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Report of the Working Group on Cephalopod Fisheries and Life History (WGCEPH)

By correspondence

International Council for the Exploration of the Sea
Conseil International pour l'Exploration de la Mer

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1 Introduction

For the third consecutive year, the Working Group on Cephalopod Fisheries and Life History (WGCEPH) worked by correspondence, as a consequence of the lack of transnational research projects that can create and support cooperative research and travelling opportunities.

During 2006 the consequences of the current lack of transnational research are more evident within WGCEPH, as very little progress was possible towards the completion of the proposed ToR.

Unfortunately, similarly to what has happened with previous reports, the preparation of the current WGCEPH report has been delayed. This has been due essentially to the less strict commitment resulting from working by correspondence.

As in previous years, meeting by correspondence was the possible alternative format to the annual meetings, but this has once more proven that the concurrent physical presence of members in a forum is more efficient. It would be desirable that such a meeting is made possible in the near future, but presently the first priority is to set up another international research action that will facilitate the development of new lines of research or consolidate previous research results by re-analyses under new methodologies.

The lack of new research projects and the continued scarcity of national funding for cephalopod research and in particular for travelling of researchers to international meetings continues to be a concern that must be restated. It is a concern that, throughout the most recent years continues to lay a heavy burden on those who wish to contribute to WGCEPH.

The importance of cephalopod resources to northern European nations during 2004 has continued to show that this group of organisms plays a supporting role in amidst many declining European fisheries and deserves or even requires continued research. Recent statistics show the same tendency for 2005, while the results of crises in the sector in depending regions have shown what the consequences of a decline in the abundance of these organisms may be. Thus WGCEPH continues to consider that the rather paradoxical situation of the inverse relationship between the importance of the resource and dedicated research funding opportunities should be reversed by national authorities within the ICES area.

1.1 Terms of Reference

The Working Group on Cephalopod Fisheries and Life History [WGCEPH] (Chair: Joao Pereira, Portugal) will work by correspondence in 2006 to:

a) update and refine available landing statistics at relevant time-scales, compile available information on fishing effort of selected fleets, on discards and on selectivity and explore resource survey databases for information about sampled cephalopods in the ICES area. Report on current status;

b) compile methods and results available for stock identification and estimation of population size of fished cephalopods. Report on current status;

c) identify possible precautionary approaches to the management of these cephalopod resources; evaluate management options and consider socio-economic issues. Report on current status;

d) compile available data and identify relationships between abundance and environmental conditions, factors affecting recruitment, migration and distribution patterns of juveniles and adults, trophic interactions and contaminants bio-accumulation;

e) review and report on cephalopod culture techniques and results and their interest in the understanding of biological phenomena;

f) update the bibliographic database of cephalopod literature relevant to fisheries, including grey literature. Make available on WWW;

g) prepare material from EU project CEPHSTOCK and WG reports for CRR on the state of the art in cephalopod fisheries biology.

2 ToR a)

- update and refine available landing statistics at relevant time-scales;
- compile available information on fishing effort of selected fleets, on discards and on selectivity;
- explore resource survey databases for information about sampled cephalopods in the ICES area.

2.1 Compilation of landing statistics

The present report updates landing statistics for 2004, provides provisional data for 2005 and reports on tendencies since 1973, for cephalopod groups caught in the ICES area (Tables 2.1 to 2.4 and Figures 2.1 to 2.3). The data originate from the ICES STATLANT database and from additional national information supplied by Working Group members. As generally happens, data for the most recent year should be considered as preliminary, and they are marked as such in the tables ("P"). The data compiled in this report represent the most precise information on cephalopod landings within the ICES area that can be obtained to date.

It has become apparent that the separation between the two groups of squid (short and longfinned) in national statistics has not always been very clear and continues to be somewhat imperfect. For that reason it is difficult to be certain of the degree of comparability of current versus older data. For the purpose of estimating tendencies, the two groups have therefore been summed up.

Tables 2.1 to 2.4 give information on annual catch statistics (1997–2005) per cephalopod group in each ICES division or subarea, separately for each nation:

- Table 2.1. groups species of cuttlefish and bobtail squid (families Sepiidae and Sepiolidae). The majority of landings summarised in this table are catches of *Sepia officinalis*, the common cuttlefish, plus smaller amounts of *S. elegans* and *S. orbignyana* and various species of bobtail squid (Sepiolidae) in a few instances, possibly only in the southernmost regions;

- Table 2.2. groups species of common squid (including the long-finned squids *Loligo forbesi*, *L. vulgaris* and *Alloteuthis subulata*). The majority of common squid landings are *L. forbesi* more important in the north and in Subarea X and *L.vulgaris*, more important in central and southern regions;
- Table 2.3. groups species of short-finned squid (*Illex coindetii* and *Todaropsis eblanae*), European Flying squid (*Todarodes sagittatus*), Neon Flying squid (*Ommastrephes bartrami*) and occasionally a variety of species belonging to different Decapod families;
- Table 2.4. groups species of octopus (including *Eledone cirrhosa*, *E. moschata* and *Octopus vulgaris*, mostly, as well as some locally and temporally abundant close allied shallow-water species).

Similarly to previous years, a compilation separated into single species or even not combining families is not possible, as not all countries report landings discriminated into lower taxa. It is worth mentioning some efforts towards that goal, such as in the case of Ireland and Portugal, where statistics begin to mention species rather than higher groups. Other cases, such as the Netherlands or Germany, continue to list families together (Loliginidae and Ommastrephidae), which is of very little use in fisheries or bio-economic research.

It should be noted that preliminary data that suggested a return in 2004 to large landings of the European Flying squid (*Todarodes sagittatus*) in subareas II and III were not confirmed, the species maintaining low levels of abundance, and nearly absent from those northern ranges. In 2005 preliminary data, it is important to note that octopod landings have significantly increased, slightly improving the best ever landings for the group, which had been observed in 1996 (11658 in 1996 as compared to 17751 in 2005). Landings were particularly significant for countries in the south of the area, in spite of the unabated fishing pressure that has been reported throughout the years and particularly in spite of the very bad reports received from Galicia early in the year.

Table 2.5 summarises total annual cephalopod landings in the whole ICES area for major cephalopod groups. The 2005 data are a provisional subtotal of the real 2005 landings and should not be analysed with other years or between groups, as the missing data are not proportional to the data already gathered. Notably, a significant proportion of cuttlefish landings are missing from the table. Inverting the tendency noted in the 3 years up to 2003, which were the worst on record since 1996, 2004 definitive statistics indicate a significant improvement of cephalopod landings. The figures indicate that overall, landings in 2004 were approximately 1.48 times greater than in 2003 and 1.07 times greater than in 2000, the previous best. Individual contributions by shortfinned squid were 1.59 times greater in 2004 than in 2003, by longfinned squid they were 1.7 times greater, by cuttlefish they were 1.6 times greater, and by octopods 1.2 times greater. Preliminary landing data for 2005 suggest that the annual production should go back to between 40 and 50 thousand tonnes, maybe closer to the top of the interval, supported by improved landings of longfinned squid and octopods.

Table 2.6 provides information of total annual cephalopod landings in the whole ICES area for major cephalopod groups, per fishing nation.

If the total cephalopod landings per nation are looked at following annual fluctuations, it can be seen that in general each nation take a proportional share of the total annual landings so that relative ranking among nations does not vary significantly, as can be seen in Figure 2.1. In fact, only very seldom are there changes in position among the top ranking six or seven nations, which appears to indicate no major alterations to the patterns of distribution of the main species as well as to the exploitation patterns.

