

Spatially-structured management of Nephrops in Zone VII

1. Introduction

In the minutes of the Council of December 2009, the following was recorded:

"The Council and the Commission take note of the calls by ICES and STECF for the management of individual functional units of Nephrops in Zone VII. They further take note of the advice for large reductions of catches in the porcupine Bank, Irish Sea West and Aran Grounds, and lesser reductions of catches in Irish Sea East and the Celtic Sea."

Scientific agencies have pointed out that the six "functional units" of Nephrops managed under the single Zone VII Nephrops TAC are functionally independent biological units and should be managed separately. Specifically, ICES advises that current management does not provide adequate safeguards to ensure that local effort is sufficiently limited to avoid depletion of resources in separate functional units, as catches can currently be taken anywhere in Zone VII as vessels are free to move between grounds and could, potentially, develop excessive effort on some grounds. There is evidence that this has happened in the Porcupine Bank area.

Given the advice for large reductions in catches especially from the Porcupine Bank, Council adopted a 9% decrease in the TAC for Zone VII in 2010 but also adopted a seasonal closure for the Porcupine Bank fishery. However, this is not necessarily an adequate nor a complete solution to the exigencies of good Nephrops management, as a reduction in effort at Porcupine Bank could result in a displacement of effort to other areas – some of which are also overfished, though to a lesser extent.

In this non-paper solutions are explored for the spatially-structured management of Nephrops Zone VII. A parallel debate is taking place concerning Nephrops management in the North Sea, and some useful cross-references can be made. However, it is clear that the need for improved Nephrops management is more urgent and more serious in the western areas than in the North Sea, where the stocks of Nephrops are not so markedly overfished and there is less urgent need for action.

2. Choice of implementing method

The fundamental objective is the independent management of fishing mortality within each functional unit, so that each unit can be fished sustainably, efficiently and profitably. The eventual goal of fishing each unit at maximum sustainable yield consistent with policies on other stocks should be maintained.

¹ This paper has been prepared by the Commission services to consult the Member States. Its contents thus cannot be construed as reflecting or pre-empting the European Commission's definitive views or positions on the subject matters in issue. The Commission cannot be held responsible for any use which might be made of the information contained therein.

Any management option meeting this objective would restrict the freedom of the vessel operators to move from one unit to another. This is unavoidable given the aim of managing the out-take from each unit separately.

Two management options to meet this aim are discussed here and their consequences are assessed with respect to fishing for Nephrops. Wider management implications are discussed in the following section.

1. Effort Restrictions on a Functional Unit Basis: A system could be developed where a limited number of kW-days is made available to exploit the Nephrops in each unit. The kW-days ceiling would have to be adjusted periodically according to the received scientific advice. Under such a system, effort management would be principal constraint on fishing activities rather than quota limits. Some consequences are:

- A "relative stability" key for kW-days would have to be established between the different Member States operating in each unit.

- An effort management system based on Vessel Monitoring Systems (VMS) would have to be developed, including the recording of entries and exits into FUs. This would include the need to monitor the activities of small vessels operating in small sea areas and would be a data-intensive system.

- Problems concerning the measurement of engine power would introduce complications.

- An additional incentive for more efficient fishing would develop.

2. Separate TAC allocations for each Functional Unit: Perhaps the most obvious option, this has been advocated in some sectors as the simplest way to manage Nephrops out-takes from each unit. Some plausible consequences are:

- New allocation keys would have to be developed for each of the units.

- Control measures would have to be reviewed in order to ensure that landings can indeed be managed separately; i.e. if a vessel lands Nephrops from two or more units, how can the catch from each unit be measured reliably and managed?

- Each year, the out-take from each unit would have to be adjusted according to the latest scientific advice.

- National and internal allocations would have to be redistributed among functional units.

Further detail on the possible implementation of unit-based catch limits are given in Annex 2.

