33000	no	64181	0.026	0.178	0.042	0.293	14294	9617
Rule A	cte	ricker	0.4	33000	no	60222	0.043	0.252	0.060	0.371	16241	10563
Rule A	cte	ricker	0.5	33000	no	56348	0.058	0.337	0.073	0.432	17684	11032
Rule A	cte	ricker	0.6	33000	no	53779	0.075	0.422	0.087	0.500	18747	11532
Rule A	cte	ricker	0.7	33000	no	49222	0.093	0.475	0.104	0.552	19106	11625
Rule A	cte	ricker	0.8	33000	no	47626	0.113	0.546	0.122	0.627	19675	11829
Rule A	cte	ricker	0.9	33000	no	47818	0.132	0.580	0.138	0.640	20242	11945
Rule A	cte	ricker	1	33000	no	45672	0.141	0.614	0.146	0.657	20896	11865
Rule A	cte	ricker	0.1	no	7000	84366	0.008	0.057	0.635	0.999	4622	6339
Rule A	cte	ricker	0.2	no	7000	73316	0.007	0.055	0.377	0.961	10960	11224
Rule A	cte	ricker	0.3	no	7000	63224	0.021	0.134	0.302	0.942	15537	15585
Rule A	cte	ricker	0.4	no	7000	56574	0.040	0.246	0.289	0.922	18850	19285
Rule A	cte	ricker	0.5	no	7000	48899	0.075	0.406	0.292	0.928	21733	23680
Rule A	cte	ricker	0.6	no	7000	43466	0.131	0.603	0.323	0.942	22743	26451
Rule A	cte	ricker	0.7	no	7000	38374	0.172	0.710	0.346	0.967	23819	28816
Rule A	cte	ricker	0.8	no	7000	37158	0.224	0.819	0.368	0.980	24249	30606
Rule A	cte	ricker	0.9	no	7000	31354	0.274	0.862	0.391	0.980	24954	32187
Rule A	cte	ricker	1	no	7000	27677	0.337	0.925	0.435	0.987	24701	34065
Rule A	cte	ricker	0.1	33000	7000	80138	0.007	0.052	0.627	1.000	4599	6052
Rule A	cte	ricker	0.2	33000	7000	72941	0.010	0.070	0.372	0.967	10347	9331
Rule A	cte	ricker	0.3	33000	7000	65856	0.019	0.123	0.296	0.926	13480	10729
Rule A	cte	ricker	0.4	33000	7000	61434	0.032	0.211	0.262	0.893	15718	11462
Rule A	cte	ricker	0.5	33000	7000	56776	0.049	0.295	0.247	0.880	17250	11822
Rule A	cte	ricker	0.6	33000	7000	56767	0.066	0.378	0.242	0.877	18333	12051
Rule A	cte	ricker	0.7	33000	7000	53738	0.083	0.454	0.246	0.881	18907	12414
Rule A	cte	ricker	0.8	33000	7000	48437	0.107	0.535	0.241	0.879	19591	12487
Rule A	cte	ricker	0.9	33000	7000	47285	0.119	0.553	0.242	0.848	20040	12351
Rule A	cte	ricker	1	33000	7000	47769	0.143	0.618	0.242	0.857	20437	12481

Source: STECF

Figure A.1 - Performance statistics for Rule A (probability of SSB falling below Blim, probability of closing the fishery, the average catch and average sd in catch) depending on the harvest rate in the biomass model (using BBM) with the Ricker SR model.

(Solid, dashed, dotted and dot-dashed lines represent the case without any restriction on the TAC, with a maximum TAC restriction of 33,000t, with a minimum viable TAC of 7000t and with a maximum TAC restriction of 33,000t and a minimum viable TAC of 7000t respectively).



