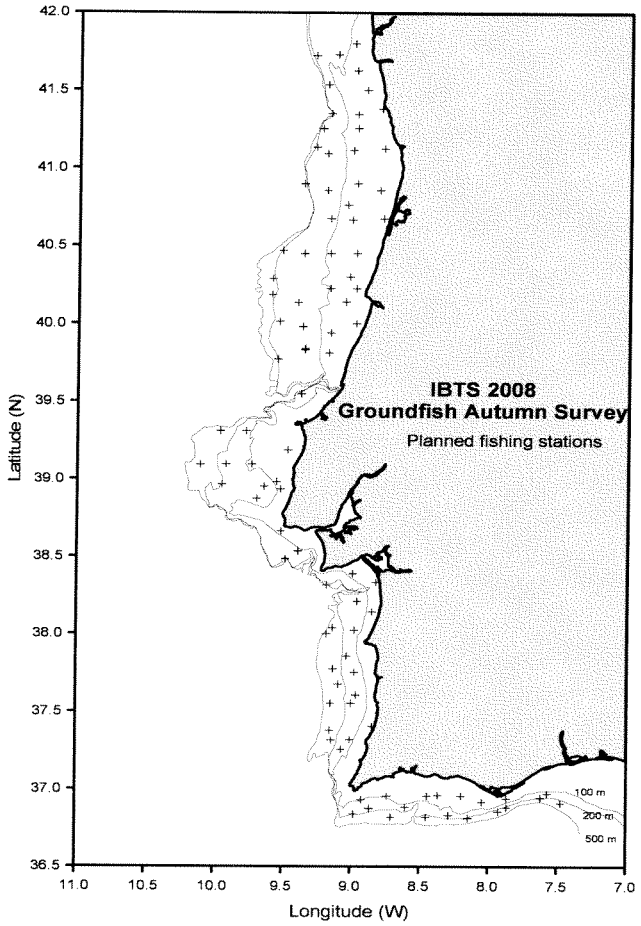
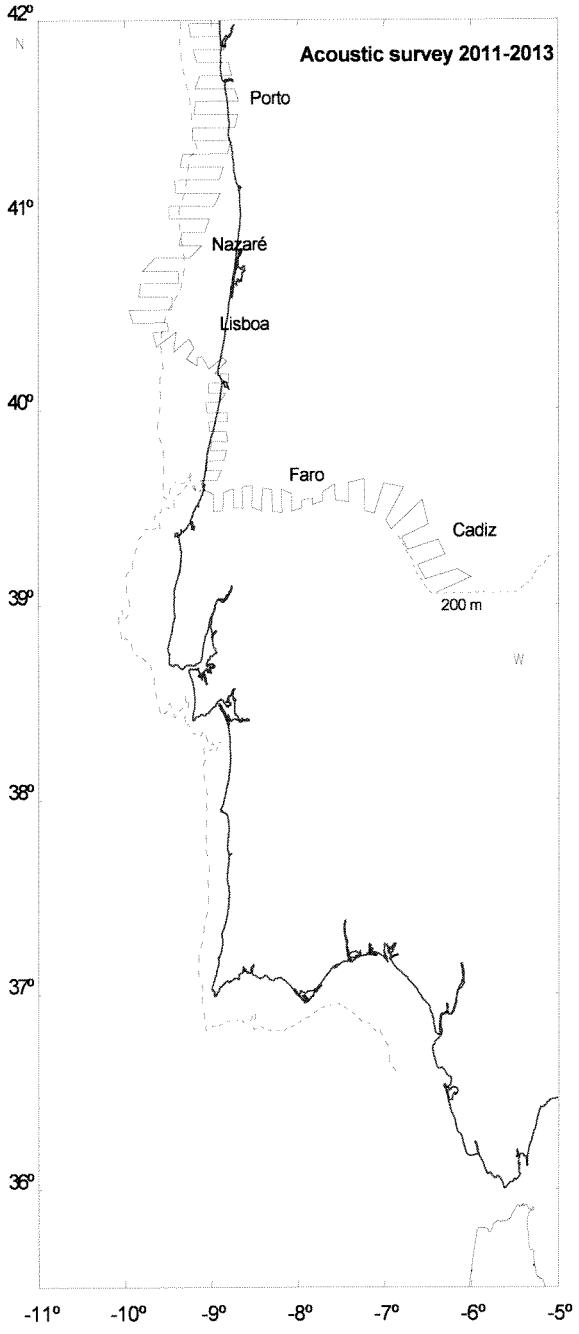
ANNEX I

