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COMMISSION STAFF WORKING PAPER

REPORT OF
THE SCIENTIFIC, TECHNICAL AND ECONOMIC
COMMITTEE FOR FISHERIES

**EVALUATION OF THE REPORT OF THE
STECF-SGBRE (07-01) WORKING GROUP ON ANCHOVY IN THE
BAY OF BISCAY
BRUSSELS 19-20 FEBRUARY, 2007**

**This report was adopted by the Scientific, Technical and Economic Committee for Fisheries (STECF)
through a fast track procedure by correspondence in March 2007**

*This report does not necessarily reflect the view of the European Commission and in no way anticipates the
Commission's future policy in this area*

Table of Contents

1. Background	3
2. Summary Findings of the STECF – SGBRE 07-01 Working Group on Anchovy in the Bay of Biscay.	3
3. STECF Comments and Recommendations	4
4. ANNEX I: STECF WORKING GROUP ON ANCHOVY IN THE BAY OF BISCAY REPORT.....	6

1. Background

A zero TAC has been established for the Bay of Biscay anchovy in 2007. In addition to the spring scientific surveys regularly utilised to estimate both the strength of the incoming new year-class and the Spawning Stock Biomass (SSB) the Council of Ministers decided to authorize the use of commercial vessels to gather information on the state of the anchovy stock. It was decided that a maximum number of 20 Spanish purse seiners and 8 French commercial vessels could be deployed in ICES Sub-area VIII for experimental fishing from 15 April until 15 June 2007. As a result of the Council's decision, and in an attempt to maximise the utility of any information from the fishery for stock assessment, the Commission sought the advice of the STECF. Accordingly an Expert Working Group was convened (STECF_SGBRE 07-01) in Brussels from 19-20 February 2007 with the following terms of reference:

STECF is requested to

- advise on a suitable sampling design in terms both of minimum and maximum weekly deployed fishing effort (number of vessels, GT capacity, fishing days, etc..) and of its spatial distribution (geographic and depths) taking into consideration that information is collected through commercial fishing vessels with different characteristics, fishing gears and fishing power;
- indicate whether it is advisable to have an homogeneous weekly sampling effort during the identified period (15 April – 15 June) or if it is advisable applying different fishing effort levels along such a period. Information and analysis of commercial catches and catch rates obtained in previous years could be helpful in such a deliberation;
- indicate also whether it is advisable for the effectiveness of the sampling that the sampling effort should be complemented by a weekly or fortnightly catch limitation and in such a case what catch level should not be exceeded;
- advise on how to make best use of the data collected through this experimental fishing with a view to estimating the strength of the incoming year-class and spawning stock biomass. Indicate also whether and how the data collected with this experimental fishing can be used or interpreted jointly with data coming from scientific surveys.

The full Report of the STECF – SGBRE 07-01 Working Group on Bay of Biscay anchovy is given in Annex I. STECF reviewed the report by correspondence in March 2007.

2. Summary Findings of the STECF – SGBRE 07-01 Working Group on Anchovy in the Bay of Biscay.

The sub-group reviewed the data available on the main commercial fisheries for anchovy in zone VIII and the Council Decision to authorize the use of commercial vessels to gather information on the state of the anchovy stock. Overall the sub group agreed that there were two possible approaches to the use of “experimental fishing” as described in the Council documents. The first was to allow time or catch limited, but otherwise free access by the

chosen vessels to the fishery. The second was to use the vessels in a controlled approach to provide supplementary data in the context of the existing surveys.

The aim of the first approach (“free fishing”) would be to evaluate the catches, and particularly the CPUE of those vessels in comparison to that obtained by the fishery in previous years. This would include both the recent years where the fishery was reduced and earlier years with a stronger stock. The sub group concluded that the historic data on CPUE were insufficient to provide a suitable basis for evaluation of free “experimental fishing”. The additional constraints need to control this experimental fishing in time and space (i.e. stratification), and the fact that there would only be 10% of the fleets involved, would further compromise any comparison. Moreover, it is widely recognized that effort data (and consequently CPUE) are not useful measures in fish, which school strongly, as is the case for anchovy. In conclusion, the sub group agreed that a “free” or partially stratified experimental fishery would not yield any useable information on stock status.

The second option explored was to use the commercial vessels to enhance the existing surveys and improve the quality of the existing assessment of the stock status. In essence this would entail using the commercial vessels as “auxiliary” survey vessels. Two further options for this were also explored. The first was to use commercial vessels as “consorts” to the research vessels used on the surveys. The second was to use the vessels to carry out a separate experimental fishing only survey, at the same time as the scientific surveys already carried out.

In summary, the Working group favoured the second of the two main options outlined above noting that a free experimental fishery would not provide any useful additional data for an evaluation of stock status or incoming year-class strength for Biscay anchovy. The working group elaborated on its comments and made more detailed suggestions as to how commercial fishing vessels could be best used to provide valuable information to complement the scientific surveys already planned for 2007.

3. STECF Comments and Recommendations

The STECF supports the findings of the STECF_SGBRE 07-01 report on anchovy in the Bay of Biscay (Annex I) and its suggestions as to how commercial fishing effort might best be used to supplement the scientific surveys planned for 2007. Based on the findings of the WG, the STECF draws the following conclusions and recommendations:

- A free commercial fishery from 15 April to 15 June 2007 involving 20 purse seine and 8 pelagic trawl vessels would not provide any useful additional data for an evaluation of stock status or incoming year-class strength in 2007. Hence STECF **recommends** that a free commercial fishery for anchovy in the Bay of Biscay from 15 April to 15 June 2007 should not be permitted.
- The commercial vessel effort proposed for such a fishery would be better deployed in a “consort” role to provide supporting fishing and surveying activity for the existing research vessel surveys in the spring of 2007. Such a role would potentially improve the accuracy and precision of existing surveys, by providing additional acoustic and biological sampling, allow for an extension of the survey transects into shallower waters closer to the French coast and into deeper waters to the west. Such measures would maintain the consistency of the existing time series and enhance our

understanding of the distribution of the stock. STECF therefore **recommends** that the three main Spring surveys for Biscay anchovy (PELGAS, PELACUS & BIOMAN) be supplemented by additional commercial vessels, both purse seine and trawlers, to collect additional biological material and to survey specific areas not covered by the existing surveys.

- If additional commercial vessel effort beyond that to support the surveys is allowed to take place in 2007, it would best be deployed in a targeted acoustic fishing “rake” survey at the same time as the PELGAS and BIOMAN surveys in Biscay. Such an approach, which was pioneered in South America, would permit vessel, métier and survey effects to be evaluated. It would also provide the groundwork for a genuine sentinel fishery if needed. STECF **recommends** that a multi-vessel acoustic/fishing survey (“Rake” survey) should be carried out by commercial vessels, assuming additional commercial vessel effort is available after supporting the “consort” surveys.
- STECF considers that the scientific surveys already planned for 2007 should by themselves, provide sufficient information to enable the 2007 stock status and the relative strength of the incoming 2006 year-class to be evaluated. While the proposals to utilise additional commercial vessels in a “consort” role or to undertake acoustic fishing “Rake” surveys, would provide additional information, such information is unlikely to affect the survey results for 2007. STECF **recommends** that the current spring surveys are already sufficient to assess the status of the stock in spring and provide management advice for the rest of the year, and that management advice should continue to be on this basis.