Source: STECF

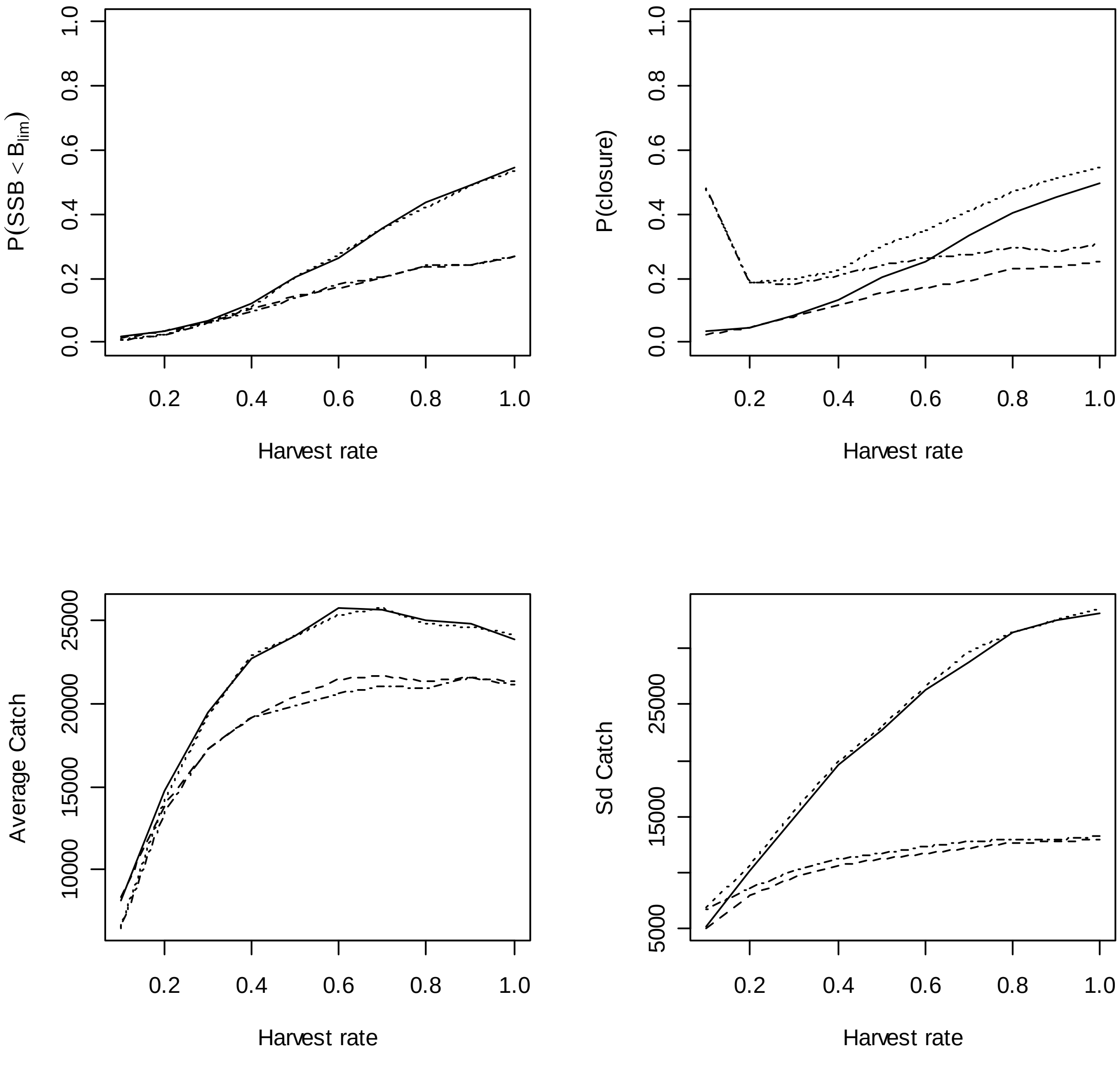
Table B.1 - Summary results of the performance of Harvest Control Rule B