Surveys Maps

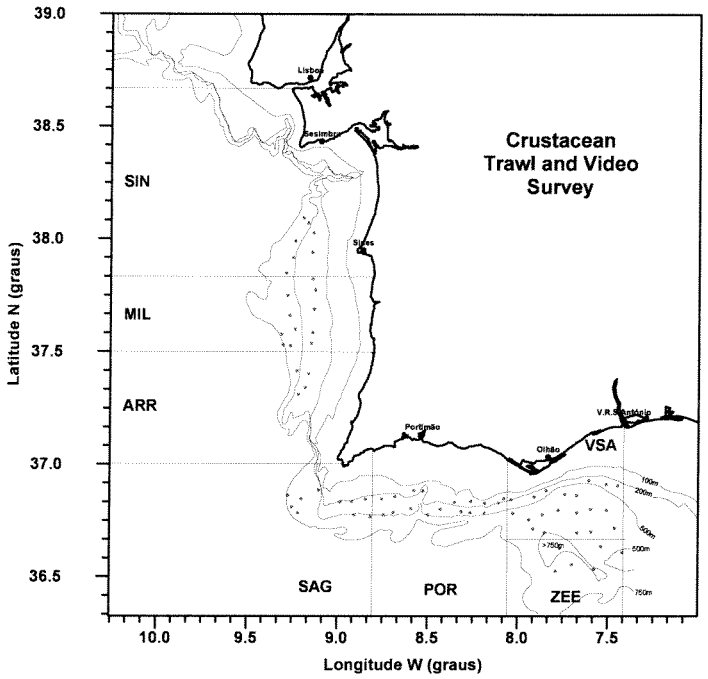
Map 1 – Planned fishing hauls in **Western IBTS survey in Div IX a** (Portuguese waters) in 4th Quarter, **in 2011-2013**



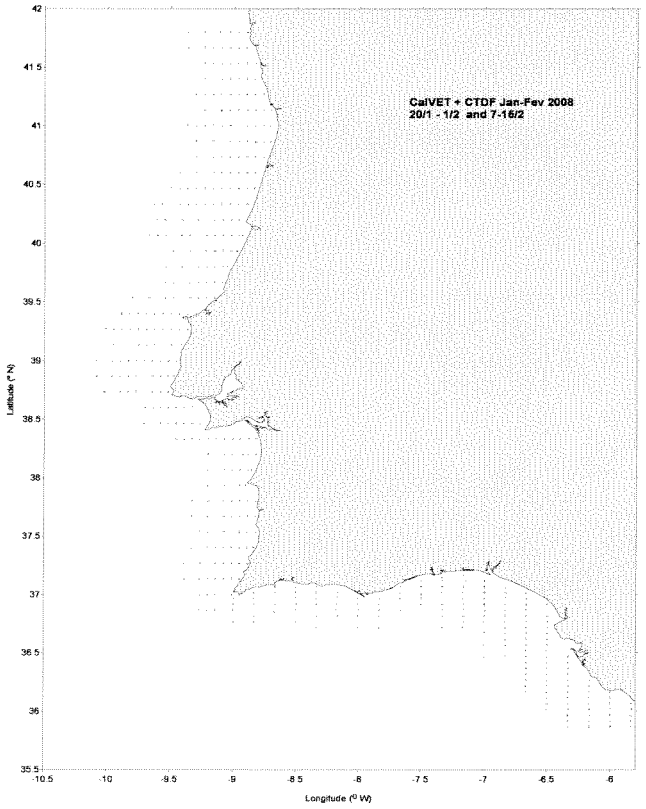
Map 2 - Sampling grid (radials) for Sardine, Anchovy and Horse Mackerel Acoustic Surveys (March/April) **in 2011-2013**