In keeping with its previous advice and in the absence of any new relevant data and information, STECF further advises that:

- With the current poor stock situation, maximum protection of the remaining spawning population is required.
- STECF **recommends** that the Biscay anchovy fishery should remain closed until reliable estimates of the 2007 SSB and 2006 year class become available based on the results from the spring 2007 acoustic and DEPM surveys.
- STECF stresses that any recovery is entirely dependent on good incoming recruitment.
- STECF notes that there is presently no agreed comprehensive long-term management plan for this stock and **recommends** that alternative or complementary management measures to output control (TAC) need to be further investigated to maintain the longer-term viability of the stock (closed seasons, closed areas, minimum size, etc.). These should only be considered after the stock has recovered to biologically safe levels, and would need to be scientifically evaluated prior to adoption.

4. ANNEX I: STECF WORKING GROUP ON ANCHOVY IN THE BAY OF BISCAY REPORT



COMMISSION OF THE EUROPEAN COMMUNITIES

Brussels, SEC ()

COMMISSION STAFF WORKING PAPER

STECF WORKING GROUP ON ANCHOVY IN THE BAY OF BISCAY REPORT

Brussels 1-2 March 2007

This report is the opinion of the expert working group on anchovy (STECF SGBRE-07-01) and not of the Scientific, Technical and Economic Committee for Fisheries (STECF)

This report does not necessarily reflect the view of the European Commission and in no way anticipates the Commission's future policy in this area

Table of Contents

1. Executive Summary	8
2. Introduction	10
2.1. Background: Anchovy in the Bay of Biscay	10
2.2. STECF is requested to (ToRs)	10
2.3. Participants	11
3. Evaluation of potential use of a CPUE based experimental fishery.....	12
3.1. General comments on CPUE in small pelagic fisheries.....	12
3.2. Spanish Purse Seine Fishery	13
3.3. French Trawl fishery	16
3.4. Conclusions	18
4. Using commercial vessels as “consorts” in routine assessment surveys for anchovy	18
4.1. General comments on commercial vessel consorts.....	18
4.2. PELACUS survey consorts.....	18
4.3. BIOMAN survey consorts.....	19
4.4. PELGAS survey consorts.....	20
5. Using commercial vessels as additional survey vessels for anchovy.....	23
5.1. General comments on using commercial vessels for surveys and rationale for May 2007	23
5.2. Survey design and method	24
6. Evaluation of potential maximum catches of the proposed commercial fishing vessel effort.....	26
7. Time and resource implications for the proposed surveys	27
8. Overall Conclusions	27

1. Executive Summary

A zero TAC has been established for the Bay of Biscay anchovy in 2007. In addition to the spring scientific surveys regularly utilised to estimate both the strength of the incoming new year-class and the Spawning Stock Biomass (SSB) the Council of Ministers decided to authorize the use of commercial vessels to gather information on the state of the anchovy stock. It was decided that a maximum number of 20 Spanish purse seiners and 8 French commercial vessels could be deployed in zone VIII for experimental fishing from 15 April until 15 June 2007. STECF was requested to advise on how best to deploy and manage these vessels. These questions were addressed by an expert group at a meeting in Brussels (19-20 February 2007 – SGBRE-07-01).

The sub-group reviewed the data available on the main commercial fisheries for anchovy in zone VIII. The fishery has mainly been prosecuted by Spanish purse seiners in the first half of the year and French pair trawlers in the second half. While other smaller components exist these two components represent the bulk of the fishery, and the vessels indicated by the Council, so evaluation was restricted to these. Working documents presented to the sub-group are presented in Annexes 1 & 2. In both cases it was possible to evaluate the quality of the CPUE data available for these fisheries.

On the basis of these data, the sub group agreed that there were two possible approaches to the use of “experimental fishing” as described in the Council documents. The first was to allow time or catch limited, but otherwise free access by the chosen vessels to the fishery. The second was to use the vessels in a controlled approach to provide supplementary data in the context of the existing surveys.

The aim of the first approach (“free fishing”) would be to evaluate the catches, and particularly the CPUE of those vessels in comparison to that obtained by the fishery in previous years. This would include both the recent years where the fishery was reduced and earlier years with a stronger stock. The sub group concluded that the historic data on CPUE were insufficient to provide a suitable basis for evaluation of free “experimental fishing”. The additional constraints need to control this experimental fishing in time and space (i.e. stratification), and the fact that there would only be 10% of the fleets involved, would further compromise any comparison. Moreover, it is widely recognized that effort data (and consequently CPUE) are not useful measures in fish which school strongly, as is the case for anchovy. In conclusion, the sub group agreed that a “free” or partially stratified experimental fishing would not yield any useable information on stock status. These conclusions are presented in chapter 2 for each of the two fleets involved.

The second option explored was to use the commercial vessels to enhance the existing surveys and improve the quality of the existing assessment of the stock status. In essence this would entail using the commercial vessels as “auxiliary” survey vessels. Two further options for this were also explored. The first was to use commercial vessels as “consorts” to the research vessels used on the surveys. The second was to use the vessels to carry out a separate experimental fishing only survey at the same time as the scientific surveys already carried out.

The approach to using commercial vessel consorts is detailed in chapter 3. The general value of using commercial vessels to collect additional data is discussed in chapter 3.1. The main

advantages are the collection of more information for the acoustic identification of targets, additional biological data (weights, fecundity, ages etc.) and to allow examination of areas where the large survey vessels cannot go, e.g. the coastal areas of French Biscay. The sub-group believe that this approach will, potentially, materially enhance the survey results, by providing additional data and samples. The aim would be to provide more accurate and precise abundance data from the surveys. It would also allow the evaluation of the impact of the capture metier (trawl or purse seine) on the abundance estimate, and an evaluation of what proportion of the stock was outside the current survey area.

The second option of a commercial vessel survey is explored in chapter 4. This approach is based on similar surveys carried out on pelagic resources in the SE Pacific and on pilot work in Biscay in recent years. In essence, a group of commercial vessels from both fleets will carry out a simple acoustic-fishing survey on a series of parallel tracks. The vessels will record presence or absence of fish schools seen on the sounders, and then fish on these to establish species composition. The data will be recorded visually using digital cameras, but will not be useable to calculate biomass. The survey will provide a presence/absence map. Because it involves multiple vessels of the two different metier it will allow a comparison between vessels of the same and different metier. Because it follows the same basic transect design as the RV surveys it will allow comparison between the two survey results. It should be emphasised that it will not provide an “alternative” biomass estimate. It will, however, provide the information needed to define a future “Sentinel” fishery for this stock if required in the future.

The sub group also provided an analysis of the potential catch impact of the vessel days used in the proposed survey work IF that were used in an experimental fishery, although the design of the surveys would not allow landing of any fish, as the vessels would be required to continue the survey after fishing. This information is provided in chapter 5.