HCR	Allocat % Spain	SR	HR	TAC_{max}	TAC_{min}	Median SSB_{last}	$P(SSB<B_{lim})$	$P(SSB<B_{lim}$ once)	P(closure)	P(closure once)	Average catch	Average sd catch
Rule B	cte	ricker	0.1	no	no	74742	0.017	0.109	0.033	0.217	8145	5132
Rule B	cte	ricker	0.2	no	no	66586	0.033	0.188	0.047	0.297	14791	10115
Rule B	cte	ricker	0.3	no	no	52052	0.068	0.373	0.081	0.461	19423	14776
Rule B	cte	ricker	0.4	no	no	46756	0.124	0.586	0.134	0.666	22681	19557
Rule B	cte	ricker	0.5	no	no	36970	0.206	0.774	0.205	0.820	24106	22717
Rule B	cte	ricker	0.6	no	no	32361	0.263	0.854	0.255	0.880	25718	26215
Rule B	cte	ricker	0.7	no	no	26132	0.353	0.952	0.331	0.948	25600	28724
Rule B	cte	ricker	0.8	no	no	22891	0.438	0.977	0.403	0.986	25024	31364
Rule B	cte	ricker	0.9	no	no	20482	0.493	0.991	0.451	0.993	24775	32497
Rule B	cte	ricker	1	no	no	16997	0.544	0.996	0.497	0.997	23850	33112
Rule B	cte	ricker	0.1	33000	no	79634	0.013	0.090	0.026	0.192	8339	5047
Rule B	cte	ricker	0.2	33000	no	64231	0.033	0.191	0.048	0.300	13961	7995
Rule B	cte	ricker	0.3	33000	no	56043	0.063	0.360	0.078	0.462	17218	9503
Rule B	cte	ricker	0.4	33000	no	49525	0.107	0.516	0.117	0.584	19164	10574
Rule B	cte	ricker	0.5	33000	no	47530	0.145	0.607	0.156	0.677	20384	11309
Rule B	cte	ricker	0.6	33000	no	43325	0.172	0.668	0.172	0.709	21423	11745
Rule B	cte	ricker	0.7	33000	no	40997	0.204	0.738	0.194	0.748	21629	12220
Rule B	cte	ricker	0.8	33000	no	37040	0.236	0.769	0.228	0.797	21352	12665
Rule B	cte	ricker	0.9	33000	no	39843	0.242	0.776	0.234	0.807	21582	12792
Rule B	cte	ricker	1	33000	no	36248	0.268	0.800	0.252	0.822	21345	12973
Rule B	cte	ricker	0.1	no	7000	79209	0.008	0.054	0.479	0.994	6551	6911
Rule B	cte	ricker	0.2	no	7000	66498	0.023	0.156	0.188	0.779	14219	10553
Rule B	cte	ricker	0.3	no	7000	54622	0.061	0.343	0.196	0.790	19204	15429
Rule B	cte	ricker	0.4	no	7000	45459	0.108	0.531	0.227	0.854	22947	19962
Rule B	cte	ricker	0.5	no	7000	37439	0.202	0.761	0.300	0.940	24029	23085
Rule B	cte	ricker	0.6	no	7000	32910	0.276	0.891	0.350	0.961	25283	26622
Rule B	cte	ricker	0.7	no	7000	27644	0.356	0.946	0.411	0.984	25790	29732
Rule B	cte	ricker	0.8	no	7000	24286	0.420	0.973	0.466	0.995	24771	31354
Rule B	cte	ricker	0.9	no	7000	19245	0.493	0.989	0.512	0.998	24628	32537
Rule B	cte	ricker	1	no	7000	20094	0.533	0.990	0.546	0.998	24151	33630
Rule B	cte	ricker	0.1	33000	7000	83760	0.007	0.048	0.479	0.992	6480	6681
Rule B	cte	ricker	0.2	33000	7000	68240	0.022	0.145	0.187	0.782	13524	8626
Rule B	cte	ricker	0.3	33000	7000	57626	0.060	0.334	0.182	0.750	17268	10121
Rule B	cte	ricker	0.4	33000	7000	52933	0.093	0.488	0.211	0.825	19191	11224
Rule B	cte	ricker	0.5	33000	7000	44863	0.138	0.624	0.241	0.857	19877	11661
Rule B	cte	ricker	0.6	33000	7000	40147	0.181	0.690	0.264	0.857	20596	12284
Rule B	cte	ricker	0.7	33000	7000	41276	0.203	0.743	0.274	0.881	21069	12799
Rule B	cte	ricker	0.8	33000	7000	38213	0.244	0.792	0.297	0.877	20935	12923
Rule B	cte	ricker	0.9	33000	7000	34291	0.244	0.775	0.286	0.872	21515	12908
Rule B	cte	ricker	1	33000	7000	35121	0.267	0.803	0.306	0.887	21164	13291

Source: STECF

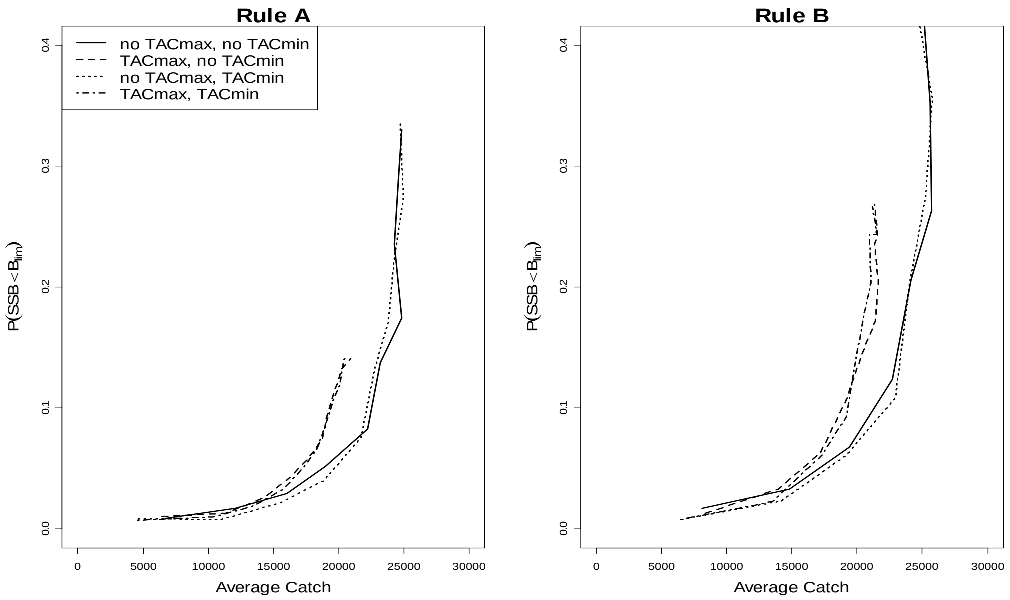
Figure B.1 - Performance statistics for Rule B (probability of SSB falling below Blim, probability of closing the fishery, the average catch and average sd in catch) depending on the harvest rate in the biomass model (using BBM) with the Ricker SR model.