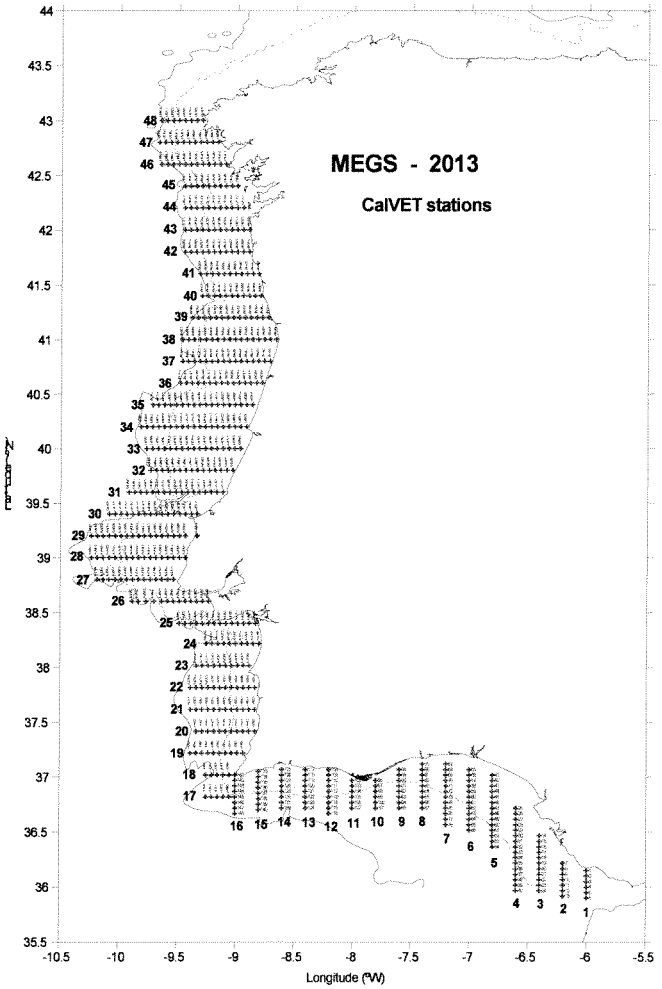
Map 3 – Planned fishing hauls and video footage of the **Nephrops TV survey - offshore of Portugal – FU 28+29 - in 2011-2013**



Map 4 – Planned Plankton grid (CALVET) for the **Sardine DEPM survey in 2011**



Map 5 – Planned plankton grid for the International Mackerel and Horse Mackerel Eggs survey – **MEGS in 2013**



ANNEX II

PILOT STUDIES

(IPIMAR)

- **Pilot Study on the métiers where skates are caught in IXa**
- **Pilot study for glass eel (*Anguilla anguilla*), 2011-2013**

Pilot Study on the métiers where skates are caught in IXa

Portugal is including a pilot study on the artisanal fisheries catching skates in areas of the continental coast (ICES Subarea IXa). The most important ports, where landings of skates take place, were identified during a previous study and estimators to determine specific composition of skate's landings were developed (Bordalo-Machado *et al.*, 2004). Peniche (centre of Portugal) is the main landing port for skates and as far as it is known, no directed fisheries are taking place. Skates in Peniche are by-catch species from landings of the mixed artisanal fleet, particularly from the fleet segment of vessels operating with trammel nets and gill nets. The fishing regime of those vessels is highly variable both temporally and spatially and not fully known.

This proposal came in response to the recent Council Regulation (EC No 43/2009) which prohibits the landings of *Raja undulata, Dipturus batis* and *Rostroraja alba* in Iberian waters (ICES subareas IXa and VIII). This decision is considered controversial because there is not enough information or evidence of declines in the populations of these species in the subareas mentioned (ICES 2009). Furthermore the socio-economic impact of this regulation has not been evaluated. The 2009 ICES WGEF report of 2009 recommended *that in order to register possible changes that might occur in the specific composition of landings of these species, this methodology should be improved with a more intensive and effective sampling in ports*. The RCM for the North Atlantic (Cadiz, September 2009), considered that studies, with the purpose of improving the knowledge of a given fishery, is within the scope of DCF, and recommended its inclusion as a pilot study in the National Plan of the Member States involved.

The main objective of the proposal is to improve the knowledge on the metiers where skates are caught, filling the gaps in existing basic data on the métiers, e.g. skates fishing effort and economic aspects and on the biology of rajidae species. This pilot study was designed for three years and during the first year focus will be put only Peniche landing port. In the second and third years and based on the results obtained during the first year will be extended to the other landing ports at the north and south of Portugal. This presupposes adaptation of sampling design in order to accommodate the study of the fisheries from the métiers catching skates as by catch. This pilot study will be developed in Portugal but its conception, goal and data analysis will be performed in a close collaboration with Spain, which is also submitting a similar proposal for their Atlantic waters (ICES Subarea ICES

VIIIb, VIIIc and IXa). Such joint approach will constitute an important contribution for the future stock assessment of skates at Iberian Eco-region.