3. Mixed Fisheries Issues

The present objective is to improve the management of Nephrops stocks by better matching the fishing effort deployed in each unit to the productive potential in that unit. However, the proportion of Nephrops in "Nephrops" fisheries using gear of 70 to 80 mm mesh may lie between 30% and 100% depending on the fishery. Fish by-catches can account for an important part of the vessel revenue in some sectors. Also, some vessels may change their

activity from targeting Nephrops to targeting fish at different times of the year. Importantly, some of the fish stocks caught together with Nephrops are presently seriously overfished and a need is recognised to reduce such catches (e.g. whiting in Irish Sea, haddock West of Scotland).

The impact of each of the measures described above in this situation needs to be assessed.

Option 1, based on restricting effort, would in principle lead to reductions in fish by-catches in the functional units in the same proportion as effort is reduced and Nephrops catches are reduced, other parameters being unchanged. At first sight, it would seem obvious that effort directed at Nephrops could be limited simply by limiting the effort deployed by vessels using the "Nephrops" trawl gear of 70mm to 100mm mesh (TR2 gear). However, there are a number of difficulties with this.

- TR2 gear can legitimately be used to target some species (squid and sole, for example) with no significant by-catch of Nephrops.

- Some vessels use larger mesh-sizes to fish for Nephrops, e.g. 100mm used by FR in the Celtic Sea (and this should rather be encouraged for conservation reasons).

- Currently, information is not available on the levels of effort deployed using creels.

- Effort data are not currently available by functional unit (though effort in the Irish Sea and the Celtic Sea has been evaluated separately).

This means that limiting effort by TR2 gear could cause an unnecessary reduction in by-catches of fish species, while fishing for Nephrops could continue with TR1 gear outside the restrictions set by effort limitations. Specific derogations would be necessary for non-Nephrops fishing, and there is a risk that the system could become overcomplicated and lead to increased discarding. Four sub-options can be envisaged.

(a) Fishing Nephrops with TR1 is prohibited, which would be a step backwards in conservation terms and could create an obligation to discard.

(b) Fishing with TR2 is prohibited and Nephrops fisheries are all obliged to move up to TR1 gear. This would be good for conservation, but may be difficult in areas such as the Irish Sea where Nephrops are slower-growing and there is a need to use smaller mesh.

(c) Effort by TR1 gear in which more than a threshold percentage of Nephrops are caught is subtracted from the same ceiling as TR2 gear. This means that TR1 effort that caught more than a threshold percentage of Nephrops should be included in the baseline calculations concerning the ceiling.

(d) Instead of limiting kW-days by gear type, a limit could be set on the kW-days for trips landing more than a threshold percentage of Nephrops.

For sub-options (c) and (d) an incentive to increase discarding would be created in some circumstances as fishers would have to balance their catch compositions for maximum profitability while respecting the threshold percentages. More details of the possible implementation of option (c) is given in Annex 1.

There are intrinsic advantages to management by limitation of effort, such as better economic efficiency, lower discards and better controllability. The approach also has advantages of simplicity in implementation. When exploiting a sedentary species such as Nephrops, fishing mortality should be more directly proportional to fishing effort than could be expected when fishing shoaling species such as cod. Because of these advantages, the Commission would like to further explore and address possible solutions to the disadvantages outlined above.

Concerning unit-based Nephrops catch limits as set out in option 2, the obvious concern is that vessels may begin to discard Nephrops in order to keep the proportion of Nephrops on board at 30% and so make the maximum use of the Nephrops quota to be able to operate a mixed fishery with 80mm gear (or 35% and 70mm gear, respectively). This does not seem to be a desirable outcome.

4. Legislative Implementation

Two types of legal instrument are relevant to these options: long-term plans and annual fishing opportunities Regulations. Only the latter is exempt from the requirements of the ordinary legislative procedure (co-decision).

While either option could be implemented in the annual Fishing Opportunities Regulation, improved stability and clarity could be brought in by also adopting a long-term plan such that the levels of fishing effort or catches are adjusted gradually so that maximum sustainable yield levels are attained for each functional unit.