(Solid, dashed, dotted and dot-dashed lines represent the case without any restriction on the TAC, with a maximum TAC restriction of 33,000t, with a minimum viable TAC of 7000t and with a maximum TAC restriction of 33,000t and a minimum viable TAC of 7000t respectively)



Source: STECF

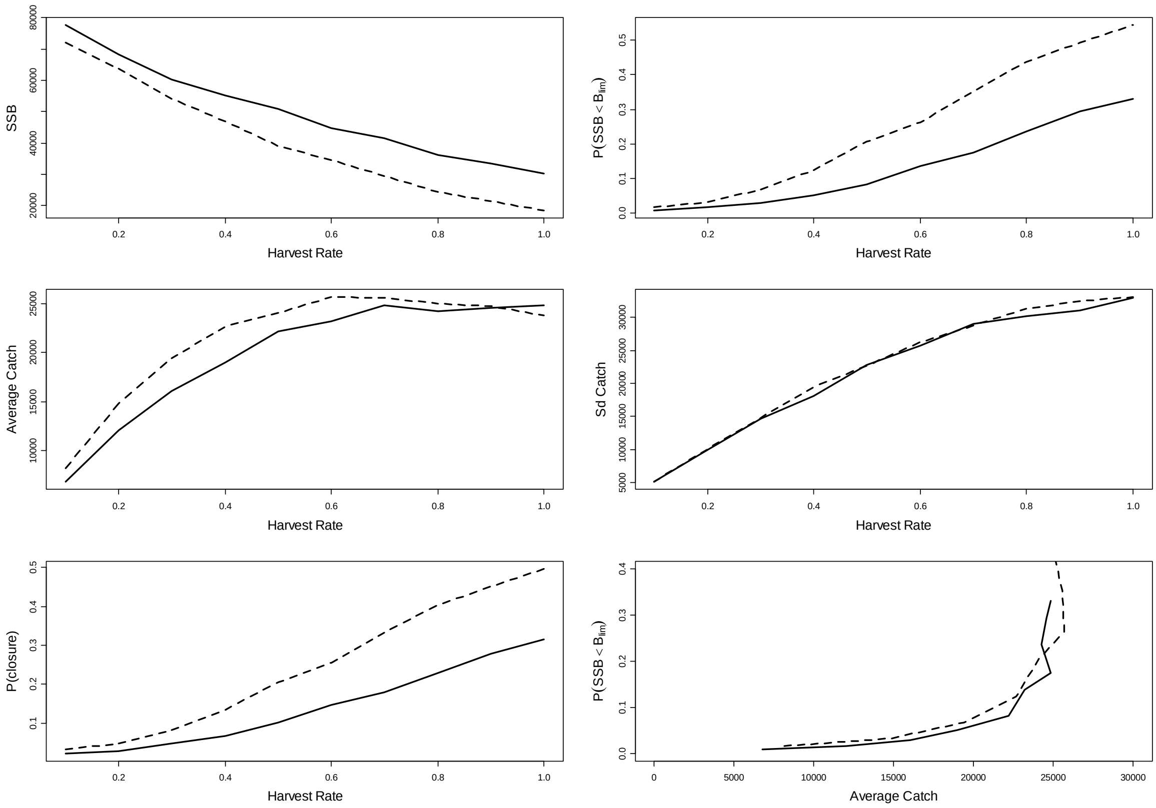
Figure AB.1 - Catches versus Risks for both HCR A and B according to the different TAC constraints



In terms of risks, if a target level of catches was selected by managers above 15,000 t, setting a maximum TAC implies higher risks than the cases when no maximum TAC is set. This is true for both (A and B) Harvest Control Rules.

Figure AB.2 - Comparison of the Performance of Rule A (solid line) and Rule B (dashed line)

(for the biomass model with the Ricker SR model and no minimum or maximum TAC constraint (SSB is the median SSB at the end of the period)