It was recognized that the proposed survey work by commercial vessels would also entail considerable extra work by the scientists working in the institutes running these surveys and for observers on the vessels. The scope of this work, and a timetable for it, should resources be allocated, is presented in chapter 6. With the appropriate resources the initial results of the additional surveys in May 2007 (fishing maps, species composition and length distributions) should be available for reporting to STECF by 15 of June and the final report (including biological sampling and analysis of pictures of the acoustic records) would be available for the ICES working group WGACEGGS in November 2007

The sub-group wished to emphasise a number of points:

- This WG does not recommend any other exploratory fishing activity this year aimed at providing scientific data, beyond that described here.
- This WG believes that the current spring surveys are already sufficient to assess the status of the stock in spring and provide management advice for the rest of the year
- This WG would suggest that the most useful application of the commercial vessel effort would be as consorts to the existing surveys. The commercial vessel survey should be considered a lower priority.
- This WG considers that landings from commercial vessels taking part in the surveys would not be compatible with the scientific objectives of those surveys.
- Any vessel deployed in any of the ways above, including CPUE “Experimental fishing” would require observers on board, and dedicated time by scientists to analyse the resultant data

2. Introduction

2.1. *Background: Anchovy in the Bay of Biscay*

A zero TAC has been established for the Bay of Biscay anchovy in 2007. This catch limit may be revised by the Commission in the light of scientific information collected during the first half of 2007.

In addition to the spring scientific surveys regularly utilised to estimate both the strength of the incoming new year-class and the Spawning Stock Biomass (SSB) the Council of Ministers decided to authorize also the use of commercial vessels to gather information on the state of the anchovy stock.

A maximum number of 20 Spanish purse seiners and 8 French commercial vessels may be deployed in zone VIII for experimental fishing from 15 April until 15 June 2007. Concerned Member States shall submit the catch reports every 15 days to the Commission. The Commission will suspend such additional experimental fishing once sufficient data has been collected.

2.2. *STECF is requested to (ToRs)*

- advise on a suitable sampling design in terms both of minimum and maximum weekly deployed fishing effort (number of vessels, GT capacity, fishing days, etc..) and of its spatial distribution (geographic and depths) taking into consideration that information is collected through commercial fishing vessels with different characteristics, fishing gears and fishing power;
- indicate whether it is advisable to have an homogeneous weekly sampling effort during the identified period (15 April – 15 June) or if it is advisable applying different fishing effort levels along such a period. Information and analysis of commercial catches and catch rates obtained in previous years could be helpful in such a deliberation;
- indicate also whether it is advisable for the effectiveness of the sampling that the sampling effort should be complemented by a weekly or fortnightly catch limitation and in such a case what catch level should not be exceeded;
- advise on how to make best use of the data collected through this experimental fishing with a view to estimating the strength of the incoming year-class and spawning stock biomass. Indicate also whether and how the data collected with this experimental fishing can be used or interpreted jointly with data coming from scientific surveys.

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3. Evaluation of potential use of a CPUE based experimental fishery**3.1. General comments on CPUE in small pelagic fisheries**

Catch per unit effort (CPUE) is common in demersal fisheries as a measure of abundance or biomass of the stock. The sandeel fishery in the North Sea, for example, is managed using data on CPUE from commercial vessels (e.g. STECF, 2006). Good relationships

exist for standardised CPUE (with respect to gross weight of vessel) to the abundance of sandeels. Estimates of sandeel abundance are made weekly, with the fishery being closed once the estimated abundance falls below 500 000 million individuals at age 0.

In small pelagic fisheries, the establishment of the effort parameter is problematic. Pelagic fish often aggregate and the identification of these aggregations is made by acoustic techniques before fishing commences. This immediately gives rise to two possible units of effort, with either the time nets are deployed or the total time at sea being possible measures of estimate.

The catch is also influenced by the aggregation behaviour of the fish. Catching aggregated individuals results in higher variability in the catches in a given time, resulting in less precise estimates of average CPUE. Detailed examination of using CPUE as a measure of estimating biomass from Spanish purse seine data and French pelagic trawls is given in the following sections.

Reference: STECF 2006. Report of the Scientific, Technical and Economic Committee for Fisheries. Evaluation of the report of the ad hoc working group on sandeel fisheries. Estimate of the abundance of the 2005 year-class of North Sea sandeel

3.2. Spanish Purse Seine Fishery

CPUE of the Spanish purse seiners has never been included in the assessment of anchovy because of the likely changes in the catchability of these types of fleets (ICES 2006). No standardisation of effort has been made for this fishery. According to literature, CPUE indices have been considered as not reliable indicators of abundance for small pelagic fish, possibly inversely to the size of the stock (Ulltang, 1980, Csirke 1988, Pitcher 1995, Mackinson et al. 1997).

First total annual Landings were analysed in a past ICES assessment WG (ICES 2005) in order to see whether they could be related directly to Spawning Biomass. The results below show the poor performance of those relationships. So the catches would be poorly related to stock abundance.

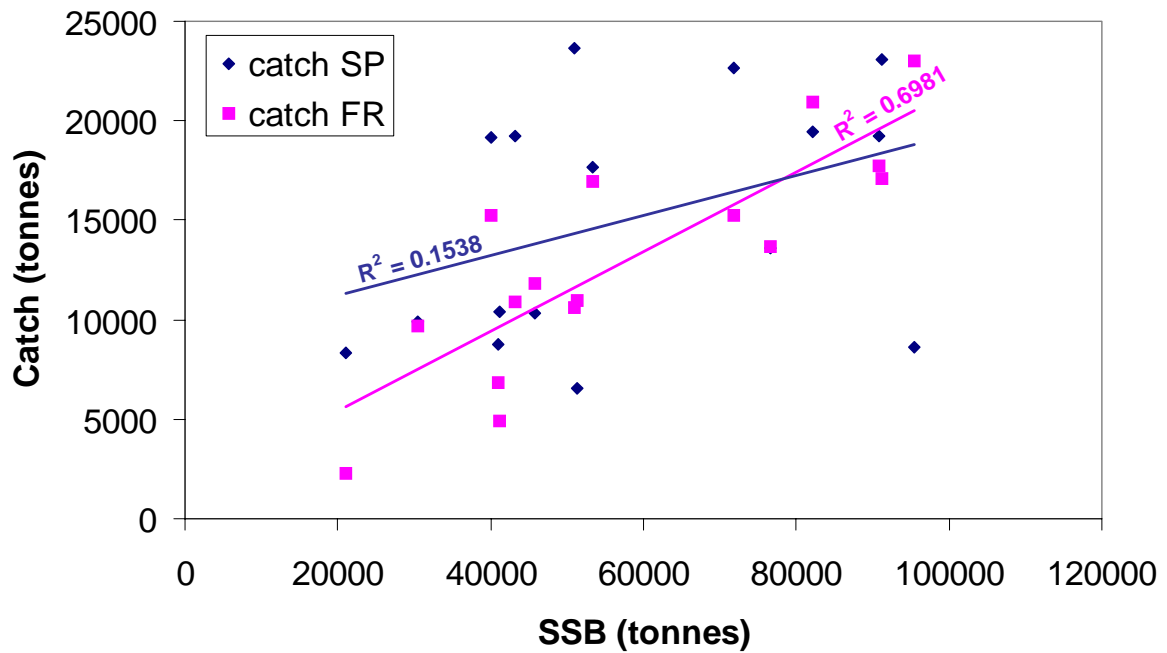
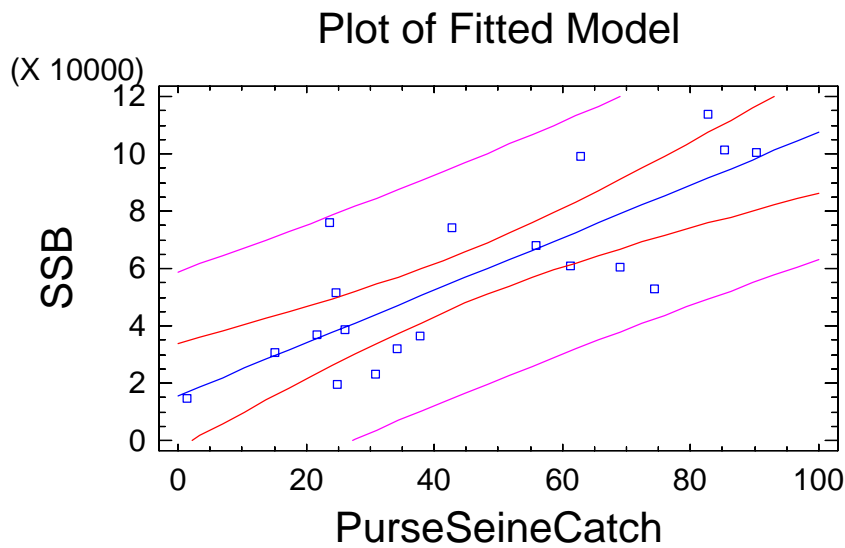