If species landings are grouped into three groups, cuttlefish, squid (shortfinned and longfinned) and octopus, each group can be seen to be exploited by a few nations, and this situation does generally also not change significantly over the years. Figure 2.2 shows that in the case of cuttlefish, France has always landed the largest proportion of the total in the ICES area and generally only Spain and Portugal have landed to any comparable degree. In the case of this group of organisms, the U.K. also began to land from 1989, obtaining a share of the total that has surpassed those of Portugal and Spain together. This seems to indicate additional effort directed at the species in the group, since the global amount of the French, Portuguese and Spanish landings did not decrease and neither did the small shares of the remaining nations. The four largest landing nations in this group have always accounted for over 95% of all cuttlefish landings in the ICES area. In the case of squid, landings have also been shared mostly among France, Portugal and Spain, the largest of the shares similarly belonging to France. In this group however, Norway played a significant role from 1979 to 1985 and again to a lesser degree in 1987 and 1988, as availability of *Todarodes sagittatus* changed dramatically. Thus from 1979 to 1985, the most important landings were those of Norway. The group is also exploited to an important degree by a combination of other nations, among which Scotland ranks first. In the group of octopus landings, more than 95% are shared by two nations, Portugal and Spain. The shares of the two nations have changes slightly over the years, Spain having had initially the largest, which is now taken by Portugal. It is important to note that in spite of the continued fishing pressure, cephalopod resources in the ICES area have tended to yield increasingly throughout the 32 years of recorded data. Figure 2.3 displays the total yearly landings for each of the same three groups of cephalopod species, cuttlefish, squid and octopus. Cuttlefish landings display a strong significant ($n=32$, $p \ll 0.01$) tendency to increase, whereas those of octopus a less significant similar trend ($n=32$, $p<0.02$) and only those of squid have been stationary, which appears to be at least partially due to the large fluctuations in the landings of *Todarodes sagittatus*.

Table 2.1: Landings (in tonnes) of Cuttlefish (Sepiidae) and Bobtail Squid (Sepiolidae).

Country	1997	1998	1999	2000	2001	2002	2003	2004	2005P
ICES Division IIIa (Skagerrak and Kattegat)									
Denmark					2	6	18	21	29
ICES Division IVa (Northern North Sea)									
Denmark					2	3	7	10	7
France									+
Scotland								1	
ICES Division IVb (Central North Sea)									
Belgium	2	3	3	7	11.8	12	4.1	5	1
France			1.4	0.4	0.1	0.1	0.4		+
Denmark					1	13	35	36	13
England, Wales & Northern Ireland					0.1	3.1	0.4	1	
Netherlands	+	+	+	2		10.8	6	3	1
Scotland								1	
ICES Division IVc (Southern North Sea)									
Belgium	4	4	5	12		205.9	64.4	103	57
England, Wales & Northern Ireland	22	28	22	14	4.7	4.2	2.3	2	3
France	135	140	231.4	419.8	184.2	217.2	119.8	120	+
Netherlands	+	+	+	97	118	363.3	229	352	146
Scotland								2	1
ICES Division Vb (Faroe Grounds)									
France								5	+

Country	1997	1998	1999	2000	2001	2002	2003	2004	2005P
ICES Division VIa,b (NW coast of Scotland and North Ireland, Rockall)									
England, Wales & Northern Ireland	0	+	0	0			0.2		
France	1	0	5.3	0.6	0.4	0.2	0		+
Scotland					4.8				
Spain	14	16	0	1	0	0	0	0	0
ICES Division VIIa (Irish Sea)									
Belgium	1	1	1	1	2	4.7	1	1	
England, Wales & Northern Ireland	1	1	1	1	0.1	0	0.8		
France	0	0	0.1	0.9	0.7	7.1	0.5		
ICES Divisions VIIb, c (West of Ireland and Porcupine Bank)									
England, Wales & Northern Ireland	0	4	3	0		0	0.02		+
France			0.2	0	0.2	0.3	2.3	10	+
Spain	13	14	0	3	17	3	4.6	9.9	11.5
ICES Divisions VIId, e (English Channel)									
Belgium	6	15	9	35	223.7	497.1	472.6	607	501
Channel Islands	8	20	22	26	8	11.3	9.4	12	7
England, Wales & Northern Ireland	1634	2449	2014	2910	2607.8	3406.7	4581.3	4858	2821
France	5742	7530	8342.9	11220.4	7242	11596.6	9124.6	13463	+
Netherlands	+	+	+	2	2.6	6.4	14	33	27
ICES Division VIIf (Bristol Channel)									
Belgium	1	+	1	1	11.7	3.8	7	38	16
England, Wales & Northern Ireland	44	39	9	12	6.9	18.8	39.2	28	11
France	29	36	23	22	27	62	56	52	
ICES Divisions VIIg-k (Celtic Sea and SW of Ireland)									
Belgium	3	3	4	2	3.1	5.6	15	55	20
England, Wales & Northern Ireland	464	220	206	139	80.2	101.8	325.2	135	153
France	21	946	886.2	986	759.9	609.1	843.8	1168	+
Ireland									3
Netherlands						0.1	1		
Spain	57	181	122	13	6	0	1.4	25	0.5
ICES Subarea VIII (Bay of Biscay)									
Belgium	0	0	1	1	7.3	11.7	4	10	3
England, Wales & Northern Ireland	37	19	4	0			28.9	18	19
France	5118	4363	4434.4	4322.8	4179.4	2939.1	1155.9	6685	+
Netherlands					41				
Portugal	8	11	5	8	9.6	6.2	18	21	32
Spain	368	593	829	683	365	302	288.1	493.6	407
ICES Subarea IX									
Portugal	1415	1723	1156	1357	1338.3	1361.6	1186.1	1706	1825
Spain	1504	1916	1868	1454	765	820	992.0	889.4	1112
ICES Subarea X									
France								8	+
Portugal									+

COUNTRY	1997	1998	1999	2000	2001	2002	2003	2004	2005P
Spain									+
Grand Total	16652	20275	20210	23754	18034	22614	19659.3	30987.9	7228.0

Table 2.2: Landings (in tonnes) of Common Squid (includes *Loligo forbesi, L. Vulgaris* and *Alloteuthis subulata*).

COUNTRY	1997	1998	1999	2000	2001	2002	2003	2004	2005P
ICES Division IIIa (Skagerrak and Kattegat)									
Denmark	6	8	6	7					
Sweden*	1	1	1	+			1	5	3
ICES Division IVa (Northern North Sea)									
Denmark	2	5	3	3					
England, Wales & Northern Ireland	0	3	2	3	2.1	1.3	1.2	1	1
France	1	0	0.2	0.1	0	0.3	0.7		+
Germany*	+	+	+	+				1	
Scotland*	453	844	712	547	348.9	687.9	1428	1442	344
ICES Division IVb (Central North Sea)									
Belgium	7	11	16	24	3.2	14	22.1	16	8
Denmark	9	3	18	10					
England, Wales & Northern Ireland	39	144	65	29	35.5	70.4	159.3	162	161
Germany*	3	5	5	3			58	33	23
Netherlands*	+	+	+	4			27	22	27
Scotland*	66	214	144	87	112.1	218.3	323	358	214
ICES Division IVc (Southern North Sea)									
Belgium	39	36	72	121	20.2	40	17.2	12	10
England, Wales & Northern Ireland	3	2	2	4	11.8	4.7	2.2	2	3
France	123	93	150.9	164.8	236.9	660.2	426.1	246	+
Germany*	1	6	1	2			4	4	1
Netherlands*	+	+	+	758			104	93	38
Scotland*							1		1
ICES Division Vb (Faroe Grounds)									
England, Wales & Northern Ireland	0	+	+	+	0.2	0	0.1		+
Faroe Islands	5	32	23	+					
Scotland*	1	1	2	2			5	1	
ICES Division VIa (NW coast of Scotland and North Ireland)									
England, Wales & Northern Ireland	40	7	3	2	2.8	3.4	14	4	+
France	82	136	94.8	51	8.4	27.6	22.6	24	+
Ireland*	140	99	106	38			33+30	72	49
Scotland*	301	285	334	210	191.6	196.2	367	321	72
Spain	+	7	8	3	0	3	9.6	1.6	0
ICES Division VIb (Rockall)									
England, Wales & Northern Ireland	5	14	1	+	0.3	0.6	2.6		+