Source: STECF

Table C.1 - Summary results of the performance of Harvest Control Rule C

HCR	Allocat	SR	TACmax	TACmin	Median SSBlast	P(SSB<Blim)	P(SSB<Blim once)	P(closure)	P(closure once)	Average catch	Average sd catch
Rule C	cte	ricker	no	no	41354	0.160	0.676	0.257	0.894	24240	31089
Rule C	cte	ricker	33000	no	53456	0.076	0.418	0.164	0.741	18586	12376
Rule C	cte	ricker	no	7000	40920	0.164	0.667	0.398	0.984	24145	31691
Rule C	cte	ricker	33000	7000	52095	0.063	0.363	0.279	0.922	18471	12873
Rule C	cte	qhstk	no	no	39992	0.167	0.672	0.258	0.896	23755	29981
Rule C	cte	qhstk	33000	no	53692	0.071	0.382	0.157	0.714	18708	12355
Rule C	cte	qhstk	no	7000	42098	0.143	0.610	0.379	0.980	25292	32124
Rule C	cte	qhstk	33000	7000	53954	0.065	0.367	0.272	0.892	18858	12626
Rule C	cte	low	no	no	25907	0.255	0.903	0.517	0.999	3533	5429
Rule C	cte	low	33000	no	25778	0.254	0.920	0.517	1.000	3519	5336
Rule C	cte	low	no	7000	26892	0.240	0.873	0.786	1.000	2843	5570
Rule C	cte	low	33000	7000	26369	0.225	0.872	0.776	1.000	2945	5718
Rule C	var	ricker	no	no	38423	0.169	0.702	0.264	0.904	23450	30079
Rule C	var	ricker	33000	no	53563	0.075	0.398	0.159	0.714	18418	12191
Rule C	var	ricker	no	7000	42540	0.157	0.658	0.397	0.989	23684	30418
Rule C	var	ricker	33000	7000	55220	0.070	0.364	0.274	0.917	18629	12950
Rule C	var	qhstk	no	no	41660	0.167	0.671	0.254	0.880	24510	30556
Rule C	var	qhstk	33000	no	53276	0.077	0.408	0.164	0.722	18604	12187
Rule C	var	qhstk	no	7000	42881	0.154	0.627	0.396	0.982	23873	30746
Rule C	var	qhstk	33000	7000	54539	0.067	0.356	0.274	0.898	18761	12749
Rule C	var	low	no	no	25202	0.269	0.922	0.527	1.000	3515	5448
Rule C	var	low	33000	no	26134	0.266	0.905	0.526	1.000	3486	5401
Rule C	var	low	no	7000	26753	0.230	0.867	0.783	1.000	2918	5771
Rule C	var	low	33000	7000	26816	0.233	0.861	0.781	1.000	2912	5699

Source: STECF

Detailed summary of scientific assessment carried out by the Anchovy Working Group:

The performance of each rule was tested for values between 0 and 1 by steps of 0.1. For each of the strategies outlined, the HCR with and without a ceiling equal to 33,000 tonnes, (the historically fixed level of TAC set to this fishery) and, with and without a minimum TAC as corresponding to the smallest catch that allows the fishery to remain economically viable (at 7,000 tonnes, as pointed out by the SWW RAC), were constructed.

In the fishery model, the simulation was performed using two operating models: an age-structured and a two-stage biomass fishery model. The model was conditioned on the results from the stock assessment corresponding to ICES advice 2007. An age-structured model used for verification, was based on a seasonal multi-fleet integrated catch at age assessment as the one used in ICES 2005. This model was updated up to 2007 in order to provide starting conditions for the current simulations.

Catches were allocated to countries on a half-year basis, as shown in Figure 1.1 (Annex 1). The allocation was based on the mean fraction of the catch taken by each Country during the period 1992-2004 (constant allocation). However, some other possible allocations were tested, 90% (Sp)-10% (Fr) to 60% (Sp)-40% (Fr). Furthermore a likely projection of the allocation of catches to countries (variable allocation relative to the TAC level) was subject to discussion at the pelagic committee of the SWW RAC.

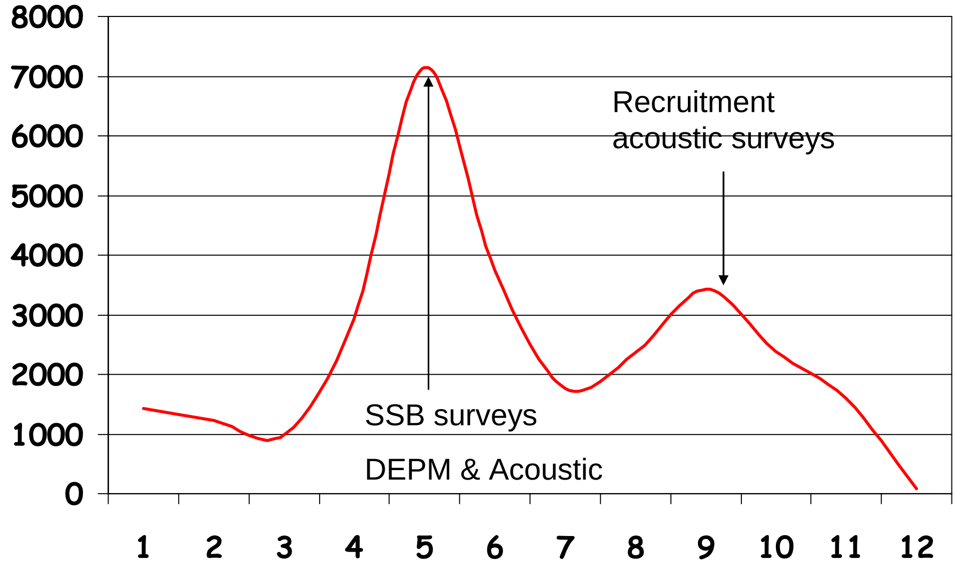
The socio-economic impact of the options was evaluated by means of algorithms developed during the meeting. It performed a stochastic socio-economic analysis considering the biological outcome as an input. It was based on estimations of production functions for anchovy by semester and by fleet, considering the SSB of anchovy, the number of vessels in the fishery of anchovy and the time devoted to it. A production function for the rest of target species was also estimated, in this case without considering any SSB.