5. Conclusions

Management by kW-days by functional units (Option 1) has the strong advantage that a clear link between fishing effort and fishing mortality should pertain, so scientific advice could be used in order to fix appropriate effort levels. The science base is not yet fully developed (we do not know how many kW-days should be used to fish each functional unit, nor do we have solutions to defining a Nephrops fleet in a mixed fishery) but it should be possible to obtain the necessary advice in due course. More work would be needed on identifying the appropriate combinations of mesh size, selective devices, catch composition and control measures to enable a workable implementation to be developed. Contributions from RACs and Member States are particularly requested on this point. However, making a choice that does not create an incentive to discard is challenging.

Management by catch limits by functional unit (option 2) has the advantage that suitable control systems already exist, and scientific advice is already available on appropriate catch levels. It has the disadvantage that a discussion would be needed on a reallocation of relative stability. These issues are discussed further in Annex 2. Overall, implementation of this option is the only one that seems implementable in the near future.

The Commission's preferred option is therefore to work on the implementation of catch limits by functional unit in 2011. For subsequent years, advice will be sought from the RACs and scientific committees on implementing methods for an area-based effort management system.

ANNEX 1

Example outline of a possible effort management system for Nephrops

Three kinds of demersal fishing activity would be permitted in each FU, as defined by a special fishing licence:

- A. Fishing for Nephrops with creels
- B. TR2. Fishing for Nephrops with trawls, using 80mm or 70mm gear as appropriate to the area and incorporating a selective device (grid or other device) and having a low headline height.
- C. TR1 (and others). Low-Nephrops fishing activities using any other gear. This would include TR1 gear. If in any fishing trip the percentage of Nephrops in the catch exceeds [X%], the effort expended in that trip would also be counted against the ceiling for fleet TR2.

A one-net rule would apply (no mixed trips using TR1 and TR2 gear).

Derogations with associated control provisions would be permitted for fisheries with proven low levels of Nephrops.

kW-days for the TR2 fleet would be set with reference to scientific advice about the kW-days expended by each fleet in each functional unit (unless a better measure of effort can be identified concerning static gear usage), adapted according to the scientific advice concerning that unit.

Initial reference levels for the TR2 fleet may include a quantity of kW-days to account for TR1 trips with more than [X%] Nephrops in the catch during a reference period.

On an annual basis, the kW-days for the creel and TR2 fleets would be set to the lower of :

- a reference to scientific advice about the kW-days expended by each fleet in each functional unit in a recent period, adapted according to the scientific advice concerning that unit;
- the effort permitted according to any other relevant effort management measure in place (e.g. cod plan, western waters Regulation).

kW-days for the TR1 fleet would be set according to any other relevant effort management measure in place (e.g. cod plan, western waters Regulation)

A harvest rule would have to be developed which would define how the annual permissible kW-days limits would be adjusted in response to scientific advice.

ANNEX 2

The historical fishing patterns show, broadly, that the Irish Sea was fished by vessels of UK and IRL; the south and south-west Ireland units were fished mainly by Irish vessels. The Porcupine Bank unit is fished by ES, FR, IRL and UK and the Celtic Sea units are fished mostly by FR and IRL. Belgium takes occasional, very small catches in the Irish Sea and the Celtic Sea and covers these by transfers mostly from ES.

A recalculation of possible allocation keys by functional unit is attempted here, using the reference years 1999-2008. As is customary, the Commission takes no position concerning the relative stabilities of Member States and the calculation is provided for assistance and information only.

Catches of Nephrops by functional unit as described by ICES are reported in Tables 1a-1g. The relevant transfers between Member States are reported in Tables 2a-2g.

A calculation has been made re-adjusting reported catches for the declared transfers (Tables 3a-3g). The calculation was made as follows.

Using the subscripts

s to denote Member State

u to denote functional unit,

$C_{s,u}$ = Catch in tonnes by Member State s in functional unit u

and

$T_{D,R}$ to denote a transfer T tonnes from Member State D to Member State R

then the proportion of the catches that a Member State takes in each area is

$$P_{s,u} = \frac{C_{s,u}}{\sum_u C_{s,u}}$$

A correction is made for transfers as follows, in three steps. First, the overall adjustment to be made for all of area VII is calculated.

$$T_s = \sum_R T_{s,R} - \sum_D T_{D,s}$$

Then these net quantities are allocated to functional units according to the functional units in which they are taken:

$$C'_{s,u} = T_s P_{s,u}$$

(where $C'_{s,u}$ represents an adjustment in tonnes to the reported catch for transfers effected from and to the state concerned)

Lastly, catches adjusted for quota transfers were calculated simply as $C_{s,u} + C'_{s,u}$, with the result being set to zero if $C_{s,u} + C'_{s,u} < 0$ (this happens in a few instances for Belgium, where the transferred quantities were larger than the realised catches).