Figure 2.2.1: Relationship between anchovy Spawning stock biomass (SB) and the catches achieved per country and year (from ICES 2005). The Spanish catches are produced by 85% in the Spring fishing season.

For the purposes of evaluating the potential of making inference about the status of the anchovy stock from a free fishery operating in the Spring from 15 of April to 15 of June, the past information from the fishery has been analysed. Fishing over the whole period can only be compared with past series of data for the purse seines. For the French fleet comparisons should be restricted to June since bilateral agreement between France and Spain interdict them to operate during the Spring season (See section 2.3).

For the Spanish fleet, the past series of catches from first of April to end of June were divided by the total amount of purse seines involved in each spring fishing season from 1987-2005 as a proxy to CPUE (without any standarization) Figure 2.2.2:



Parameter	Estimate	Error	Statistic	P-Value
Intercept	15640.8	8652.59	1.80764	0.0884
Slope	918.218	165.525	5.54731	0.0000

Correlation Coefficient = 0.802588
R-squared = 64.4148 percent
R-squared (adjusted for d.f.) = 62.3215 percent
Standard Error of Est. = 18567.9

Figure 2.2.2: Relationship between Catch per purse seine vessel between first of April and the end of June and the Spawning Stock biomass of anchovy (in May, as assessed by ICES -2006 with the Biomass Bayesian Model) for the years 1987-2005, along with the model fitting.

The results show that the relationship although statistically significant is of medium to low precision.

In order to use data from a purse seine experimental fishery from 15 April to 15 of June, the cumulative catch information from the vessels would have to be related to the total catch which would be expected for the complete fishing fleet over the full fishery period. So to use the former relationship of figure 2.2.2 the independent covariate (the total catch from April to June for the whole fleet) would itself be an estimate from 20 vessels (not an observation) and covering just part of the fishing season. Therefore the uncertainty of this estimate would (in a multiplicative fashion) increase the uncertainty of the former function, degrading its value further. In addition there will be the requirement that the 20 selected fishing vessels are randomly representative of the whole fleet. If that could not be assumed then the relative performance of the selected 20 vessels should also be studied in comparison to the total fleet in order to infer the independent covariate for the function in figure 2.2.2. In addition the relative interactions between these 20 vessels is unlikely to be similar to that of the whole fleet.

In summary, because of the cumulative uncertainties on the inference about SSB that can be obtained from use of Catch per vessels information from an experimental fishery, and due to the non use of CPUE indices in the assessment of this population by ICES in the past, or indeed in any major pelagic fishery, the WG considers that the information from the catches by vessel from the experimental fishery would not be useful for any analytical assessment of the population after the scientific surveys. Therefore the WG recommends not to carry out an experimental free fishery, but to take advantage of the vessels to provide support to the development of the surveys (Acoustics and DEPM) and to make some sentinel surveys that could map the spatial distribution of the anchovy and pelagic resources.

Other possible inputs from a free fishery such as the inference about the percentage at age of the population would not generate a genuine additional information regarding the one expected to be achieved by the direct scientific surveys that will be carried out in May (Acoustic and DEPM).

References

Csirke J. 1988. Small shoaling pelagic fish stocks. In *Fish Population Dynamics* (Second Edition). Edited by J.A. Gulland. John Wiley & Sons Ltd.

ICES 2005 : Report of the Working Group on the assessment of mackerel, horse mackerel, sardine and anchovy. 7–16 September 2004 ICES, Copenhagen. ICES CM 2005/ACFM:08.

Recommended format for purposes of citation: ICES. 2006. Report of the Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine and Anchovy (WGMHSA), 5 - 14 September 2006, Galway, Ireland. ICES CM 2006\ACFM:36. 1191 pp.

Mackinson, S., Sumaila, U. R. and T. J. Pitcher. 1997. Bioeconomics and catchability: fish and fishers behaviour during stock collapse. *Fisheries Research* 31: 11-17.

Pitcher, T. J., 1995 : The impact of pelagic fish behaviour on fisheries. *Sci. Mar.*, 59 (3-4): 295-306.

Ulltang, O. 1980. Factors affecting the reaction of pelagic fish stocks to exploitation and requiring a new approach to assessment and management, *Rapp. Procès-Verb. Réun. Cons. Int. Explor. Mer* 177. 489-501.

3.3. *French Trawl fishery*

According to bi-lateral agreements since 1992 (the so called “Agreement of Arcachon”), the French pelagic trawlers are not allowed to fish before the 1st of June each year. It would therefore be impossible to compare CPUE in April and May 2007 with previous years.

The only period where a CPUE approach could be considered is the first fortnight of June. An analysis based on 2000 to 2006 according to log books shows that the catches at this period are from 143 to 426 t with the participation of 15 to 30 vessels (see table 2.3.1.) . These catches were distributed differently from one year to the other but covered over all 17 statistical rectangles.

Furthermore, the estimate of CPUE for pelagic trawlers is more difficult than for other métier as it is necessary to take into account the research time, fishing time and fleet effect, which are not well reported in the log books.