The terms of the study will be subdivided in two categories:

a) Fishery:

a. Revisions and up to date of historical landings data (i.e. landed weight and value), according to the specific composition of rays by month, métier and geographical distribution.

b. Characterization of the fleet landing skates and discards.

c. Standardised effort and CPUE by month by specie.

d. Preparation of a Guide of Rays in Iberian waters, in cooperation with Spain (Spanish, Portuguese and English versions)

b) Biological.

a. Obtaining of length frequencies, sex proportion and maturity determination for all rajidae species. Besides the studies referred before, under the present proposal, studies will be initiated on age/growth and on reproduction for the species *Raja brachyura*, *Raja undulata* and *Rostroraja alba*, the later are a rare species in Portuguese landings.

b. Description of condition of landings by port and métier.

c. Estimation of conversion factors (wing/total weight ratios by specie).

The cost of the pilot study on the artisanal mixed fishery with skates landings is put at EUR 105 476. The main items of expenditure are personnel (a PhD researcher will be recruited to lead the study under the supervision of an experienced researcher) and missions (travel expenses to the landing port and daily allowance). Skate samples and consumables for biological studies of the aforementioned species will be obtained under the DFC routine sampling programme.

Budget Pilot study on skates fishery	2011	2012	2013
Human Resources	18.967 €	18.967 €	18.967 €
Post-doc grant	17.940 €	17.940 €	17.940 €
Other costs - social security	1.027 €	1.027 €	1.027 €
Missions	10.176 €	19.200 €	19.200 €
Travel to landing ports (Peniche = 4 missions/month)	3.600 €	3.600 €	3.600 €
Travel to landing ports (Matosinhos/Olhão=2 missions/month)	2.160 €	2.160 €	2.160 €
Travel expenses (to Peniche, 230 km)	4.416 €	4.416 €	4.416 €
Travel expenses (to Matosinhos, 680 km)		3.264 €	3.264 €
Travel expenses (to Olhão, 600 km)		2.880 €	2.880 €
Hotel Matosinhos/Olhão (2 day/person)		2.880 €	2.880 €
TOTAL (2011)	**29.143 €**	**38.167 €**	**38.167 €**
TOTAL (2011-2013)	**105.476 €**		

Pilot study for glass eel (*Anguilla anguilla*), 2011-2013

Recruitment of glass eel is at a historically low level and continues to decline with no signs of recovery across Europe. All glass eel recruitment series available from NW Europe demonstrate a clear decline since the early 1980s. Although Portugal is considered one of the most important countries with respect to recruitment of glass eel, just after France and Spain, there are no reliable historical data on glass eel relative abundance. The only time series available comes from fishery data in Minho River, the only river where glass eel fishing is still legally allowed... As can be seen from the tabulated values (Table I), landing trends in Minho river are similar to what observed in the rest of Europe.

Table I. Official data of Portuguese glass eel landings in Minho River (source: Capitania do Porto de Caminha)

Season	Catch (kg)	Season	Catch (kg)	Season	Catch (kg)
1979/80	10110	1989/90	4485	1999/00	3000
1980/81	18050	1990/91	2800	2000/01	1149
1981/82	22235	1991/92	4471	2001/02	804
1982/83	6740	1992/93	3626	2002/03	1443
1983/84	16064	1993/94	2900	2003/04	814
1984/85	14843	1994/95	5300	2004/05	1174
1985/86	7000	1995/96	8700	2005/06	2736
1986/87	9510	1996/97	4440	2006/07	905
1987/88	2571	1997/98	4460	2007/08	750
1988/89	2834	1998/99	3600	2008/09	1350

Apart from the Minho river (international river at the northern border with Spain), glass eel fishing is forbidden in the rest of Portugal since 2001. However, an important illegal activity continues to take place, catching many tonnes of glass eels annually.

With the implementation of the National Eel Management Plans according to the EU Regulation (CE) 1100/2007, eel recruitment monitoring is a key element for the evaluation of the measures adopted for the recovery of the stock of European eel. Although several European countries have already established recruitment monitoring programmes, in Portugal currently does not exist such monitoring. The proposal of this pilot study aims to establish the basis for a future sampling plan that monitors eel recruitment in Portugal and therefore permits the evaluation of the efficiency of the stock recovery measures currently being set in place.