The proportions of the catches among Member States after adjustment for transfers are given, in Table 4 together with the averages over the period. For convenience, the averages are summarised here also:

	ES	FR	IE	UK
FU 14 : Irish Sea East	0	0.000726	0.138539	0.860735
FU 15 : Irish Sea West	0	0	0.350289	0.649711
FU 16 : Porcupine Bank	0.341874	0.220606	0.348781	0.088739
FU 17 : Aran Grounds	0	0.000406	0.999595	0
FU 18 : S and SW Ireland	0	0	1	0
FU 19 : S and SW Ireland	0	0.11253	0.882828	0.004642
FU 20-22 : Celtic Sea	0	0.572337	0.416421	0.011129

Table 1. Catches of Nephrops in Zone VII by Member State and by Functional Unit, 2000-2009, before adjustments for transfers (C_{s,u}).

Table 1a. FU 14: Irish Sea East

	BE	ES	FR	IE	UK	Other
1999	0			0	153	471
2000	1			1	114	451
2001	0			0	26	506
2002	1			0	203	373
2003	1			1	69	306
2004	0			0	62	409
2005	2			1	34	536
2006	0			0	34	594
2007	1			1	86	873
2008	0			0	29	698

Table 1b. FU 15: Irish Sea West

	BE	ES	FR	IE	UK	Other
1999	0			0	4582	6204
2000	0			0	3433	4937
2001	0			0	2689	4752
2002	0			0	2291	4502
2003	0			0	2696	4356
2004	1			0	2782	4483
2005	0			0	2116	4413
2006	1			0	2048	5486
2007	0			0	2736	5688
2008	2			0	3139	7373

Table 1c. FU 16: Porcupine Bank

	BE	ES	FR	IE	UK	Other
1999	0	448	1047	609	185	
2000	0	213	351	227	120	
2001	0	270	425	369	158	
2002	0	276	369	543	139	
2003	0	333	131	306	108	
2004	0	588	289	494	126	
2005	0	799	397	752	208	
2006	0	571	462	731	201	
2007	0	496	302	1059	146	
2008	0	234	26	561	41	

Table 1d. FU 17: Aran Grounds

	BE	ES	FR	IE	UK	Other
1999	0	0	0	0	1140	0
2000	0	0	0	1	879	0
2001	0	0	0	1	912	0
2002	0	0	0	2	1152	0
2003	0	0	0	0	933	0
2004	0	0	0	0	525	0
2005	0	0	0	0	778	0
2006	0	0	0	0	637	0
2007	0	0	0	0	913	0
2008	0	0	0	0	1050	0

Table 1e. FU 18: S and SW Ireland

	BE	ES	FR	IE	UK	Other
1999	0	0	0	0	15	0
2000	0	0	0	0	9	0
2001	0	0	0	0	2	0
2002	0	0	0	0	14	0
2003	0	0	0	0	16	0
2004	0	0	0	0	22	0
2005	0	0	0	0	15	0
2006	0	0	0	0	14	0
2007	0	0	0	0	3	0
2008	0	0	0	0	1	0

Table 1f. FU 19: S and SW Ireland

	BE	ES	FR	IE	UK	Other
1999	0	0	77	499	3	
2000	0	0	144	541	11	
2001	0	0	111	702	2	
2002	0	0	188	1130		
2003	0	0	165	1075		
2004	0	0	76	997	1	
2005	0	0	62	648	2	
2006	0	0	65	675	1	
2007	0	0	63	894		
2008	0	0	46	805	15	