Country	1997	1998	1999	2000	2001	2002	2003	2004	2005P
Ireland*	1	2	2	3			4+1	1	8
Scotland*	5	27	13	5	34.3	58.8	86	23	
Spain	76	49	2	+		2			0
ICES Division VIIa (Irish Sea)									
Belgium	2	5	3	3	2.3	9.4	2.3	1	3
England, Wales & Northern Ireland	125	173	40	31	102.6	116.3	96.3	50	24
France	5	17	11.4	11.8	21.8	37.1	5.8	2	+
Ireland*	6	22	13	5		2	2+7	6	4
Isle of Man	2	2	2	+	0.8	0.4			+
Scotland*	3	2	2	2			13	8	1
ICES Divisions VIIb, c (West of Ireland and Porcupine Bank)									
England, Wales & Northern Ireland	228	162	59	40	34.8	22	10.1	12	23
France	80	60	35.2	74.9	6.8	6.3	20.1	42	+
Ireland*	42	34	40	26	2	1	31+53	39	29
Netherlands									1
Scotland*	45	71	34	27		19.2	14	19	2
Spain	69	51	0	17	18	29	35	30.7	12
ICES Divisions VIId, e (English Channel)									
Belgium	77	133	113	254	22	59.3	72.4	55	36
Channel Islands	6	5	11	9	1	2.3	1	1	+
England, Wales & Northern Ireland*	496	419	641	449	438.5	553.1	434.6	481	321
France	2518	2689	3416.9	3217.8	2659.3	3980.1	4211.9	4234	+
Netherlands*	+	+	+	11			13+62	123	110
ICES Division VIIf (Bristol Channel)									
Belgium	6	6	6	8	0.5	4.8	9.5	15	9
England, Wales & Northern Ireland	77	29	68	16	55	113.9	56.2	17	172
France	193	126	147	88			145	125	+
Ireland									2
ICES Divisions VIIg-k (Celtic Sea and SW of Ireland)									
Belgium	10	13	9	5	2.6	7.9	7.4	6	6
England, Wales & Northern Ireland	924	505	377	202	166.4	116.1	35.4	134	51
France	69	325	546.9	346.7	467.6	737.6	520.2	374	+
Ireland*	168	158	123	67	12	37	51+113	127	172
Scotland*	127	128	109	100			75	70	57
Spain	302	225	352	77	14	3	1.9	2	2
ICES Subarea VIII (Bay of Biscay)									
Belgium	14	49	3	48	0	1.8	0.9	1	1
England, Wales & Northern Ireland	68	8	3	+			18.2	18	6
France	1489	829	1351.8	1041.8	842.2	514.2	316	1245	+
Portugal	2	2	1	1	1.1	0.6		1	+
Scotland*								1	61
Spain	505	811	826	767	614	253	329.7	371.9	306
ICES Subarea IX									
France	+	+	4	42					
Portugal	848	1011	329	619	897.6	686	328	1264	601

Country	1997	1998	1999	2000	2001	2002	2003	2004	2005P
Spain	1301	1043	540	507	843	637	542.0	580.8	552
ICES Subarea X (Azores Grounds)									
Portugal	303	98	45	58	137	196	536	261	272
Grand Total	9632	11519	11245	11049	10253	8371	10135	12562	3799

Country* – These countries report undifferentiated landings of Loliginids and Ommastrephids that were grouped here. If 2 or more figures listed, the last one is the compound Loliginidae + Ommastrephidae.

Table 2.3: Landings (in tonnes) of Short-finned Squid (*Illex coindetii* and *Todaropsis eblanae*), European Flying Squid (*Todarodes sagittatus*), Neon Flying Squid (*Ommastrephes bartrami*) and other less frequent families and species of Decapod cephalopods.

Country	1997	1998	1999	2000	2001	2002	2003	2004	2005P
ICES Subarea I + II (Barents Sea and Norwegian Sea)									
Norway	190	2	+	+					
ICES Division IIIa (Skagerrak and Kattegat)									
Denmark									
Norway								1	
Sweden*							+	+	
ICES Division IVa (Northern North Sea)									
Germany*								+	+
Norway								4	
Scotland*								+	
ICES Division IVb (Central North Sea)									
Germany*								+	
Netherlands*								+	
ICES Division IVc (Southern North Sea)									
Germany*								+	
Netherlands*								+	
Scotland*								+	
ICES Division Va (Iceland Grounds)									
Iceland	5	4	3	1	0	0.1		1	
ICES Division Vb (Faroe Grounds)									
Faroe Islands							16	17	1
Scotland*							+	+	
ICES Division VIa, b (NW coast of Scotland and North Ireland, Rockall)									
England, Wales & Northern Ireland	+	3	5	+	0.6	1.1	13	1	1
France			2.7	0.4	0.1	0.2	0		+
Ireland*	+	+	0	+			32+	5	2
Scotland*							+	+	
Spain	112	177	3	+	0	11	0	0.3	0
ICES Division VIIa (Irish Sea)									

Country	1997	1998	1999	2000	2001	2002	2003	2004	2005P
England, Wales & Northern Ireland	0	0	0	+			0		
France			0.2	0.2		0			+
Ireland*	+	+	0	0			6+	5	7
Scotland*							+	+	
ICES Divisions VIIb, c (West of Ireland and Porcupine Bank)									
England, Wales & Northern Ireland	8	39	18	35	18.7	24.5	16	26	1
France	0	0	1.3	28	5.7	2.4	16.7	10	+
Ireland*	+	52	+	29	75	63	27+	30	8
Scotland*							+	+	
Spain	97	150	69	148	233	411	216.6	284.6	951
ICES Divisions VIId, e (English Channel)									
England, Wales & Northern Ireland*	1	0	0	0			0.7		
France	1	1	1.8	3.4	3.8	13	1.8	13	+
Netherlands*							+		
ICES Divisions VIIg-k (Celtic Sea and SW of Ireland)									
England, Wales & Northern Ireland	14	251	181	151	173.2	143.7	85	+	18
France	2	49	72.1	66	51.1	91.6	31.7	58	+
Ireland*	+	295	9	83	60	91	49+	37	19
Scotland*								+	
Spain	427	658	873	710	339	87	35.4	35	52
ICES Subarea VIII (Bay of Biscay)									
England, Wales & Northern Ireland	3	0	0	0			0		
France	372	166	211.3	168.2	67.2	250.4	44	154	+
Portugal	11	5	1	2			1	0	+
Scotland*								+	
Spain	2013	1806	1453	1400	868	584	474.2	495.1	634
ICES Subarea IX									
Portugal	353	383	313	321	232	205	118	321	
Spain	2536	1800	4476	2461	2133	592	438.3	655.8	386
Grand Total	6145	5841	7693	5607	4260	2571	1508	2149.8	2080

Country* – These countries report undifferentiated landings of Loliginids and Ommastrephids that were grouped in Table 2.2. Here they are listed as "+"

Table 2.4: Landings (in tonnes) of Octopods (*Eledone* spp. and *Octopus vulgaris* mainly).

COUNTRY	1997	1998	1999	2000	2001	2002	2003	2004	2005P
ICES Division IVa (Northern North Sea)									
Scotland	6	13	17	15	6	1.3	11	5	2
ICES Division IVb (Central North Sea)									
Belgium	+	2	5	5	5.5	1.5	2	2	2
England, Wales & Northern Ireland	0	1	1	1	1.7	0.6	0.52	1	1
Netherlands					0.5				
Scotland	0	1	1	+	0.1				
ICES Division IVc (Southern North Sea)									
Belgium	2	+	2	1	0.6	1.2	1		
England, Wales & Northern Ireland	1	+	+	+		0	0.03		
Netherlands					0.1		1		1
ICES Division VIa, b (NW coast of Scotland and North Ireland, Rockall)									
Belgium	1	1	+	+					
England, Wales & Northern Ireland	0	2	0	+			2.1	2	
Ireland	+	0	1	1					
Scotland	1	0	+	0					
Spain	35	42	0	+			0	0	0
ICES Division VIIa (Irish Sea)									
Belgium	18	26	4	5	10.9	31.1	20	5	1
England, Wales & Northern Ireland	1	+	+	+	0.4	0.1	0.3		+
Ireland	0	1	0	+		1	1		
ICES Divisions VIIb, c (West of Ireland and Porcupine Bank)									
England, Wales & Northern Ireland	3	5	3	4	20.2	2.5	6	15	4
France	0	0	0	8.1	0.6	0.2	0		+
Ireland	4	0	2	4	5	1	6	2	1
Scotland					1.7		1		
Spain	33	41	34	44	276	741	429.6	341.9	417
ICES Divisions VIId, e (English Channel)									
Belgium	1	+	+	+	0.3	2	2	3	1
Channel Islands	0	0	+	+			3		
England, Wales & Northern Ireland	37	17	9	22	15.2	19.5	20.6	14	21
France	7	3	8.1	13.2	5.1	7.3	5.3	6	+
ICES Division VIIf (Bristol Channel)									
Belgium	6	3	3	13	0.5	8.6	13	24	10
England, Wales & Northern Ireland	9	3	4	10	4.2	13	7.7	9	10
France	1	0	+	+					+
Spain						2			
ICES Divisions VIIg-k (Celtic Sea and SW of Ireland)									
Belgium	13	11	10	16	6	12	13	12	5
England, Wales & Northern Ireland	66	58	16	78	105.2	140.8	99.2	113	131
France	1	9	8	32.3	19.3	17.6	11.1	14	+