In conclusion an experimental fishery using French trawlers would not yield any useable data to improve the analysis of stock status or the incoming year class

Nb vessels	2000	2001	2002	2003	2004	2005
16E7		8		1	4	4
16E8	1	12		5	12	22
17E7	10	12		12	5	5
17E8	1	10	2	12	16	26
18E6				2		
18E7	15	10		22	5	27
18E8	1	8		9	13	4
19E6	4			10		6
19E7	2			10	8	18
19E8	2		12	10	4	2
20E6	9	2				1
20E7		1	4	1	2	4
20E8			25	12	4	2
21E5		4				
21E6	4		2			
21E7			4	3		
22E5		2				
Nb navires	15	18	25	28	18	30

Catch (kg)	2000	2001	2002	2003	2004	2005
16E7		22 902		1 100	7 100	4760
16E8	2 500	45 585		5 915	44 405	16975
17E7	50 095	171 139		22 923	6 910	4460
17E8	1 625	87 250	5 600	35 113	87 415	49450
18E6				934		
18E7	156 570	56 887		99 209	6 420	47605
18E8	1 000	34 340		16 825	64 475	6100
19E6	9 500			26 250		2140
19E7	1 200			21 540	12 520	8190
19E8	14 990		44 635	37 799	8 800	430
20E6	21 650	340				125
20E7		3 000	4 185	2 300	40	2180
20E8			184 410	76 810	410	500
21E5		3 800				
21E6	8 190		500			
21E7			12 200	110		
22E5		888				
	267 320	426 131	251 530	346 829	238 495	142 915

Mean catch/vessel	17 821	23 674	10 061	12 387	13 250	4 764
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Mean catch/pair	35 643	47 348	20 122	24 773	26 499	9 528
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Table 2.3.1 French vessels and catches in the first 2 weeks of June 2000 – 2005

3.4. Conclusions

Based on the above, the sub-group concluded that there was little or no scientific value in allowing an “Experimental” fishery to be carried out using a reduced number of vessels as proposed by the European Commission. By “scientific value” the sub group mean that any data derived from such an experimental fishery would not provide information on the stock status at the time of the work or of the size of any incoming year class.

The ToRs for the group appeared to be predicated on the assumption that such an experimental fishery WOULD be carried out. Given that this was not supported by the sub-group, they went on to describe a number of ways in which commercial vessels COULD usefully contribute to scientific knowledge of the stock and on its status and future assessment and management. These approaches are detailed in the following chapters.

4. Using commercial vessels as “consorts” in routine assessment surveys for anchovy

4.1. General comments on commercial vessel consorts

The expert group agreed that the most valuable use that could be made of additional commercial vessel resources as envisaged in the Council decision was to act as “consorts” to the research vessels carrying out the programmed routine surveys (PELACUS, PELGAS & BIOMAN). The value of the consorts would be to carry out additional biological sampling to supplement that done by the RVs, with the aim of increasing precision and reducing variance in the stock estimate. In general, the survey design for an acoustic survey (e.g. PELACUS and PELGAS) will be a compromise between the collection of acoustic data and of supporting biological data, so it is often difficult to collect all the biological data that would be ideally required. The consort vessels will be able to remedy this lack. It is also proposed to use consorts from both metier (trawl and purse seine). Recent evidence has shown differences in biological parameters collected by purse and trawl. The use of these consort vessels will allow some evaluation of the sensitivity of the biomass estimate and its age structure to sampling metier. In the particular case of PELGAS in Biscay, the (small purser) consorts should be able to extend the range of coverage into shallower water than would be possible with the RV – see 4.3 for more detail.

An important point to note is that in all the surveys, the consort vessels allow the collection of additional and valuable data, without compromising the data collection programme of the RV conducting the survey. So, for assessment purposes, the survey time series will be unchanged, but the understanding of bias and variance due to weaknesses in sampling or spatial coverage will be improved.

4.2. PELACUS survey consorts.

PELACUS is a multidisciplinary survey carried out by the IEO (Spanish Institute of Oceanography) in the north and northwest coast of Spain (Cantabrian Sea and Galician waters). PELACUS is directed, among other objectives, to estimate by acoustic methods the

pelagic fish resources, mainly sardine, but also including the following species: mackerel, horse mackerel, and anchovy. The timing of the survey is usually between March and April, always before the PELGAS and the BIOMAN surveys (see 3.3 and 3.4).

The distribution of these pelagic species is extended over the whole continental shelf, from shallow waters near the coast (e.g. juveniles, sardine and anchovy) to deep waters beyond the continental break (e.g. anchovy juveniles in the eastern Cantabrian Sea). The PELACUS survey is carried out onboard a scientific research vessel of about 70 m in length (in years before 1997 with the R/V Cornide de Saavedra and since 1997 with R/V Thalassa). The size of these research vessels and the characteristics of the trawl gear do not allow fishing operations in shallow waters. Therefore, in some years the participation of a commercial purse seiner was included in the survey planning to obtain samples in shallow waters and rocky grounds. The results were able to quantify the species composition and the population structure of pelagic fish in these shallow waters. This highlights the benefits of using a purse seiner as a consort to the research vessel within the PELACUS survey. Additionally, the acoustic grid used in the PELACUS survey was specifically designed for sardine, and the offshore waters are not well covered by the acoustic tracks. It would also be useful to obtain information on anchovy distribution and population structure in offshore waters. The addition of a pelagic pair trawl team in the PELACUS survey would allow the continuation of the acoustic tracks beyond the continental shelf, especially in the eastern part of the Cantabrian Sea, where anchovy has frequently been found in the past. An important point is that the trawlers are able to fish at depths at which purse seiners cannot.

Conclusion: To quantify the pelagic fish species composition and population structure in shallow waters and in deep waters (beyond the continental shelf), the PELACUS survey could include the participation of one commercial purse seiner and one commercial pair of pelagic trawlers as consorts to the research vessel. This participation should be included for the part of the survey covering Division VIIIc (from Cape Finisterre to Cap Breton Canyon) as this is part of the distribution area of the Bay of Biscay anchovy stock) and should include the presence of observers onboard. The PELACUS survey also covers part of Division IXa, but no consort is required for this period. It should be noted that the consorts would be required before 15th April, as the surveys start on the 1st April and would enter Division VIIIc around the 6th or 7th April.

4.3. BIOMAN survey consorts.

The BIOMAN survey is carried out yearly by AZTI-Tecnalia institute in Bay of Biscay, over Cantabrian and French shelf, to evaluate the spawning biomass of anchovy population by the daily egg production method. The timing of the survey is usually May and in 2007 it will be carried out between 3rd and 23rd of May. The coordination of this survey with the acoustic surveys or with other egg surveys is organised within the context of the ICES WGACEGGS and WGMEGS.

To estimate the anchovy biomass using the anchovy egg abundance and distribution it is necessary to estimate the fecundity parameters of adult anchovy throughout the whole Bay of Biscay area. For that aim a good sampling collection of adult anchovies is necessary. The BIOMAN and PELGAS acoustic survey are cooperating since many years by exchange of information in real time and by providing the second survey samples for fecundity for the application of the DEPM. In addition, in many years, the samples are enlarged by the opportunistic sampling achieved through the help of commercial fishery. For 2007 apart from

the “Investigador” research vessel, which will be in charge of egg sampling, and the cooperation of IFREMER, the “Emma Bardan” research vessel will participate in the survey to obtain adult samples by a trawl gear system. However the closure of the commercial fishery this year prevents the help of the fishermen this year. Nevertheless additional sampling of adult anchovy will contribute to deeply improve the quality of adult samples for fecundity analyses. In this sense, the collaboration of one commercial purse seiner during the BIOMAN survey would help to complement the fishing activities of the Emma Bardan R/V and to improve the adult sampling collection concurrently with the egg surveying of the area with the “Investigador”.

So the scheme of the sampling for this year for BIOMAN would be that:

- Investigador R/V for egg sampling between 3 and 22 of May 2007
- Enma Bardan R/V for pelagic trawling for adult sampling between 3 and 22 of May 2007.
- Cooperation of French PELGAS survey in the collection of the adult samples.
- And the proposal of a Spanish Purse seine operating ad hoc in parallel of the Investigador and Enma Bardan vessels to provide adult samples for fecundity. Purse seine operations would take place during night or in the morning at the places suggested by the other vessels or where acoustic records are seen. Small catches for species identification, length composition and preservation of anchovy for fecundity studies will be sufficient. Slipping practices will therefore be encouraged.