Objective: initiate a monitoring plan to evaluate seasonal variation and interannual trends of glass eel recruitment based on CPUEs in two distinct riverine systems of Portugal

Working plan

To fulfil the pilot project objectives, the sampling activity will be concentrated in two areas:

- Minho river, the only national river where there is a legal commercial activity with the existence of an historical series of data;
- Lis river, a small river where IPIMAR in the 90s conducted work, thus having some reference data of relative glass eel abundance (CPUEs) which can be compared with current data (in Lis side tributaries, glass eel fishing can be conducted in an easy way not requiring a vessel).

The sampling plan during 2011-2013 will include:

Minho river

- preliminary visits to establish relations with the fishermen and describe the local fishing gear, *tela*;
- introduction of a voluntary logbook to be filled-in by fishermen;
- weekly contacts by telephone and visits every month;

- monthly purchase of glass eel samples to determine biological characteristics: length, weight, pigmentation stage.

Lis river

- preliminary visits to establish relations, contract fishermen and describe the local fishing gear, *sarrico*;
- four-monthly fishing (October-May) to evaluate abundance in terms of CPUE and seasonal trends of recruitment;
- laboratory determination of length, weight and pigmentation stage

Budget (2011 and 2011-2013)

Activity	**Cost (€) 1year**	**Description**
Fishing (sub-contract)	8000	4 nights by month, 8 months/year (**Lis river**) (2011-2013 = 24000 €)
Travel	4000	Minho and Lis rivers (3years = 12000 €)
Fish samples	2400	6 months samples/Year (**Minho river**) (3 years = 7200 €)
Total 2011 **Total 2011 - 2013**	**14400** **43200**	

ANNEX III

SAMPLING METHODOLOGY FOR SMALL SCALE FISHERIES

1. Definition of sample

For sample definition 3 independent subpopulations were considered. The distinction between each subpopulation consists on fishing gears taken on board. In this way the following groups had been created: vessels using active gears, vessels using passive gears and vessels using polyvalent gears.

The sample size of each subpopulation, *n*, was determined using the following formula (Thompson S., 1992) for a fixed precision level[1], r = 0,05:

$$n = \frac{1}{\frac{r^2}{Z^2\gamma^2} + \frac{1}{N}}$$

Where:
N = population size;
n = sample size;
r = relative precision level;
Z = Standardized variable;
γ = coefficient of variation of the population.

2. Stratification and division of sample

The sample was distributed among the relevant strata with the principal objective of minimising the sampling error to be obtained for the stratification variable and in accordance with the fishing gears licenses and operation area. The strata had been defined taking in account the recommendations of

[1] For each subpopulation was used the coefficient of variation of respective fishing effort for the period between January and December of 2005.

the *Instituto Nacional de Investigação Agrária e das Pescas (INIAP/IPIMAR)* and the *PECOSUDE* document of the European Commission (Léauté & Caill-Milly, 2002).

Following the referred recommendations certain fishing gears had been considered predominant for determined regions, creating, by itself, strata.

The subpopulation of polyvalent vessels was divided in polyvalent with and without beam trawl.
The subpopulation of vessels using passive gears was disaggregated in four initial strata: vessels using pots and traps, netters, vessels using hooks and vessels with passive polyvalent gears. This last strata was subdivided: vessels using passive polyvalent gears with *sombreira* and the remaining vessels were grouped by: vessels using passive polyvalent gears with gillnets, vessels using passive polyvalent gears with trammel nets, vessels using passive polyvalent gears with trammel and gillnets and vessels using passive polyvalent gears with hooks, pots and traps.
The subpopulation of vessels using active gears was disaggregated in: beam trawlers, bottom trawlers, seiners, dredgers, vessels using *xávega* gear and vessels using active polyvalent gears.

3. Sample selection

The sample distribution within strata was carried through the Proportional Probability to Size (PPS) cluster sampling method which allows maintain a steady sampling fraction throughout the population. If stratum *h* has N_h units, the sample size allocated, n_h, to it would be:

$$n_h = \frac{N_h}{N} n$$

The serial number of the units in each stratum *h* was given by a computer-generated random number. The serial numbers of the units selected for the sample are obtained from the first n_h serial numbers given to each stratum *h*.