COUNTRY	1997	1998	1999	2000	2001	2002	2003	2004	2005P
Ireland	3	2	7	7	9	11	17	11	29
Scotland	1	9	1	5	9.5	1.3	6		7
Spain	145	179	348	518	156	111	27.6	29.2	32
ICES Subarea VIII (Bay of Biscay)									
Belgium	4	4	17	4	4.9	13.4	1	5	3
England, Wales & Northern Ireland	23	1	+	0			0.5	29	8
France	84	78	199.5	151.3	72.8	56.1	16.3	201	+
Netherlands					4.8				
Portugal	75	57	156	250	69.5	69.7	98	67	101
Spain	2448	2787	1261	1057	1272	1329	1144.4	1723.5	1572
ICES Subarea IX									
Portugal	9078	6350	9098	9019	7203.2	7287.9	10038	8758	11372
Spain	3630	3298	4490	5205	2163	2936	2804.4	2787.3	4010
ICES Subarea X (Azores Grounds)									
Portugal	64	39	12	9	14	16	16	15	10
Grand Total	15801	13043	15718	16498	11464	12836	14826	13083	17751

Table 2.5: Total annual cephalopod landings (in tonnes) in the whole ICES area separated into major cephalopod species groups.

CEPHALOPOD GROUP	1997	1998	1999	2000	2001	2002	2003	2004	2005P
Cuttlefish	16652	20275	20210	23754	18034	22614	19492	30988	7228
Common squid	11519	11245	11049	10253	8234	9939	7527	12562	3799
Short-finned squid	6145	5841	7693	5607	4260	2571	1348	2149	2080
Octopods	15801	13043	15718	16500	11461	12831	12191	14195	17751
Total	50117	50404	54670	56114	41989	47955	40557	59894	30858

Table 2.6: Total annual cephalopod landings (in tonnes) in whole ICES area by country and separated into major cephalopod species groups.

COUNTRY	1997	1998	1999	2000	2001	2002	2003	2004	2005P
(a) Cuttlefish (*Sepiidae*)									
Belgium	17	26	24	59	260	741	541	819	598
Channel Islands	8	20	22	26	8	11	9	12	7
Denmark	0	0	27	20	5	22	60	67	49
England, Wales & Northern Ireland	2202	2760	2259	3076	2700	3535	4978	5042	3008
France	11046	13015	13925	16973	12394	15432	11247	21511	0
Ireland	0	0	0	0	0	0	0	0	3
Netherlands	0	0	0	101	162	381	249	388	174
Portugal	1423	1734	1161	1365	1348	1368	1186	1727	1857
Scotland	0	0	0	0	5	0	0	4	1
Spain	1956	2720	2819	2154	1153	1125	1281	1418	1531
Total	16652	20275	20237	23774	18035	22615	19551	30988	7228
(b) Common Squid (*Loliginidae*)									
Belgium	155	253	222	463	51	137	132	106	73
Channel Islands	6	5	11	9	1	2		1	0
Denmark	17	16	27	20	0	0	0	0	0
England, Wales & Northern Ireland	2005	1466	1261	776	850	1002	830	881	762
Faroe Islands	5	32	23	+				0	0
France	4560	4275	5759	5039	4243	5963	5523	6292	0
Germany	4	11	6	5	0	0	58	38	24
Ireland	217	216	178	101	14	40	0	245	264
Isle of Man	2	2	2	+	1	0		0	0
Netherlands	0	0	0	773	0	0	0	238	176
Portugal	1153	1111	375	678	899	687	236	1526	873
Scotland	1001	1572	1350	980	687	1180	0	2243	752
Spain	2253	2186	1728	1371	1489	927	748	987	872
Sweden	1	1	1	+				5	3
Total	11379	11146	10943	10215	8234	9939	7527	12562	3799
(c) Short-finned Squid (*Ommastrephidae*)									
Denmark	0	0	0	0	0	0	0	0	0
England, Wales & Northern Ireland	26	293	204	186	193	169	1	27	20
Faroe Islands	0	0	0	0	0	0	16	17	1
France	375	216	289	266	128	358	94	235	0
Germany	0	0	0	0	0	0	0	0	0
Iceland	5	4	3	1	0	0	0	1	0
Ireland	0	347	9	112	135	154	0	77	36
Netherlands	0	0	0	0	0	0	0	0	0
Norway	190	2	+	+	0	0	0	1	0
Portugal	364	388	314	323	232	205	119	321	0
Scotland	0	0	0	0	0	0	0	0	0
Spain	5185	4591	6874	4719	3573	1685	1253	1471	2023
Sweden	0	0	0	0	0	0	0	0	0
Total	6145	5841	7693	5607	4260	2571	1348	11151	2080
(d) Octopods (*Octopodidae*)									
Belgium	45	47	41	44	29	70	0	51	22
Channel Islands	0	0	+	+	0	0	3	0	0

Country	1997	1998	1999	2000	2001	2002	2003	2004	2005P
England, Wales & Northern Ireland	140	87	33	115	147	177	137	183	175
France	93	90	216	205	98	81	33	221	0
Ireland	7	3	10	12	14	13	0	13	30
Netherlands	0	0	0	0	5	0	0	0	1
Portugal	9217	6446	9266	9280	7284	7369	7550	8840	11483
Scotland	8	23	19	20	17	3	0	5	9
Spain	6291	6347	6133	6824	3867	5119	4471	4882	6031
Total	15801	13043	15718	16500	11461	12831	12191	14195	17751