Protocol :

- 1 observer on board each small purse seiner
- sorting of catches, species composition weight estimates
- anchovy biological samples must be taken (length distribution on board, frozen samples and samples preserved in formaldehyde for fecundity analysis)
- not complete fishing operations. Captured anchovy would be released once a sample was caught from the haul.

4.4. PELGAS survey consorts.

The PELGAS survey will be carried out from 25 April to 20 May on board R/V Thalassa. The survey will take place between Bayonne and Brest, along a standardised grid of transects according to a sampling strategy protocol coordinated by ICES WG (WGACEGGS and WGHMSA). The objectives are 1) to assess the biomass of the main pelagic species 2) to collect ecological parameters for a better understanding of the anchovy recruitment process.

The use of commercial vessels consorts would be to improve the identification of echoes and/or improve the biological sampling in areas where Thalassa is operating and also to conduct further acoustic and biological sampling in areas where the coverage is not sufficient (offshore and shallow waters).

Three different objectives are addressed by the use of commercial consorts:

- 1) to prospect the coastal areas (inside the 30 first metres) where the smallest anchovies are supposed to be present. Also to gain further information on the reproductive behaviour of anchovies.
- 2) to enlarge the offshore coverage in order to establish a better spatial distribution pattern and knowledge of nycthemeral behaviour

3) to increase the number of fishing operations for echoes identification and biological sampling. The use of the two types of gears (purse-seiner and pelagic trawler) will provide further analysis on the respective catchability

For this purpose, several vessels are required :

- 2 small purse seiners in the coastal area during all the survey long (2 during the first 10 days in the southern area from Bayonne to the Gironde, and 2 others during the last 10 days in the southern Brittany area)
- 1 (Spanish) large scale purse seiner and 1 pair of pelagic trawlers, for the platform and offshore coverage during the whole survey (22 days).

Protocol :

- 1 observer on board each small purse seiner
- 1 observer on board one of the pair trawlers
- one of the pair trawlers must be equipped of an echo-sounder (digital echo-sounder SIMRAD)
- short fishing operations (not more than 30 mn) according to the scientific demand during the survey and /or in case of commercial vessel detections not observed by Thalassa
- sorting of catches, specific weight estimates
- anchovy biological samples must be taken (length distribution on board and frozen samples)

The areas to be sampled in addition to the standard acoustic survey are presented in figure 3.4.1.

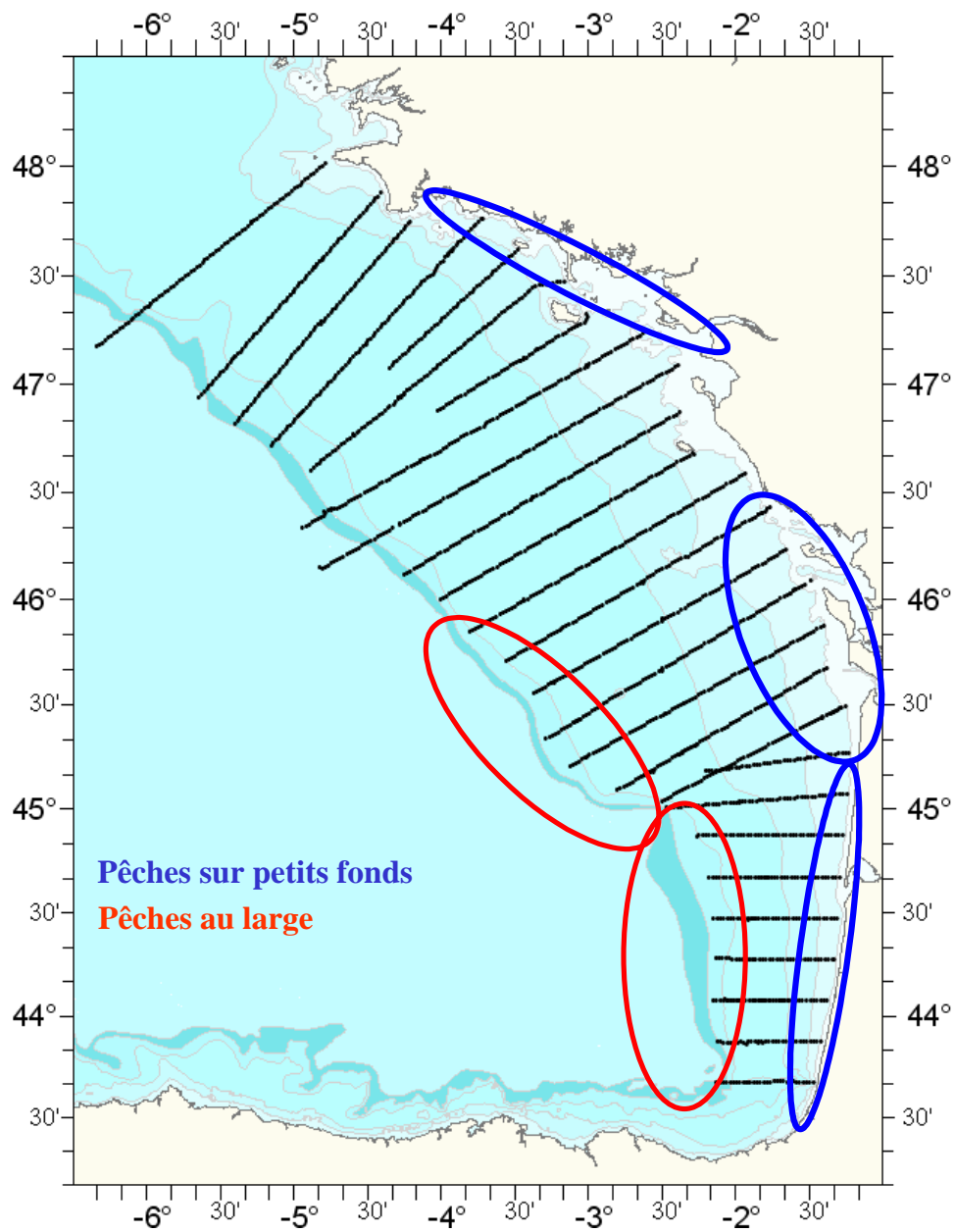


Figure 3.4.1. Transect sampling strategy for PELGAS07 survey and additional areas. (in blue, shallow waters areas and in red offshore areas).