4. Estimating the population total

An unbiased estimator is used to estimate the population total:

$$\hat{t} = N\bar{y} = \frac{N}{n} \sum_{i=1}^{n} y_i$$

Where:

N = population size;
n = sample size;
$\bar{y}$ = sample mean

An unbiased estimator of variance is:

$$\widehat{var}(\hat{\tau}) = N^2 \widehat{var}(\bar{y}) = \frac{N(N-n)s^2}{n}$$

Where:

s^2 = sample variance;

N = population size;
n = sample size;
$\bar{y}$ = sample mean

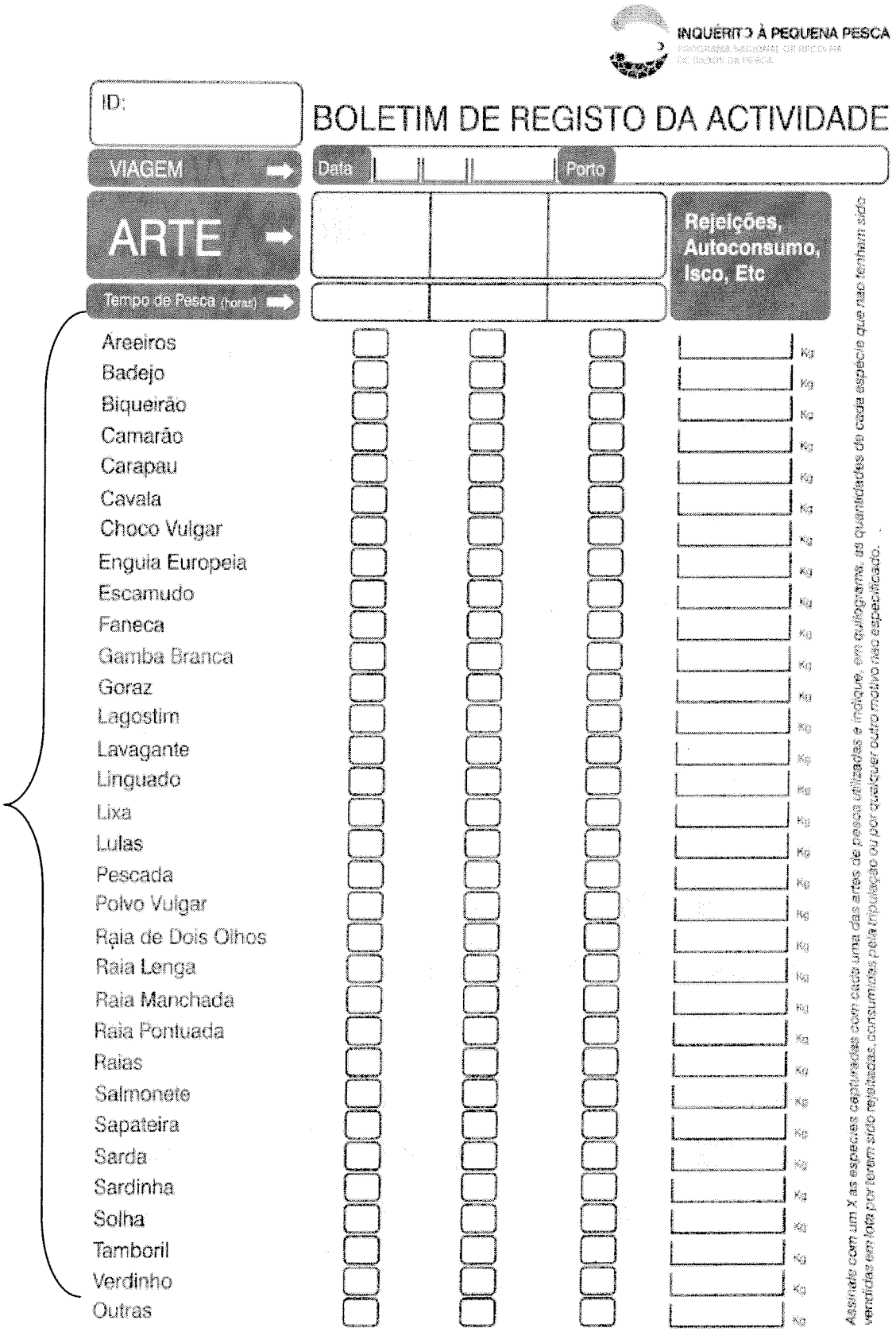
This estimator is used to estimate the following effort variables:

- Number of rigs
- Number of fishing operations
- Number of nets / Length
- Number of hooks, Number of lines
- Numbers of pots, traps
- Soaking time
- Hours fished