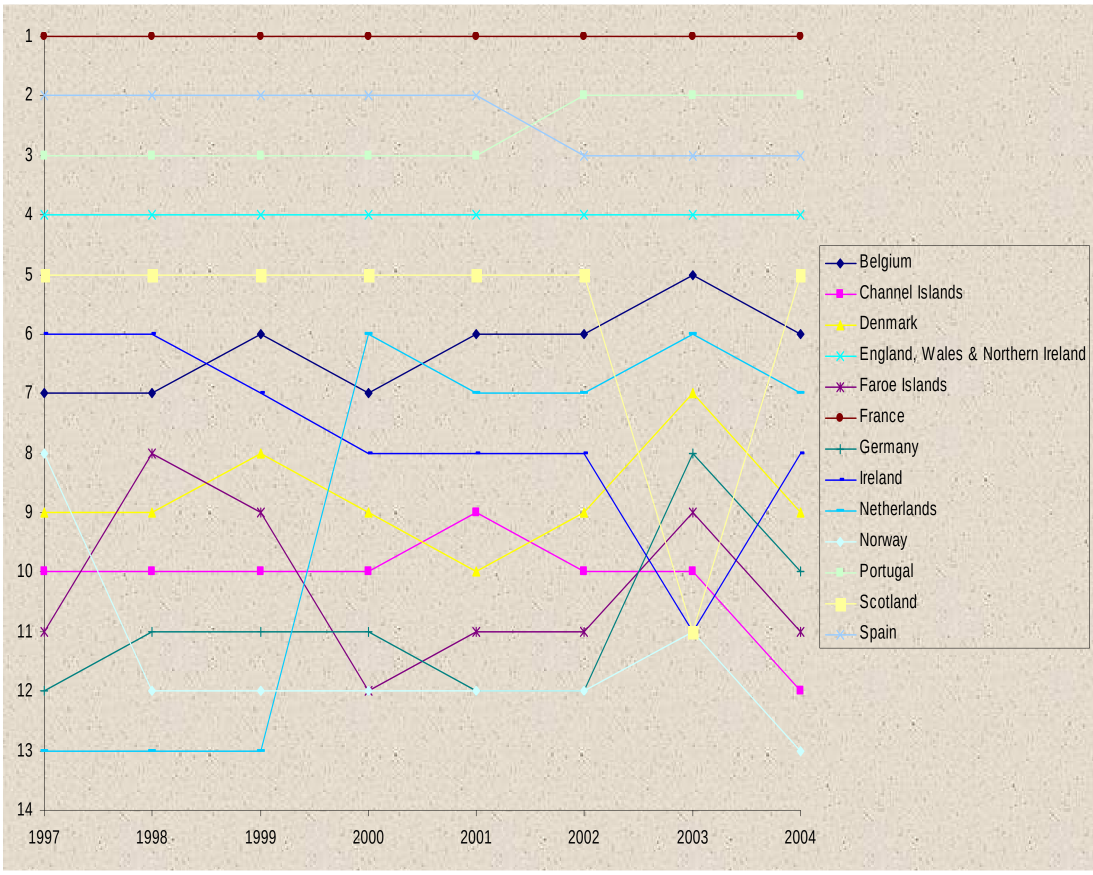

Figure 2.1: Yearly evolution of ranking cephalopod landings per ICES nation.

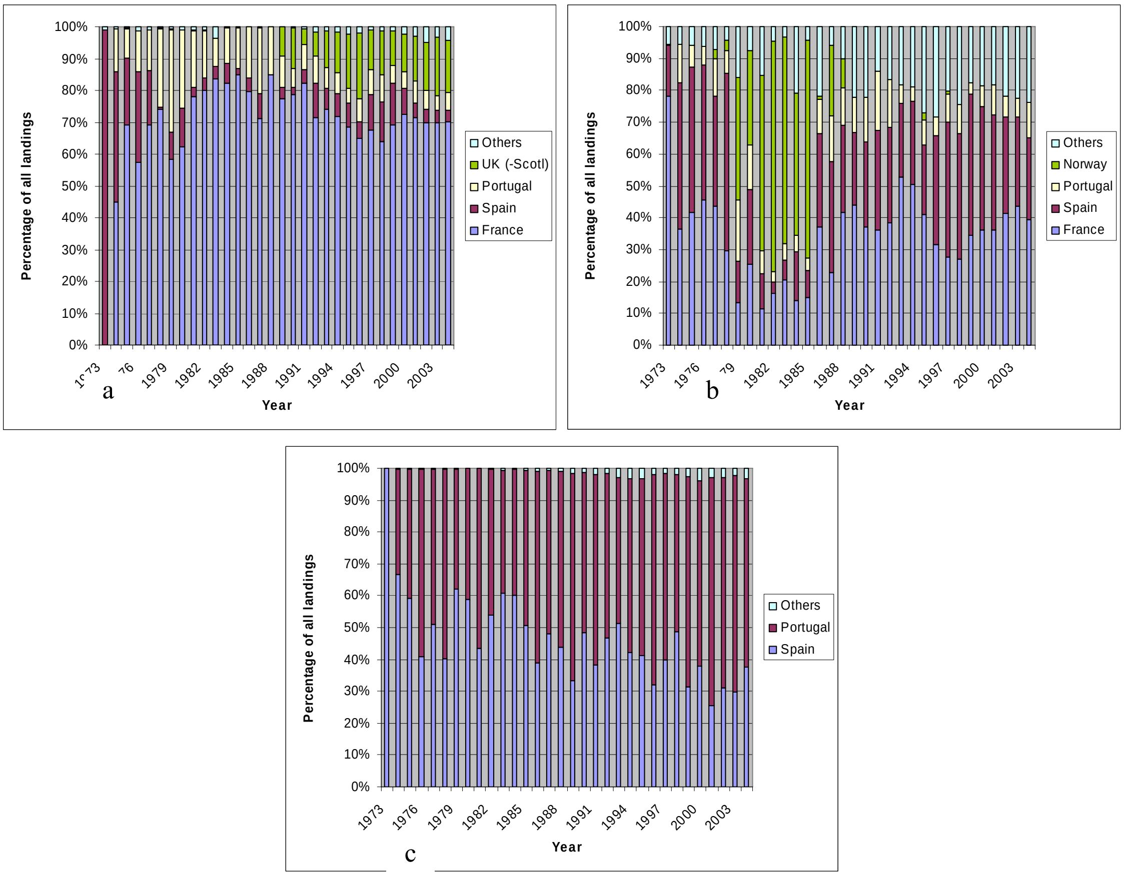

Figure 2.2: Exploitation shares by nation in the ICES area: a) cuttlefish, b) squid (longfinned and shortfinned), c) octopus.

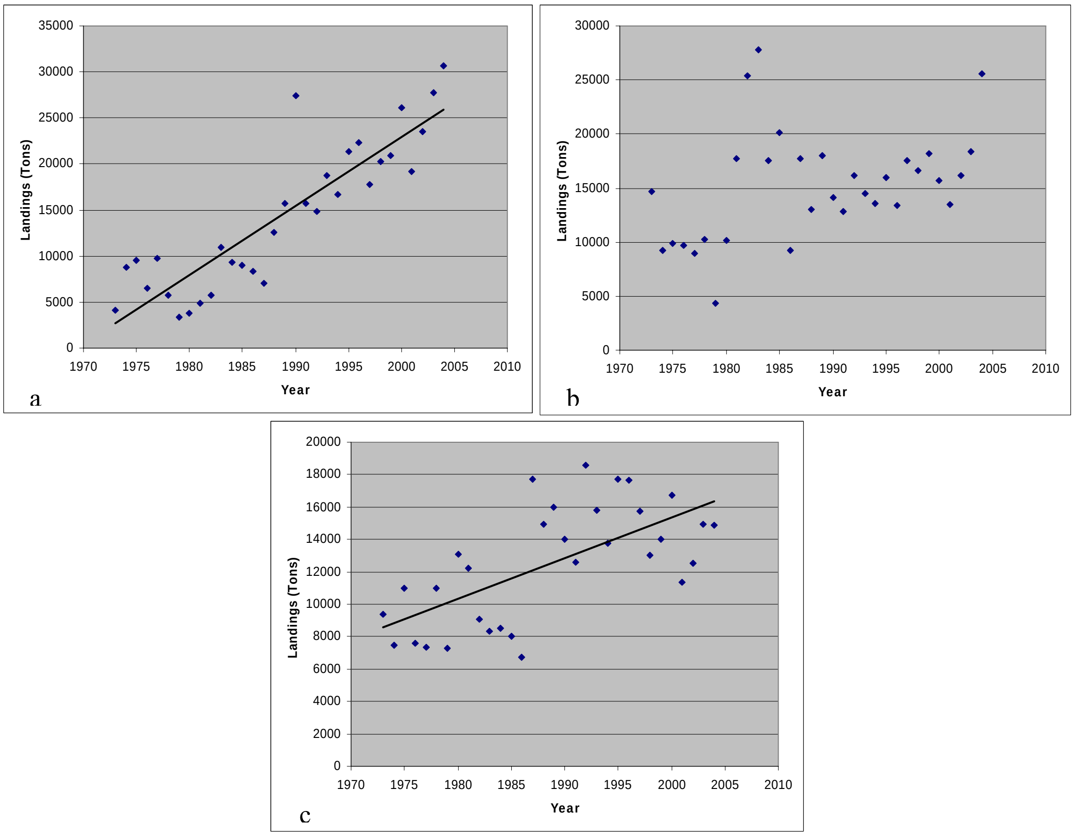

Figure 2.3: Thirty-two year landings of cephalopods in the ICES area. a) cuttlefish, b) squid, c) octopus.

2.2 Compilation of available information on fishing effort of selected fleets, on discards and on selectivity

During 2005 data on effort and landings per unit of effort continued to be gathered by several partners. Although few results were made available during the year, project proposals and manuscript preparation are in progress in this respect. Among the interesting results in preparation are the finding that some apparently bycatch cephalopod fisheries of southern Europe are actually at least partially directed. Evidence that trawling for cephalopods exists, may change the perspective with which assessment and management must be looked at.