Table 1g: FU 20-22: Celtic Sea

	BE	ES	FR	IE	UK	Other
1999	0		2078	824	41	
2000	1		2848	1793	47	1
2001	1		2626	2123	21	1
2002	8		3154	1496	15	8
2003	0		3595	1388	19	
2004	0		2605	1627	36	
2005	0		2502	2391	53	
2006	0		2368	1864	32	
2007	6		2033	3213	47	6
2008	0		2348	3422	242	

Table 2. Proportions of each Member States' annual catches taken in each functional unit ($P_{s,u}$)

Table 2a. FU 14: Irish Sea East

	BE	ES	FR	IE	UK	Other
1999	0	0	0	0.01956	0.068221	
2000	0.5	0	0.000299	0.016295	0.081028	0.666667
2001	0	0	0	0.003811	0.093032	0
2002	0.111111	0	0	0.029726	0.07417	0.111111
2003	1	0	0.000257	0.010643	0.063896	1
2004	0	0	0	0.009525	0.08091	0.5
2005	1	0	0.000338	0.005049	0.10284	
2006	0	0	0	0.005664	0.094077	0
2007	0.142857	0	0.000417	0.009659	0.129257	0
2008	0	0	0	0.00322	0.083403	0

Table 2b. FU15: Irish Sea West

	BE	ES	FR	IE	UK	Other
1999	0	0	0	0.585784	0.89861	
2000	0	0	0	0.490709	0.886992	0
2001	0	0	0	0.394108	0.87369	0
2002	0	0	0	0.335481	0.895208	0
2003	0	0	0	0.415857	0.909584	0
2004	1	0	0	0.427408	0.886845	0.5
2005	0	0	0	0.314226	0.8467	!
2006	1	0	0	0.341163	0.868863	1
2007	0	0	0	0.307278	0.842168	0
2008	1	0	0	0.348507	0.880989	1

Table 2c. FU16: Porcupine Bank

	BE	ES	FR	IE	UK	Other
1999			1	0.326983	0.077857	0.026796
2000	0	1	0.104933	0.032447	0.021559	0
2001	0	1	0.134366	0.054082	0.029049	0
2002	0	1	0.099381	0.079514	0.02764	0
2003	0	1	0.033659	0.0472	0.022552	0
2004	0	1	0.097306	0.075895	0.024926	0
2005	0	1	0.134031	0.111672	0.039908	
2006	0	1	0.159585	0.121772	0.031834	0
2007	0	1	0.125886	0.118935	0.021617	0
2008	0	1	0.010744	0.062285	0.004899	0

Table 2d. FU 17: Aran Grounds

	BE	ES	FR	IE	UK	Other
1999			0	0	0.145743	0
2000	0	0	0.000299	0.125643		0
2001	0	0	0.000316	0.133666		0
2002	0	0	0.000539	0.168692		0
2003	0	0		0	0.143915	0
2004	0	0		0	0.080658	0
2005	0	0		0	0.115533	0
2006	0	0		0	0.106114	0
2007	0	0		0	0.102538	0
2008	0	0		0	0.116576	0

Table 2e. FU 18: S and SW Ireland

	BE	ES	FR	IE	UK	Other
1999			0	0	0.001918	0
2000	0	0		0	0.001286	0
2001	0	0		0	0.000293	0
2002	0	0		0	0.00205	0
2003	0	0		0	0.002468	0
2004	0	0		0	0.00338	0
2005	0	0		0	0.002228	0
2006	0	0		0	0.002332	0
2007	0	0		0	0.000337	0
2008	0	0		0	0.000111	0

Table 2f. FU 19: S and SW Ireland

	BE	ES	FR	IE	UK	Other
1999			0	0.024047	0.063794	0.000435
2000	0	0	0.043049	0.07733	0.001976	0
2001	0	0	0.035093	0.102887	0.000368	0
2002	0	0	0.050633	0.165471	0	0
2003	0	0	0.042395	0.165818	0	0
2004	0	0	0.025589	0.153173	0.000198	0
2005	0	0	0.020932	0.096228	0.000384	0
2006	0	0	0.022453	0.112444	0.000158	0
2007	0	0	0.026261	0.100404	0	0
2008	0	0	0.019008	0.089375	0.001792	0