5. Using commercial vessels as additional survey vessels for anchovy

5.1. *General comments on using commercial vessels for surveys and rationale for May 2007*

The expert group proposed that a multi vessel survey could be carried out in May using commercial vessels. The survey would be designed as a so-called Rake survey. The survey would be based on acoustics and fishing. A group of vessels would survey along pre-designated transects and would use their own echosounders to identify presence or absence of fish schools. These would be fished on according to a set of guidelines prepared by the coordinating scientists. The survey would include both pair trawlers and purse seiners, and would cover the entire distribution area from Brittany in France to Galicia in Spain. Each vessel would have a scientific observer on board to guide the crew and to obtain biological samples. The outcome would be a basic presence/absence distribution map, although with addition of echogram recordings (recorded using digital stills cameras) allowing a more resolved abundance mapping with further post analysis. The biological samples would also provide catch data on species and age group proportions. A more detailed description of the methods and transect design is provided below (4.2)

This type of survey has already been piloted by Spain in May and December 2005 (“PROA” and “Centinela” surveys using purse seiners), and by France in September 2005 (using pair trawlers). Both used different transect plans to each other and to the proposed design here. Similar surveys have been carried out in Chile to survey pelagic resources. The proposed survey is not intended to provide additional data on SSB or the recruiting year class per se. Its primary purpose is to evaluate how effective such a survey would be in providing a synoptic overview of the abundance distribution and biological parameters. The survey would be carried out in May, at the same time as the existing PELGAS acoustic and BIOMAN egg surveys for anchovy. The results of the Rake survey could then be validated against these surveys and the potential for using such surveys at other times evaluated. The survey design (see below) includes both trawlers and pursers, and will allow direct comparison between the capture performance of these two métiers to allow evaluation of different catchability (in terms of fishing and observation as well). The transect design is based on the PELGAS and PELACUS transect design and will allow direct comparison to that survey. Finally the survey will provide the data needed to establish whether and how a sentinel fishery could be established in the future for this stock. The timing in May was chosen to allow the validation against the scientific surveys and comparison with the previous PROA surveys.

Fishing during these surveys will be constrained by guidelines provided by the scientific coordinators. It is not possible to estimate the additional fishing mortality this would cause. However, based on the estimation of the maximum potential capture rates for these vessels if allowed to operate freely, the absolute maximum catch could be an amount between 200 and 975 tonnes for scenarios corresponding to low or high spawning biomass levels respectively (see section 5). It should be emphasised that likely captures would be well below this, specially if it is considered that it is not necessary for purse seines to raise the whole catch on board and most of the captured anchovy could be released and that for

pelagic trawlers short hauls durations must be controlled. The design of the survey would not allow landings of any fish, as the vessels would be required to continue the survey after fishing.

5.2. *Survey design and method*

The WG did not have the time or resources to fully plan such a survey, but the following text makes recommendations for the planning required.

The survey would have to be planned with these considerations:

- Dates and duration
- Survey area (Limits)
- Survey strategy (perpendicular transect to coast to match PELGAS)
- Number of vessels and distribution of vessel. Trawlers & purse seines, Spatial and temporal
- Recording data methodology (material and human resources?)

The survey would take place between 1st and 27th of May, 2007 during 10-15 days and will cover the area from Brittany in France to Galicia in Spain (limits 48°N and 9°W) see Figure 4.2.1).

Four French trawlers (two pairs) and eight Spanish purse seines will participate in the survey. Four of the purse seines and the trawlers will aim to detect the presence of anchovy concentrations along perpendicular transect to the coast during day-light hours (Figure 4.2.2). The selected transects will be 3nm apart. The other four purse seiners will cover the same transects as the other four purse seiners but during the night, to check the probable concentration of adult anchovy for spawning at the surface. In each of the vessels there will be an observer on board who will be in charge of guiding the crew, reporting the survey (time, track, photographs of echoes, etc) and collecting echogram recordings and biological samples.

This scheme will allow the collection of a range of results on anchovy distributions which might allow scientists and managers:

- To compare with results of previous sentinel survey carried out in May (PROA)
- To compare with the results for anchovy distribution obtained in the scientific surveys carried out at the same time as this commercial vessel survey (PELGAS and BIOMAN)
- To evaluate any vessel effect
- To evaluate the gear effect – between purse seine and trawl.
- To evaluate any spatio-temporal effects.

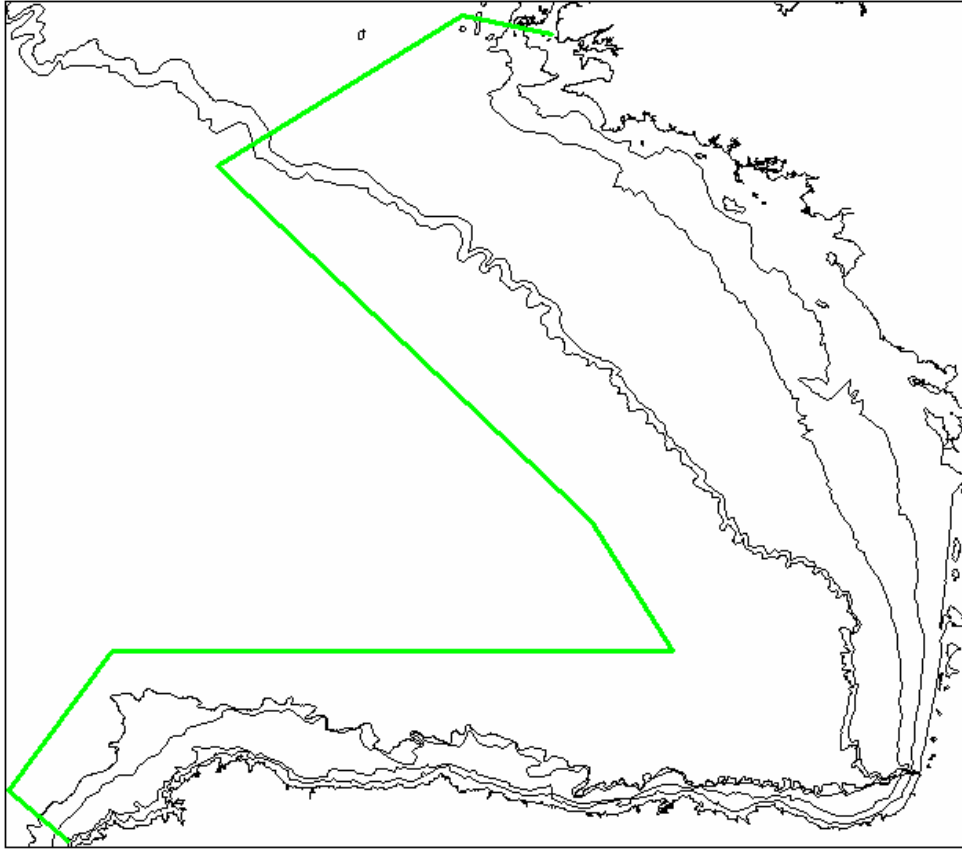


Figure 4.2.1. Map of the area proposed for the commercial vessel “Rake” survey.

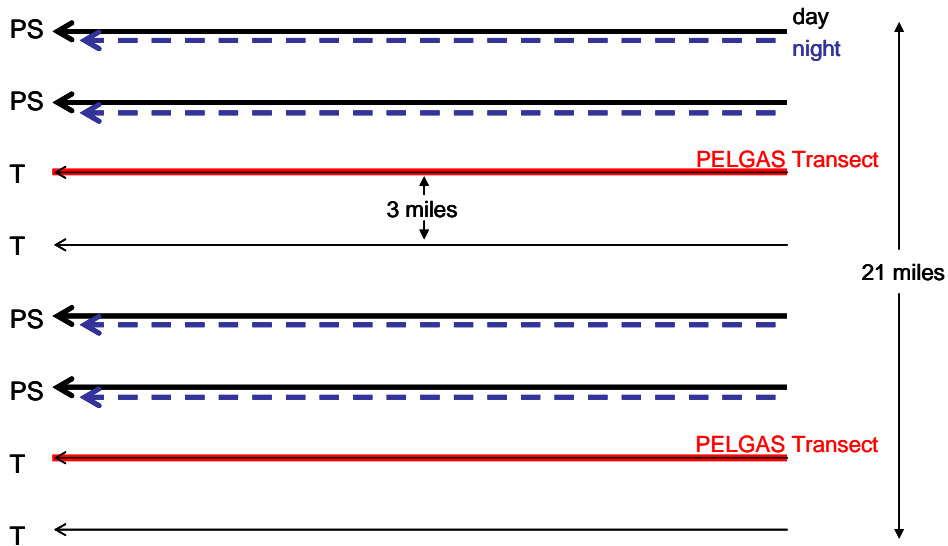


Figure 4.2.2. Schematic of the spatial and temporal distribution of commercial trawlers (T) and purse seines (PS) during day (solid line) and night (dashed line) and PELGAS transects (in red) in the proposed commercial vessel surveys.