The “Data Collection Regulation” DCR programme of the EU has set the framework for the widspread collection of discard data, which some member countries already collected but others did not. At present only a small fraction of the results has been made available, but it should be stressed that it is possible to obtain discard data relative to cephalopods which should be requested from national delegates. In Portugal, the DCR discard data collection scheme was implemented in the second half of 2003, aiming to obtain information on a variety of commercially important species. A report on cephalopods is currently under elaboration authored by elements of the group in charge of the data collection and analysis, namely Dina Silva, Ana Cláudia Fernandes, Susana Barbosa and Graça Pestana, who made use of the data gathered in commercial operations of 18 Portuguese flagged trawlers, some targeting crustacea and others fish. The following data were extracted from that manuscript, with comments added by the IPIMAR members of WGCEPH.

Cephalopods of the four groups of taxa previously defined (cuttlefish, longfinned squid, shortfinned squid and octopus) are made up of a variable set of taxa depending on the year under anaylsis. The degree to which identifications are possible also varies with the condition of the material being discarded. Table 2.7, lists the taxa identified in the discard data collection scheme during 2004 and 2005. Although some species are hardly ever commercialised, and are possibly discarded for that reason, a suit of other reasons justifies the discarding of some commercially valuable species, among which are those most highly valued among cephalopods.

Table 2.7: Taxa identified in the discard sampling scheme and grouping into major commercial denominations.

Species Groups	Taxon	2004	2005
Cuttlefish and bobtailed squid	*Sepia officinalis*	Present	Present
	Sepiolidae	Present	Present
	Sepia elegans	Present	Present
	Sepia orbignyana	Present	Present
	Rossia macrosoma	Present	Present
Longfinned Squid	*Alloteuthis spp.*	Present	Present
	Loligo spp.	Present	Absent
	Loligo vulgaris	Present	Present
Octopus	*Eledone moschata*	Present	Present
	Eledone cirrosa	Present	Present
	Histioteuthis spp.	Present	Absent
	Histioteuthis bonnellii	Absent	Present
	Opisthoteutis agassizi	Present	Absent
	Opisthoteutis spp.	Present	Absent
	Octopus vulgaris	Present	Present
	Octopus defilippi	Present	Absent
Shortfinned Squid	*Todarodes sagittatus*	Present	Present
	Illex coindetii	Present	Present
	Ommastrephes bartrami	Present	Absent
	Non-identified	Present	Absent
	Todaropsis eblanae	Present	Present

In relation to the total of discards of the vessels sampled, cephalopods represented 9.3%, and were higher in the fleet targeting crustacea (14.3%) than in the fleet targeting fish (5%).

Of the cephalopods discarded, the main species are those that are considered of less commercial value, as would be expected, and the single most significant discards are those of *Eledone cirrhosa*, which is considered a less palatable species among octopods. Among longfinned squid, the greatest rejections are those of the genus *Alloteuthis*, which is a highly abundant group that is of a small body size and therefore has only a very restricted use, either as bait or as gourmet food, but does not command a high price. The latter reason combined with the demand in labour that the separation of the specimens would require, result in significant rejections. Among the group made up of cuttlefish and bobtail squid, it is the latter that are mostly rejected and particularly the species *Rossia macrosoma*, again a fairly abundant species that is both of a small total body size and considered a less palatable species. For the commercially valuable species, such as *Octopus vulgaris* or *Loligo vulgaris*, discarding results mostly from legal impositions and mechanical damage. Legal imposition discarding must be viewed with caution, as it may reflect the presence of observers rather than common practice, the octopus being particularly significative in this context, as virtually any damage condition or size would fetch a certain price at the market. Table 2.8 presents the total discards for the two years in analysis, for the most significant cephalopod taxa identified.

Table 2.8: Summed discards for 2004 and 2005 by taxa, grouped under major commercial denominations and separated by fleet.

GROUP	TAXUM	REJECTION (KG)	
		FISH TRAWLERS	CRUSTACEAN TRAWLERS
Cuttlefish and bobtailed squid	*Sepia officinalis*	0.2	0.1
	Sepiolidae	3.1	14.9
	Sepia elegans	13.5	13.4
	Sepia orbignyana	11.2	31.5
	Rossia macrosoma	0.0	63.5
	Group total	28.1	123.4
Longfinned Squid	*Alloteuthis spp.*	333.7	17.2
	Loligo spp.	22.8	-
	Loligo vulgaris	17.3	-
	Group total	373.9	17.2
Octopus	*Eledone moschata*	-	39.5
	Eledone cirrhosa	88.5	1920.2
	Opisthoteuthis agassizi	-	21.1
	Octopus vulgaris	36.8	6.9
	Octopus defilippi	-	2.7
	Group total	125.2	1990.4
Shortfinned Squid	*Todarodes sagittatus*	1.5	22.0
	Illex coindetii	30.9	11.6
	Non-identified	0.6	-
	Todaropsis eblanae	10.6	136.4
	Group total	43.5	170.0
Total		570.7	2300.9

The partitioning of the discards by fleet mostly reflects availability, as the target depths are different for the two fleets (average 327m for the crustacean fleet and 115m for the fish fleet) and species abundance varies with depth. Rejection of the stout bobtail squid *Rossia macrossoma* is particularly representative of that situation, with discards fully comprehended in crustacean trawler catches, not because the species is retained in fish trawler catches but simply because it occurs at depths targeted by the crustacean trawlers. Similarly the distribution of the genus *Alloteuthis* is particularly concentrated at lower depths, while those of *Eledone cirrhosa* and *Todarodes sagittatus* are concentrated at greater depths. The shortfinned squid, *Todaropsis eblanae*, may constitute an exception, as it is possibly one of the few species that is rejected in crustacean trawls and retained in fish trawls, since it occurs at a large range of depths. The fact that it represents a minor return for the high-priced catch of crustacean trawlers and that it is mis-aimed at the buyers who would be interested in the landings of those trawlers, may be two of the most important reasons for the difference in the proportion discarded by the two fleets.

Data made available for the Portuguese coast suggest that in this geographical area discards of the species that are, or may be, subject to regulation, are not such that would suggest a strong need for concern when assessing. On the other hand it is evident that a large number of specimens and a large volume in weight is wasted and may represent senseless kills of species that although not commercially valued may represent important paths in the ecosystem. Among the most important discards some may become less important as the economic value of the species rises in relation to those already exploited, similarly to what has happened in northern European countries with cephalopods in general. This may be the case of *Eledone cirrhosa*, which in some countries is highly valued and which shows an increasing demand in Portuguese markets. But while presently the specimens that are caught at lower depths may sometimes constitute an interesting source of income for the fish fleet, it will take longer for the crustacean fleet to take interest in its sales. Specimens of species that possess small body sizes are particularly prone to discarding and it is unlikely in the near future that their value will surpass the cost of handling. They may be partially protected by the regulation of mesh size, but the numbers in which they are killed are always very high. Although they presumably partially re-enter the food chain, they will not play a similar role in the ecosystem and their killing may cause problems to would be predators, among which commercially valued species have been identified.

2.3 Exploration of resource survey databases for information about sampled cephalopods in the ICES area

A database of cephalopods sampled from 1991 has been compiled and updated within the latest transnational concerted action CEPHSTOCK. Members of the Working Group have also had access to resource survey databases in each country to gather data used in research.

In those countries in which cephalopod species were included in the minimum sampling programme (i.e. the required minimum sampling) and/or the extended sampling programme (i.e. recommended but not mandatory sampling), data gathering has continued and data are available within the biological databases of each country. Some countries however, continue to ignore to a large extent the importance of cephalopods and do not provide opportunities for biological data collection and logging into national databases.

Fisheries landings databases continue to be maintained and made available and are readily available at ICES own STATLANT database, which the working group members have continued to use in their research. Nevertheless some discrepancies between data reported officially and unofficial database queries in each country suggest that there is room for improvement, particularly concerning traceability and transparency.