A price function for anchovy, based on French and Spanish data was also estimated. Price for other species was considered as fixed. The time of data series used came from 2000-2005, and 2000-2006, respectively.

The indicators presented were:

- Biological risk measured in terms of number of the likelihood of SSB being below B_{lim}.
- The number of years in which the fishery should be closed.
- The total expected match of anchovy.
- The variation of this catch.
- The Gross revenue obtained from anchovy (discounted 5%) for each fleet.
- Gross Cash Flow (discounted 5%) for each fleet.
- Economic risk as the likelihood of having a negative cash flow.
- A social indicator as the relative wage to the average of the country by FTE.

As regards the management calendar for the plan in Option 2, the approach that the harvest control rules define the allowable catches from July to June according to the biomass levels estimates from surveys in May of the first year has been adopted (please see the graph below).



The plan would contain provisions for periodic reviews such that policy amendments can be introduced if further developments warrant this. Periodic reviews are a standard feature of Community long-term plans.

ANNEX 3 – SUMMARY OF SCIENTIFIC AND STAKEHOLDER ADVICE

Scientific and stakeholder bodies consulted

The Commission requested the Scientific, Technical and Economic Committee for Fisheries (STECF) to provide scientific advice on the long-term management of anchovy. Two meetings were organised for an *ad hoc* group; the first one took place in Hamburg 14th to 18th April 2008, and the second one in San Sebastian 2nd to 6th June 2008. STECF expressed its opinion at the plenary meeting of 2nd to 4th July, 2008.

Advice was also sought from the South Western Waters Regional Advisory Council (SWW RAC). This body was established by the European Community to allow representatives of catching and processing industry sectors, environmental non-governmental organisations, recreational fishermen and various other interest groups to provide advice to the European Commission on Common Fisheries Policy in respect of south-western waters fish stocks. SWWRAC delivered its views and recommendations on a management approach for anchovy by letter in July 2008.

Advice received and used

- Summary of recommendations received from STECF

STECF advised that there were substantial benefits in moving from the current system based on *ad hoc* annual measures into a long-term plan. It provided the results of different harvest control rules through a risk analysis under the following scenarios of exploitation:

Option A: Harvesting a constant proportion above an escapement Biomass (SSB) level;

Option B: Harvesting a constant proportion of the Biomass SSB level;

Option C: Harvesting a constant short term risk of 15% for low recruitments scenarios.

The probability of having stock biomass falling below B_{lim} and the probability of having to close the fishery within the ten years simulation model is the basis for the analysis.

The full advice from STECF is publicly available on its website (fishnet.jrc.it/web/stecf).

- Summary of recommendations from SWWRAC

The SWW RAC agreed with a need to have a long-term plan to manage anchovy in the Bay of Biscay. The RAC also selected Option B as a preferred harvest control rule for setting TAC. The stakeholders, however, opted for the higher exploitation factor (gamma) of 0.4 instead of the 0.3 suggested in the Commission proposal. This rate would significantly increase the level of risks in terms on probability of the stock falling below B_{lim} and a fishery closure.

The advice from SWW RAC is publicly available on its website (www.ccr-s.eu).

The Commission proposal for the long-term plan is based on the advice received by both bodies.

GLOSSARY

B

biomass– the total weight of living matter, either by species or all species combined. Also referred to as the standing stock.

B_{lim} – see limit reference points.

B_{msy} – the spawning stock biomass (SSB) necessary to support a fishery that would produce the maximum sustainable yield (MSY).

B_{pa} – see limit reference points.

by-catch – the catch of non-target species and undersized fish of the target species. By-catch of commercial species may be retained or discarded along with non-commercial by-catch.

C

catch (C) – the total quantity of fish that is retained by fishing gear and brought onto the deck or fishing station, ie landings plus discards.

CFP – the Common Fisheries Policy of the European Union (as revised in: Council Regulation 3760/92). It provides the framework for the management of the EU fishery sector, including all marine fisheries within 200 miles of member states'baselines.

collapsed stock – the decline in spawning stock biomass (SSB), through sustained fishing pressure or natural causes, to the point where it no longer generates sufficient recruits to support a fishery.

D

depleted stock – the decline in spawning stock biomass (SSB) to a level that is approaching, or is below, the lowest historic record but has not necessarily reached the point of collapse. (See also limit reference points and safe biological limits.)

discards – any fish, or other living matter caught when fishing, that is not retained but returned to the sea – alive or dead.