Table 2g. FU 20-22: Celtic Sea

	BE	ES	FR	IE	UK	Other	
1999			0	0.648969	0.105344	0.005939	
2000	0.5		0	0.85142	0.256289	0.008444	0.333333
2001	1		0	0.830224	0.311153	0.003861	1
2002	0.888889		0	0.849448	0.219066	0.002983	0.888889
2003	0		0	0.92369	0.214098	0.003967	0
2004	0		0	0.877104	0.249962	0.007122	0
2005	0		0	0.8447	0.355064	0.010169	
2006	0		0	0.817962	0.310511	0.005068	0
2007	0.857143		0	0.847436	0.360849	0.006959	1
2008	0		0	0.970248	0.379927	0.028916	0

Table 3. Catches of Nephrops in Zone VII by Member State and by Functional Unit, 2000-2009, after adjustments for transfers ($C_{s,u}+C'_{s,u}$).

Table 3a. FU 14: Irish Sea East

	BE	ES	FR	IE	UK
1999	0	0	0	155	465
2000	0	0	1	115	445
2001	0	0	0	26	504
2002	0	0	0	192	395
2003	0	0	1	68	309
2004	0	0	0	60	410
2005	0	0	1	33	528
2006	0	0	0	35	573
2007	0	0	1	86	863
2008	0	0	0	29	698

Table 3b. FU15: Irish Sea West

	BE	ES	FR	IE	UK
1999	0	0	0	4641	6119
2000	0	0	0	3462	4866
2001	0	0	0	2697	4735
2002	0	0	0	2163	4762
2003	0	0	0	2640	4392
2004	0	0	0	2711	4496
2005	0	0	0	2057	4349
2006	0	0	0	2090	5291
2007	0	0	0	2736	5625
2008	0	0	0	3123	7373

Table 3c. FU16: Porcupine Bank

	BE	ES	FR	IE	UK
1999	0	523	1047	617	182
2000	0	288	351	229	118
2001	0	345	425	370	157
2002	0	554	352	513	147
2003	0	461	131	300	109
2004	0	688	295	481	126
2005	0	1091	397	731	205
2006	0	811	446	746	194
2007	0	611	302	1059	144
2008	0	249	26	558	41

Table 3d. FU 17: Aran Grounds

	BE	ES	FR	IE	UK	
1999	0	0	0	0	1155	0
2000	0	0	0	1	887	0
2001	0	0	0	1	915	0
2002	0	0	0	2	1087	0
2003	0	0	0	0	914	0
2004	0	0	0	0	512	0
2005	0	0	0	0	756	0
2006	0	0	0	0	650	0
2007	0	0	0	0	913	0
2008	0	0	0	0	1045	0

Table 3e. FU 18: S and SW Ireland

	BE	ES	FR	IE	UK	
1999	0	0	0	0	15	0
2000	0	0	0	0	9	0
2001	0	0	0	0	2	0
2002	0	0	0	0	14	0
2003	0	0	0	0	16	0
2004	0	0	0	0	22	0
2005	0	0	0	0	15	0
2006	0	0	0	0	14	0
2007	0	0	0	0	3	0
2008	0	0	0	0	1	0

Table 3f. FU 19: S and SW Ireland

	BE	ES	FR	IE	UK
1999	0	0	73	475	3
2000	0	0	144	531	11
2001	0	0	113	685	2
2002	0	0	188	1099	0
2003	0	0	161	1096	0
2004	0	0	76	997	1
2005	0	0	63	644	2
2006	0	0	65	665	1
2007	0	0	63	894	0
2008	0	0	46	805	15

Table 3g. FU 20-22: Celtic Sea

	BE	ES	FR	IE	UK
1999	0	0	2078	810	41
2000	0	0	2903	1751	47
2001	0	0	2626	2065	21
2002	0	0	3069	1523	14
2003	0	0	3595	1388	19
2004	0	0	2644	1616	36
2005	0	0	2502	2359	54
2006	0	0	2368	1864	32
2007	6	0	2033	3213	47
2008	0	0	2348	3422	242

Table 4. Proportions of Catches of Nephrops in Zone VII by Member State and by Functional Unit, 1999-2008, after adjustments for transfers and showing averages over the period.