Limited access to some more restricted datasets, such as individual daily landing operations per species and VMS logs has been shown to be extremely useful for fisheries management of cephalopods when occasional probing has been permitted to members. Some results are in preparation making use of such resources, but as mentioned in the previous report, an official effective way to provide continuous access to such data sets would help resolve difficulties with data precision, particularly in cases where cephalopod resources are exploited by a multitude of fleet components and metiers.

3 ToR b)

compile methods and results available for:

- stock identification;
- estimation of population size

Some of the most recent methods and results available for stock identification and/or estimation of population size were presented in the 2004 and 2005 WGCEPH reports. Papers published with data analyses relevant to this ToR and resulting from work presented at the 2004 ICES ASC Theme Session on "Cephalopod Stocks: Review, Analysis, Assessment, and Sustainable Management" became available in late 2005 mostly in a special issue of the journal Aquatic Living Resources (Volume 18, Number 4). Additional results and discussion that are specifically relevant to this ToR were presented by members of WGCEPH in a workshop sponsored by CEPHSTOCK and became available in early 2006 in a special issue of the journal Fisheries Research (Volume 78, Issue 1).

4 ToR c)

- identify possible precautionary approaches to the management of these cephalopod resources;
- evaluate management options and consider socio-economic issues;

Under the current situation of limited cephalopod research, no major new results were obtained related to this ToR.

Due to the *de facto* situation found in Galicia, N. Spain (but not elsewhere in Spain), of a dramatic reduction of landings of octopus verified since 2005 (45% less than in 2004), local emergency management options were considered taking into consideration socio-economic issues, but they lacked any particular innovative aspect.

4.1 Management options put into practice considering socio-economic issues

In many regions in Galicia (Finisterra, Costa da Morte and rías de Noia, Arousa, Pontevedra and Vigo), landings in 2005 were up to 69% less than in 2004, reportedly as an aftermath of the wrecking of "Prestige". The situation caused great commotion among the fishing communities in the area, which saw their income significantly reduced, and that in turn produced a ripple effect in the autonomous region at large.

The management response to the crisis was the redefinition of a biologically motivated closed season, which in effect was an extension of the closed season that was already a part of the management regime. Simultaneously, the minimum landing weight was raised from 750g to 1kg. However, even if the official response is not innovative and has not changed much in legal terms, in practice, there is apparently an increased participation of all sectors in the decision process, with the representatives of the producer associations making sure that they not only participate in bilateral meetings to raise their concerns, but that they are also present when decisions are converted into legislation, to make sure that the agreements are fully respected.

5 ToR d)

- data available and relationships between abundance and environmental conditions, factors affecting recruitment, migration and distribution;
- trophic interactions;
- contaminant bio-accumulation;

The most up to date information available on this ToR was reported by WGCEPH during 2004.

In addition to the results made available then as a result of the research conducted up to the conclusion of the European transnational concerted action CEPHSTOCK, scientific manuscripts were published in the two special journal issues referred to above under ToR B: Aquatic Living Resources, Volume 18, Number 4, and Fisheries Research, Volume 78, Issue

1. Some of the results published are particularly interesting as they open-up new lines of research, such as the accumulation in cephalopods of biological contaminants not previously reported for the group.

6 ToR e)

- review cephalopod culture techniques and results;
- cephalopod aquaculture as a source of information on biological phenomena;

The following text on cephalopod aquaculture is mainly a contribution by WGCEPH member Noussithé Koueta.

Cephalopods appeared during the last few years as an important economic resource for global fisheries. For their high growth rate and market price, the development of much of the research in the field of cephalopod culture is still an area of great interest. Particularly interesting is the improvement of the knowledge of the early life history, physiology, neurophysiology and behaviour both from a point of view of the science involved and the potential industrial commercial aquaculture production.

Cephalopods have a high protein metabolism for their growth and energy production. Lee (1994) has suggested that proteins are the principal source of energy where as fatty acids are mainly used for membrane constitution and functions, and for cholesterol and steroid hormone elaboration. Over the last two decades, several studies have been conducted to determine the nutritional requirements of marine larvae and juveniles (Zambonino-Infante *et al.*, 1997; Perrin *et al.*, 2004). As demonstrated by Zambonino-Infante *et al.* (1997) in sea bass larvae, the molecular size of the dietary protein fraction could play a major role in larval and juvenile development. Protein hydrolysates are potential ingredients that are used in aquaculture mainly as protein supplements, attractants and palatability enhancers (Hardy, 1991). The use of high concentrations of free amino acids in silage is permitted as a food additive in aquaculture (Viana *et al.*, 1996).

The importance of polyunsaturated fatty acids (PUFA) on normal development of marine fish larvae and oysters has been shown by many investigators (Ostrowski and Divakaran, 1990; Watanabe, 1993; Ozkizilcik and Chu, 1994; Barclay and Zeller, 1996). Recent investigations on juvenile cephalopods have shown the impacts of fatty acids on survival and growth. Navarro and Villanueva (2000, 2003) demonstrated that juvenile cephalopods need an important quantities of PUFA and especially DHA (22:6n-3) during the exponential phase of growth. In fact a mortality and a growth are correlated to the ratio of DHA/EPA (20:5n-3) in their nutrition. Koueta *et al.* (2002) demonstrated the importance of PUFA and especially DHA (22:6n-3) and EPA (20:5n-3) in the increase of growth and survival of juvenile cuttlefish in culture. Domingues *et al.* (2004) showed that an optimal DHA/EPA ratio could be relevant for correct development of cuttlefish, variation in the concentrations of AA (20:4n-6) and EPA, essentially the ratio EPA/AA could have profound effect on eicosanoid production. Because there is no formulated diet suitable for marine larvae and juvenile, they are fed live preys. Then, rearing marine larvae and juvenile represents a high cost that limits the development of marine aquaculture. In this way, cephalopods eat mainly live preys as crustaceans and fish, and only sub-adults and adults can be reared easily with inert food.

Recent investigations concerning culture of cephalopods are focused on the production of routine low coast prey for juvenile and the study of the biochemical composition of the early stages of cephalopods to determine the influence and the rate of lipids and peptides in artificial juvenile diet formulation. The species mainly used are cuttlefish and octopus.

6.1 Recent work on cuttlefish

During post-hatch development, the animals exclusively hunt small crustaceans as young shrimp (Koueta *et al*., 2002). This is the main problem to succeed in rearing juvenile cuttlefish for aquaculture. Many attempts have been made to rear juvenile cuttlefish with alternative diets, but young animals in these trials were fragile and their growth rate was low (Castro, 1991). Nevertheless, Perrin *et al*. (2004) have shown encouraging results in rearing juvenile cuttlefish with enriched frozen shrimps from 10-days-old. Many experiments were made on the acceptance of different diets by juvenile cuttlefish aged 20 days. Dried mysids were not as easily accepted (6.6%) as frozen mysids (83%) or shrimp surimi (33%). The shape of surimi was also important. A cylindrical shape was better accepted than others (Perrin, 2004). Nevertheless, whatever the conditions, the rearing success was different according to season and the female used. This observation means that the quality of the eggs remains essential in culture and there may be different opportunities given by different subspecies (Sykes *et al*., 2006), which must be further researched.

From a metabolic point of view, one of the most apparent differences in comparing cephalopods and other marine organisms is a high-protein content (75–85% of dry weight) due to the predominance of their amino acid metabolism (Villanueva *et al*., 2002). In this way, silage has proved to be a good protein source for sea-farmed fish (Raa and Gildberg, 1982). The utilization of silage as enrichment of juvenile cuttlefish diet shows very interesting results. Thus, it permits to reduce ration, to increase weight and to ameliorate the food conversion rate (Le Bihan, 2006). Several factors can be at the origin of this phenomenon. Enrichment improves higher quantity of peptides and carbohydrates in shrimps as observed by Perrin (2004). Artificial diets based on less expensive protein sources are becoming increasingly important as an alternative to live feeds in the aquaculture of cephalopods. When hatchlings of cuttlefish are fed with live prey enriched with PUFA, they begin to accept frozen diets very early in their life. This enriched diet contributes to reduce mortality due to the change of the diet during rearing. The induction of early acceptance of frozen diets by juvenile cuttlefish using PUFA is essential for cuttlefish culture because it allows a reduction of the difficult period of rearing when it is necessary to offer the younger animals only live prey of an appropriate size (Koueta *et al*., 2006). Another important nutrient is carotenoids that must be incorporated in the diet since they are not produced by cephalopods (Sykes *et al*., 2006).