REGION	VESSELS LICENSED TO OPERATE EXCLUSIVELLY AT THE SEA												
	ACTIVE GEARS	PASSIVE GEARS									POLYVALENT		
				Polyvalent passive							With Dredger	Without Dredger	
				Without *Sombreira*						With *Sombreira*			
	Xávega	Hooks	Nets	Hooks Traps	With Trammel nets	With Gillnets	With Gillnets and Trammel nets	With Gillnets or Trammel nets	Nets		Without Beam Trawl	With Beam Trawl	Without Beam Trawl
North	16			10			109	33		66		59	18
Center									29			14	
Lisbon and Tagus Valley	22	106	14	52	76	78	111						20
Alentejo		15		19		29			34				
Algarve		81	34	169	67	117	220				38		19

REGION	VESSELS LICENSED TO OPERAT AT THE SEA AND INLAND WATERS									
	PASSIVE GEARS								POLYVALENT	
	Hooks	Nets	Polivalente Passiva						With Dredger	Without Dredger
			Hooks and Traps	With Trammel nets	With Gillnets	With Gillnets And Trammel nets	With Gillnets or Trammel nets	Nets		
North				16				18		13
Center				24				30		88
Lisbon and Tagus Valley	33	86	19	58	14	74			21	13
Alentejo										
Algarve	11			40				53		

Anexo IV


INQUÉRITO À PEQUENA PESCA
ID:
BOLETIM DE REGISTO DA ACTIVIDADE
VIAGEM
Data
Porto
ARTE
Rejeições, Autoconsumo, Isco, Etc
Tempo de Pesca (horas)
Areeiros
Badejo
Biqueirão
Camarão
Carapau
Cavala
Choco Vulgar
Enguia Europeia
Escamudo
Faneca
Gamba Branca
Goraz
Lagostim
Lavagante
Linguado
Lixa
Lulas
Pescada
Polvo Vulgar
Raia de Dois Olhos
Raia Lenga
Raia Manchada
Raia Pontuada
Raias
Salmonete
Sapateira
Sarda
Sardinha
Solha
Tamboril
Verdinho
Outras
Kg
Assinale com um X as espécies capturadas com cada uma das artes de pesca utilizadas e indique, em quilogramas, as quantidades de cada espécie que não tenham sido vendidas em lota por terem sido rejeitadas, consumidas pela tripulação ou por qualquer outro motivo não especificado.

FULFILLING FIELDS

(A)	ID	Vessel's statistical code. 5 character alphanumeric code.
(B)	DATE	Fishing date, *dd-mm-yyyy.*
(C)	PORT	Departure port.
(D)	FISHING GEAR	Fishing gear FAO code.
(E)	FISHING TIME	Fishint time, *hh.*
(F)	CATCH	Catch presence or absence for the following species:

Megrim
Whiting
European anchovy
Pandalus shrimps
Atlantic horse mackerel
Chub mackerel
Common cuttlefish
European eel
Pollock
Pouting
Deepwater rose shrimp
Blackspot sea bream
Norway lobster
European lobster
Common sole
Leafscale gulper shark
European squid
European hake
Common octopus
Cuckoo ray
Thornback ray
Spotted ray
Blonde ray
Raja rays

West African goatfish
Edible crab
Atlantic mackerel
Sardine
European plaice
Angler
Blue whiting

Associated classification: *X* – Presence.

(G)	**DISCARDS, SELFCONSUMPTION, BAIT, ETC**	Amount of fish discarded, used as bait or for crew consumption. Measuring unit: kilogram.

ANNEX V

SAMPLING METHODOLOGY FOR ECONOMIC VARIABLES ON VESSELS > 10 M

1. Definition of sample

The definition of the sample varies according to the universe and type of parameter to be estimated, always taking the precision level defined into account.

a. Stratification and division of sample

The size of the sample is obtained in order to achieve a coefficient of variation not superior to 5% to the variable "Income" (reference year n-1) for each stratum. Some strata may be sampled exhaustively if by doing so an inprove in the quality of estimates will be achieved.

Substratification may be used in order to obtain more homogeneous strata and further minimize variance and, therefore, decrease the necessary sample size in order to achieve the minimum precision.

Sample is distributed by each strata using the optimum Neyman allocation criteria wich guarantees a minimum variance:

$$n_h = \frac{N_h S_h}{\sum_h N_h S_h} \, n$$

where:

h stratum index

n_h sample size attributed to stratum *h*

n overall size of sample

N_h size of universe in stratum *h*

S_h standard deviation of stratum *h* stratification variable

Slight adjustments were subsequently made to the values calculated so as to obtain an equilibrium between sample size and reasonable values for the coefficient of variation associated to each stratum and to guarantee that the size of each strata is not too small.