Table 4a. FU 14: Irish Sea East

	ES	FR	IE	UK
1999	0	0	0.25	0.75
2000	0	0.001783	0.204991	0.793226
2001	0	0	0.049057	0.950943
2002	0	0	0.327087	0.672913
2003	0	0.002646	0.179894	0.81746
2004	0	0	0.12766	0.87234
2005	0	0.001779	0.058719	0.939502
2006	0	0	0.057566	0.942434
2007	0	0.001053	0.090526	0.908421
2008	0	0	0.03989	0.96011
Mean	0	0.000726	0.138539	0.860735

Table 4b. FU15: Irish Sea West

	ES	FR	IE	UK
1999	0	0	0.43132	0.56868
2000	0	0	0.415706	0.584294
2001	0	0	0.36289	0.63711
2002	0	0	0.312347	0.687653
2003	0	0	0.375427	0.624573
2004	0	0	0.376162	0.623838
2005	0	0	0.321105	0.678895
2006	0	0	0.283159	0.716841
2007	0	0	0.327234	0.672766
2008	0	0	0.297542	0.702458
Mean	0	0	0.350289	0.649711

Table 4c. FU16: Porcupine Bank

	ES	FR	IE	UK
1999	0.220768	0.441959	0.260447	0.076826
2000	0.292089	0.355984	0.232252	0.119675
2001	0.265998	0.327679	0.285274	0.121049
2002	0.353768	0.224777	0.327586	0.09387
2003	0.460539	0.130869	0.2997	0.108891
2004	0.432704	0.185535	0.302516	0.079245
2005	0.450083	0.163779	0.301568	0.084571
2006	0.36914	0.203004	0.339554	0.088302
2007	0.288752	0.142722	0.500473	0.068053
2008	0.284897	0.029748	0.638444	0.046911
Mean	0.341874	0.220606	0.348781	0.088739

Table 4d. FU 17: Aran Grounds

	ES	FR	IE	UK
1999	0	0	1	0
2000	0	0.001126	0.998874	0
2001	0	0.001092	0.998908	0
2002	0	0.001837	0.998163	0
2003	0	0	1	0
2004	0	0	1	0
2005	0	0	1	0
2006	0	0	1	0
2007	0	0	1	0
2008	0	0	1	0
Mean	0	0.000406	0.999595	0

Table 4e. FU 18: S and SW Ireland

FU 18 : S and SW Ireland

	ES	FR	IE	UK
1999	0	0	1	0
2000	0	0	1	0
2001	0	0	1	0
2002	0	0	1	0
2003	0	0	1	0
2004	0	0	1	0
2005	0	0	1	0
2006	0	0	1	0
2007	0	0	1	0
2008	0	0	1	0
Mean	0	0	1	0

Table 4f. FU 19: S and SW Ireland

	ES	FR	IE	UK
1999	0	0.132486	0.862069	0.005445
2000	0	0.209913	0.774052	0.016035
2001	0	0.14125	0.85625	0.0025
2002	0	0.146076	0.853924	0
2003	0	0.128083	0.871917	0
2004	0	0.070764	0.928305	0.000931
2005	0	0.088858	0.908322	0.002821
2006	0	0.088919	0.909713	0.001368
2007	0	0.065831	0.934169	0
2008	0	0.053118	0.929561	0.017321
Mean	0	0.11253	0.882828	0.004642

Table 4g. FU 20-22: Celtic Sea

	ES	FR	IE	UK
1999	0	0.709457	0.276545	0.013998
2000	0	0.617528	0.372474	0.009998
2001	0	0.557301	0.438243	0.004457
2002	0	0.666305	0.330656	0.00304
2003	0	0.718713	0.277489	0.003798
2004	0	0.615456	0.376164	0.00838
2005	0	0.509054	0.479959	0.010987
2006	0	0.555347	0.437148	0.007505
2007	0	0.383657	0.606341	0.00887
2008	0	0.390552	0.569195	0.040253
Mean	0	0.572337	0.416421	0.011129