E

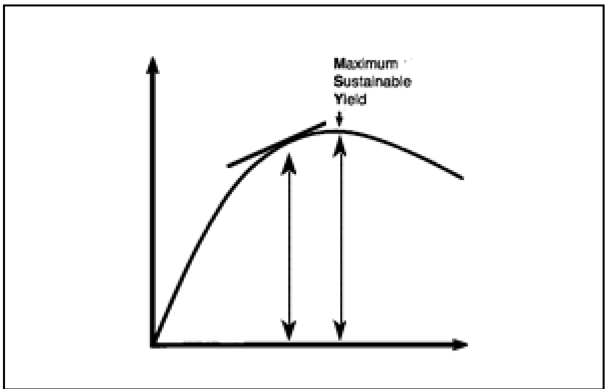
effort (f) – the total quantity of fishing gear in use for a specific period of time. Effort can be expressed in a multitude of ways: days away from port, hours trawling, length of drift net, number of hooks used, and so on. At its most basic, it is the total number of boats engaged in a fishery and/or the number of days they were fishing.

environmentally sustainable fisheries – fisheries that safeguard the requirements of all animals and plants within an ecosystem or habitat and do not cause irreversible or other significant, long-term change to the environment or the communities of species that live within that environment.

exploitation pattern - the distribution of fishing mortality over the age composition of the fish population, determined by the type of fishing gear, area and seasonal distribution of fishing, and the growth and migration of the fish. The pattern can be changed by modifications to fishing gear, for example, increasing mesh or hook size, or by changing the ratio of harvest by gears exploiting the fish (e.g., gill net, trawl, hook and line, etc.).

F

F – formally, the instantaneous rate of fishing mortality (the natural logarithm of the change in abundance due to fishing per unit of time), but more simply, the proportion of the population killed each year by fishing.



A generalised yield-per-recruit (YPR) curve showing the point at which the fishing mortality rate (F) is equivalent to the maximum sustainable yield (F_{msy}) and the point at which the slope of the curve is approximately 10% the slope of F=0, ie F 0.1.

fish stock – scientifically, a population of a species of fish that is isolated from other stocks of the same species and does not interbreed with them and can, therefore, be managed independently of other stocks (cf gene pool). However, in EU legislation the term 'stock' is used to mean a species of fish living in a defined sea area, the two are not always synonymous.

fishery conservation – the conservation and sustainable use of exploited fish stocks. It is the principal objective of UK and EU fisheries legislation; fishery management is the primary method through which the objective is pursued.

fishing effort – see effort.

fishing mortality rate – see F.

F_{lim} – see limit reference points.

F_{MSY} – the level of fishing mortality (F) that corresponds to the peak value on a dome-shaped yield-per-recruit curve and the value that will produce the maximum sustainable yield (MSY) from a fish stock.

F_{pa} – see limit reference points.

H

HCR — harvest control rule describes how harvest is intended to be controlled by management in relation to the state of some indicator of stock status. For example, a harvest control rule can describe the various values of fishing mortality which will be aimed at for various values of the stock abundance. It formalizes and summarizes a management strategy. Constant catch and constant fishing mortality are two types of simple harvest control rules.

I

ICES – the International Council for encourages research into commercial the Exploration of the Sea, an fish stocks, their biology and all factors independent scientific advisory body (natural and man made) that may founded in 1902. It is funded by 19 affect their abundance. It does not member states' governments from undertake research in its own right but around the North Atlantic (including has a secretariat (in Copenhagen) to Canada and the USA) and Baltic Sea. It facilitate and co-ordinate collaboration, including fishery stock assessments, between member states. Work is carried out through numerous working groups convened under the remit of one or more standing committees: Advisory Committee of Fisheries Management (ACFM), Advisory Committee for the Marine Environment (ACME), Baltic Committee, Fisheries Technology Committee, Living Resources Committee, Mariculture Committee, Marine Habitat Committee, Oceanography Committee, Resource Management Committee.