The coefficient of variation is estimated by:

$$\hat{C.V.}(A) = \frac{\sqrt{\sum_h \hat{\text{var}}\,(A_h)}}{\sum_h A_h} \times 100$$

In which the variance estimated in each stratum h is given by:

$$\hat{\text{var}}\,(A_h) = \frac{N_h}{n_h} \, (N_h - n_h) \, S_h^2$$

where S_h^2 represents the variance of the stratification variable in the population of stratum h, which is calculated by the formula:

$$S_h^2 = \frac{\sum_{i=1}^{N_h} (a_{hi} - \bar{a}_h)^2}{N_h - 1}$$

where $\bar{a}_h$ is the average value of the stratification variable of stratum h, given by:

$$\bar{a}_h = \frac{\sum_{i=1}^{N_h} a_{hi}}{N_h}.$$

1.2. Selection of sample

The sample will be selected independently in each stratum by a systematic process, with a selection interval determined by the quotient between the size of the universe of the stratum and the size of the sample it is intended to study within it.

The units will be ordered in each stratum, following which a serial number will be attributed to each unit.

The systematic selection interval is given by:

$$I_h = \frac{N_h}{n_h}$$

where N_h is the size of the universe of the generic stratum h and n_h is the respective size of the sample.

The serial number NO of the first unit to be selected in each stratum h is given by a computer-generated random number equal to or greater than 1 and less than the value of the systematic selection interval of the stratum concerned.

The serial numbers of the units selected for the sample are obtained by means of the following expression:

$$nord = NO_h + k * I_h$$

where

$$k = 0,1,...,(n_h - 1)$$

2. Substitution of the survey unit

The objective of determining substitution rules is to allow one unit to be substituted by another when there is no other alternative, but without breaking the rules of random selection, and respecting the size of the sample.

Data collection of this type envisages units being substituted only in the event of it being impossible to contact the shipowner or someone who can provide the information requested in the collection.

For substitution purposes an extra sample of the same size as the effective sample is always selected in each stratum when possible, and should be used if necessary.

An extra unit should be chosen for the unit of the same stratum, as geographically close as possible to the effective unit to be substituted.

3. Data quality evaluation

All the collected data is submited to a critical view, assured by a technician. Some automatic validations are also made.

The automatic validation distinguish between unplausible but possible situations (warning errors) and incorrect situations (fatal errors). Data with fatal errors is not considered to the estimation process.

Types of rules for the automatic validation subroutines includes:

Algebric operation rules;

Limitation rules;

Coherence rules between datasets;

Comparison rules between reference year n and n-1.

Data quality analysis begins with the Universe characterization and it will extend to the final distribution to the end users, divided in three phases:

- Universe and sample definition;
- Data collection;
- Data analysis

Precision

After closure of the survey the data collected for each vessel is subject to a set of validation rules and is subject to occasional changes.

With respect to sampling errors it should be noted that the generic expression of the relative standard deviation of the estimator of a variable X, in stratum h, for a confidence level of 95,0 % is,

$$E.R.A(\hat{X}_h) = 1.96\frac{\sqrt{Var(\hat{X}_h)}}{\hat{X}_h}$$

Where $\mathrm{Var}(\widehat{\mathrm{X}}_{\mathrm{h}})$ is the variance of estimator $\widehat{\mathrm{X}}_{\mathrm{h}}$, wich is given by,

$$Var(\hat{X}_h) = \frac{N_h}{n_h}(N_h - n_h)s_h^2$$

Where s_h^2 is the variance of the feature X in the sample and is obtained by the expression,

$$s_h^2 = \frac{\sum_{i=1}^{n_h}(x_{hi} - \bar{x}_h)^2}{n_h - 1}$$

Where $\bar{\mathrm{x}}_{\mathrm{h}}$ is the average of X, in the stratum h and is given by,

$$\bar{x}_h = \frac{\sum_{i=1}^{n_h} x_{hi}}{n_h}$$

The sample size was determined to limit the coefficient of variation for the variable income, for the crosses and aggregates of the stratification variables described above.

The coefficient of variation is given by

$$C.V(\hat{X}) = \frac{\sqrt{Var(\hat{X})}}{\hat{X}}$$

Where the variance of the estimator for the Income variable and for the desired aggregation θ is obtained by the sum of the variances of the estimator in the strata that constitute it, ie

$$,Var(\hat{X}) = \sum_{h\epsilon\theta} Var(\hat{X}_h)$$

Coherence

The survey data is compared with data recorded in the database SI2P and with publications of fisheries statistics.