Methodology:

Four trawlers and four purse seiners will start the transects perpendicularly from coast at the same time (day-light hours). The crew and observer will use the vessel echo sounder to locate fish, they will also use digital stills cameras to record the registrations. The other four purse seines will do the same job but beginning at night. Any vessels detecting echoes will carry out a haul (trawl) to identify the species, their length distribution and to collect and analyze biological samples for anchovy studies (otoliths and fecundity) when these are captured. Each of the transects will finish at 20 nm beyond the shelf break (200m contour) and the vessel will then return to coast along the next specified transect.

6. Evaluation of potential maximum catches of the proposed commercial fishing vessel effort

The sub group ToR included a question on levels of catch expected in the experimental fishery, and what might be acceptable. While the sub-group did not recommend such a fishery it was able to some extent to evaluate the potential impact of the fishing effort proposed for the consort and commercial vessel surveys IF it had been deployed in an experimental fishery.

To do this, the number of days at sea by métier (trawl or purse seine) was calculated for both the consort and the commercial vessel surveys (table 5.1.). The maximum potential captures using those vessel days in two stock situations were then calculated. The first situation was that prior to the recent stock collapse, and in this case we used 2001 at one of the maximum stock levels. The second situation was an average for recent years when the stock was low but before the collapse recorded in 2005. In each case the average catch per day was calculated for Spanish purse seiners and for French pair trawlers. This data is presented in table 5.2. This was then multiplied by the number of days required for the survey work to provide a maximum likely impact for those vessels acting within an experimental fishery.

Vessel Metier	Consort surveys	Commercial vessel surveys	Totals
Purse Seine (vessel days)	68	112	180
Pair trawl (pair days)	48	28	76

Table 5.1. Vessel days required for each survey deployment by métier

Vessel Metier	Average catch per day in 2001 (tonnes)	Average catch per day (first half of May 2003) (tonnes)
Purse Seine (by vessel day)	4.0	0.33
Pair trawl (by pair day)	3.4	1.8

Table 5.2. Average catch per day by metier in 2001 and in 2003 representing good and low stock scenarios respectively.

Based on these data it can be concluded that if the vessel days proposed for the surveys were applied in an experimental fishery the maximum potential catches would be around 975 tonnes in a healthy stock scenario and about 200 tonnes if the stock level was as low as in the most recent years prior to the collapse. It should be emphasized that these values represent the maximum that the vessels would be expected to catch if they were allowed to fish freely. Substantially lower catches would be expected in both survey proposals as the bulk of the fishing would take place away from the main fishing areas and under control of the scientists running the survey.

7. Time and resource implications for the proposed surveys

The sub-group wished to emphasise that the proposed uses of the commercial vessel effort would also require the commitment of scientific and technical staff from any institute taking part in the work. Experienced acoustic survey scientists would be required on at least one of the vessels acting as consort to the two acoustic surveys. Observers would be required on all vessels in both types of survey. Finally, commitment of scientist time would be required to integrate and work up the material gathered from the commercial vessels.

With the appropriate resources the initial results of the additional surveys in May 2007 (fishing maps, species composition and length distributions) should be available for reporting to STECF by 15 of June and the final report (including biological sampling and analysis of pictures of the acoustic records) would be available for the ICES working group WGACEGGS in November 2007

8. Overall Conclusions

In summary, the group made the following recommendations

- An experimental fishery would not provide any useful additional data for an evaluation of stock status or incoming year class strength in Biscay anchovy
- The commercial vessel effort proposed for such a fishery would be better deployed in providing supporting fishing and surveying activity for the existing research vessel surveys in the spring
- If additional commercial vessel effort was agreed beyond that to support the surveys, it could best be deployed in a targeted acoustic fishing “rake” survey at the same time as the PELGAS and BIOMAN surveys in Biscay.
- The current scientific surveys might be anyway considered alone, as sufficient to evaluate Biscay anchovy stock status and the strength of the incoming year class for 2007 and to be comparable to previous years results (official series).

Annex 1

Indicative costings for IFREMER, IEO & AZTI to carry out proposed Consort and Rake surveys

SURVEY		Time	Cost	Comments	
PELACUS	COMMERCIAL VESSELS	1 PURSE SEINE 1 PAIR TRAWLERS	20 days 20 days		
	SCIENTIFIC PERSONNEL to contract	2 OBSERVERS (1 Spanish and 1 French)	30 days each = 2 man/month	4000/person	
	MATERIAL	Water clothing; sampling material; photographic material; maps; others		1200/boat	
BIOMAN					
PELGAS	COMMERCIAL VESSELS	1 Spanish PURSE SEINE 1 French PURSE SEINE 1 PAIR TRAWLERS	20 days 2*10 days 20 days	20 * 2000 € 20 * 5600 €	10 days for the southern coast then 10 days for the northern
	SCIENTIFIC PERSONNEL to contract	2 OBSERVERS (1 Spanish and 1 French)	30 days each = 2 man/month	30*170€ 4000/person	10 Extra days to elaborate some data from the material collected in the commercial vessels
	MATERIAL	Water clothing; sampling material; photographic material; maps; portable computers others		1200/boat	

SURVEY			TIME	COST	COMMENTS
RAKE	COMMERCIAL VESSELS	8 PURSE SEINERS 2 PAIR TRAWLERS(4 boats) 1 OBSERVER/purse seiner	15-20 days 15-20 days	$4 * 2800 \text{ €} * 20 \text{ days}$	
	SCIENTIFIC PERSONNEL at SEA (to contract)	(Spanish). 1 observer /pair trawler	20 days/observer = 10 or 12 man month	$2 * 170 \text{ €} * 20 \text{ days}$	
	SCIENTIFIC PERSONNEL at LABORATORY (to contract)	2 persons/laboratory = 6 persons (2 IEO; 2 AZTI; 2 IFREMER)	From June to November = 30 man/month	$2 * 6415 \text{ €} / \text{month} * 6 \text{ months}$	1 scientific and 1 technician per laboratory to make the biological sampling of the material collected and data processing to prepare with the scientific responsables the final report of the racke. The report should be ready for November, therefore the ti
	MATERIAL at sea	Water clothing; sampling material; maps; others		1200/boat	
	Material at laboratory	portable computer*, basic office material, others		2000/laboratory	This is a personal computer for each laboratory (IEO, AZTI, IFREMER) and other office and reprography material