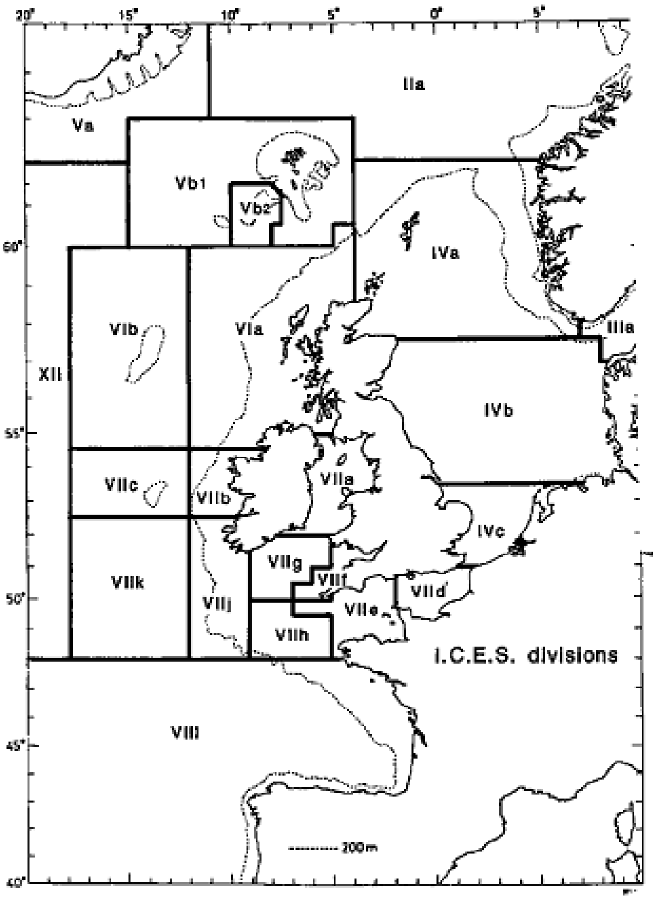


Figure 9: ICES sub-Areas (Roman numerals) and Divisions (Roman lower-case letters) around the British Isles

J

juvenile – an immature fish, ie one that has not reached sexual maturity (but could still be larger than the minimum landing size – MLS).

L

landings – that part of the catch which is put ashore. Frequently, landings provide the only record of total catch; ie the landings plus discards.

limit reference points – are biological or fishery management indicators that define the point at which precautionary action must be taken to safeguard a fish stock. In order for stocks and fisheries exploiting them to be within safe biological limits, there should be a high probability that: 1 – the spawning stock biomass (SSB = B) is above the threshold where recruitment is impaired; 2 - the fishing mortality (F) is below that which will drive the spawning stock to the biomass threshold, a condition that must be avoided. Thus: B_{lim} = minimum acceptable biomass F_{lim} = maximum acceptable fishing mortality (lim stands for 'limit'). The certainty with which these points can be identified varies with the quality of assessment data available. Therefore, ICES has also identified precautionary reference points that identify higher biomass thresholds than B_{lim} and lower fishing mortality thresholds than F_{lim}:

B_{pa} = precautionary minimum biomass

F_{pa} = precautionary maximum fishing mortality (pa stands for precautionary approach).

In many instances, the value for B_{pa} will be the same as the value previously identified as the minimum biologically acceptable limit – MBAL. In circumstances where the relationship between the exploited stock and the spawning stock is not clear, as is the case with some of the deep-water species of fish, limit reference points may be expressed with respect to the 'unexploited stock':

M

MSY - Maximum Sustainable Yield: the largest average catch that can bet taken continuously from a stock under existing environmental conditions. (For species with fluctuating recruitment, the maximum might be obtained by taking fewer fish in some years than in others). Also known as maximum equilibrium catch.

mixed fishery – a fishery that takes multi-species catches. Pelagic fisheries tend to take relatively 'clean' single species catches whereas multi-species catches are more frequent in demersal fisheries.

monitoring – the regular and systematic collection of environmental and biological data by agreed methods and to agreed standards. Monitoring provides information on current status, trends and compliance with respect to declared standards and objectives. (See also surveillance.)

mortality – the death of organisms through natural causes (M), eg predation, or fishing (F) etc. It is usually expressed as an instantaneous rate: the natural logarithm (with sign changed) of the ratio of number of animals surviving to the end of the year and the number at the start of the year.

O

over-fishing – any fishery where the total fishing effort is greater than is required to meet or match a specific management objective, eg maximum sustainable yield (MSY). (See also growth overfishing and recruitment overfishing.)

P

precautionary approach – a decision to take avoiding action based on the possibility of significant environmental damage, even before there is conclusive evidence that damage will occur. This approach requires fishery managers to pay due regard to the uncertainties of stock assessment and management. They must implement the appropriate precautionary action if limit reference points are reached.

R

recruitment – a process by which fish enter the exploitable stock and become susceptible to fishing (age/growth related).

S

SSB – spawning stock biomass is the total weight of all sexually mature fish in a population or stock. It is the sexually mature part of an exploited population upon which the future survival of the stock, and its fishery, depends.

STECF – the Scientific, Technical and Economic Committee on Fisheries of the EC, DG Fisheries. Unlike ICES working groups and ACFM which only consider stock assessments and management from a scientific perspective, the STEFC is expected to consider the socio-economic implications of modifying or varying scientific, including ICES' advice.

stock biomass – the total weight of all fish of all ages in a given population or stock.

sustainability – meeting the needs of the present without compromising the ability of future generations to meet their own needs.

sustainable fisheries – fisheries with an annual catch, including discards, that does not exceed the surplus production of the stock (ie annual growth plus recruitment less the annual natural mortality – M). Fisheries can be sustainable at levels of stock significantly below the stock that would support MSY or MEY but only if managers pay full regard to limit reference points. (See also environmentally sustainable fisheries.)

T

TAC – total allowable catch, the quantity of fish that can be taken from each stock each year. The figure is agreed by the Fisheries Council of Ministers each December for the following year. EU member states are allocated a fixed proportion of the TAC as their national quota. (See also relative stability and track record.)