6.2 Recent work on *Octopus vulgaris*

Iglesias *et al*. (2004) reared paralarvae of octopus using crab zoeae as a complement of a main diet of artemia. The percentage of paralarvae survival (31.5%) is higher that way than using artemia alone. These authors have thus proposed that future research should be directed at the identification of the nutritional element of zoeae that can be used to enrich artemia to obtain a suitable live prey for paralarval rearing. Vaz-Pires *et al*. (2004) in a review on octopus culture suggested that the investigation must be focused on the standardization of paralarval rearing methods, especially on live prey versus inert diet. Okomura *et al*. (2005) improved survival and growth of octopus paralarvae when feeding large type artemia and sandeel flakes and discovered that supplementing sandeel flakes improved the DHA/EPA ratio of the paralarvae. Garcia and Valverde (2006) indicated that diets based exclusively or even mainly on crustaceans are not commercially viable for cephalopod aquaculture due to increased feeding coast. So they show that for economic reasons, and as a feeding strategy, the diet must contain 45% crab and 54% fish. Villanueva and Bustamante (2006) aiming to understand the feeding requirements of early stages of cephalopods, have studied their composition in essential and non essential elements. The knowledge of the proportion of essential element incorporated with food is essential when formulating artificial diets for cephalopods culture.

6.3 Discussion

The socioeconomic aspects of Cephalopod culture show that the results are encouraging and even with difficulties, a fairly large production can be obtained. It is envisaged that an economically viable production is on the verge of being achieved which will initiate a new era in the commercial production of cephalopods in aquaculture (CEPHSTOCK report 2000). The aquaculture production of cephalopods is expected to increase in a few years but recent work shows that the development of the knowledge in the biology of the early stage of cephalopods remains essential. It appears useful to continue to investigate in the field of nutrition, digestion and growth of paralarvae and juveniles. Investigations in genetic, ecophysiology and behavioural aspects are also essential (Boletzky, 2004) in order that cephalopod culture techniques can be further developed.

6.4 Research priorities

The first question is: can a aquaculture of cephalopods from hatching to mature animals using cultured live prey (mysids, shrimps artemia, fish) be economically viable?

Second question is: Can aquaculture of cephalopods from hatchings to mature animals using alternative diets or artificial diets (frozen prey, surimi) be possible and economically viable? In the future, the investigation must be focused on these points. Co-feeding during the early stages appears essential: enriched prey, then artificial or alternative diets must be used.

6.5 References

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8 ToR g)

- prepare material from EU project CEPHSTOCK and WG reports for CRR on the state of the art in cephalopod fisheries biology

The preparation of material for a Cooperative Research Report arising both from the concerted action CEPHSTOCK and previous WG Reports is well underway and is expected to be delivered for publication during 2007. The structure of the manuscript is the following: Chapter 1 – Cephalopod species commercially exploited in Europe (biology and ecology in relation to exploitation pattern and geographic incidence of exploitation); Chapter 2 – European Cephalopod Fisheries and Aquaculture (species and metiers, evolution of the fisheries in terms of fishing pressure, techniques and targets; aquaculture progress and species involved); Chapter 3 – Assessment and Management (experimental and practical assessment, management in theory and in practice); Chapter 4 – The future of Cephalopod Fisheries in Europe (fisheries versus aquaculture, sustainable fisheries: socio-economic concerns, management SWOT analysis)

9 Research priorities

As in 2004 and 2005, the WGCEPH considers that research priorities that have been previously indicated remain valid. An additional priority is to set up a new international collaborative research project that can help solve outstanding issues:

- It is important to include cephalopods in the minimum sampling programme of the EU within each country's national fisheries sampling programmes, with samples schemes adapted to these species; maintain the sampling programmes in place where they exist;
- Continue to make progress towards stock assessments of the main stocks;

- Since most studies of environmental factors affecting cephalopod abundance have underlined that recruitment variations were the most important, ecological studies of early life stages should be encouraged;
- Explore the role of cephalopods as ecosystem components, and their relationships with other fished resources;
- Continue to improve ageing techniques;
- Monitor the socio-economics of small cephalopod fisheries, particularly in southern European countries;
- Continue to improve understanding on the role of cephalopods as indicators of marine pollution and as routes of transfer of toxic elements, hydrocarbons, and other contaminants to higher trophic levels;
- Setup a follow-up international research project that can continue to add outstanding information to the scientific knowledge base, specifically aimed at addressing the previous issues and in particular the lack of knowledge concerning early life stages and the environmental influences on their survival and abundance.

10 The future programme of WGCEPH and recommendations

10.1 Terms of Reference

WGCEPH considers that, broadly speaking; the terms of reference that have been identified in previous years continue to be relevant. However, research opportunities have decreased since there is presently no transnational funding in place. Therefore, even though the working group wishes to continue to gather expertise on European cephalopod fisheries and to make it available to ICES Advisory Commission for Fisheries Management, particularly what regards any progress in stock assessments, all progress will have to rely on presently unknown authors and results, as opportunities for research may present themselves within the ICES countries participating to WGCEPH. The working group still considers that progress in the understanding of cephalopod life history and of the role of cephalopod populations in changing ecosystems should be of interest to the Advisory Commission for Environmental Management. Because presently the exploration of databases made up of monitoring data may constitute a readily available source of cephalopod data for analyses, the WG will continue to explore such sources of information without need for specific funding, and continue to report on the results and analyses. The following terms of reference are proposed for 2007, less specific and demanding than those that have been proposed in previous years, but that the WG expects to be able to expand in view of the results obtained throughout the year and as new opportunities for collaborative research arise:

h) update and explore landing statistics across the ICES area;
i) report on innovative cephalopod research results in the ICES area;
j) finalise CRR and submit for publication.

10.2 WGCEPH working

It has been underlined, but is worth remembering as the situation has not improved, that WGCEPH, more than most ICES Working Groups, relies on participation from a wide range of scientists working often in universities where no funding is available for participation in ICES activities. Furthermore, budget cuts in many European nations, designed to slim down national deficits have taken strong tolls on travel and subsistence budgets even in fisheries research institutes, so that participation in ICES activities may never be taken for granted. Presently there is no EU transnational research programme in place from which synergies with the ICES WHCEPH can be gained to create meeting opportunities. During the next year (2006–2007) WGCEPH proposes to continue to work by correspondence in as much as that can be made possible. The group hopes to improve communication by correspondence and quickly regain research momentum to increase the opportunities for collaborative research.

Annex 1: Draft ToRs for 2007

The **Working Group on Cephalopod Fisheries and Life History** [WGCEPH] (Chair: Joao Pereira, Portugal) will work by correspondence in 2007 to:

a) update and evaluate landing statistics across the ICES area;

b) report on innovative cephalopod research results in the ICES area;

c) finalise production of the *ICES Cooperative Research Report* and submit for publication.

WGCEPH will report by 31 July 2007 for the attention of the Living Resources Committee, ACFM and ACE.

Supporting Information

PRIORITY:	High. The work of the Group is of high priority to ICES because cephalopods are an important component of marine ecosystems.
SCIENTIFIC JUSTIFICATION AND RELATION TO ACTION PLAN:	Cephalopods support important fisheries in the ICES area. However, they remain outside the scope of the European Community's Common Fisheries Policy and understanding of stock dynamics, particularly in European coastal waters, remains heterogeneous: although population assessments and fishery diagnostics are developed in some areas, time series of recruitment estimates are still too short to analyse stock/recruitment relationships. Specific comments to the Terms of Reference are: a) This activity remains fundamental to the work of the Group. The past broadening of the remit to include effort, discard, and survey data was useful but improved data, and improved access to data, are needed before the collection of the same may be resumed. [Action Number 1.2.2]
SCIENTIFIC JUSTIFICATION AND RELATION TO ACTION PLAN CONTINUED:	b) With the current uncertainty on the level of financing that may be obtained to proceed research on cephalopods in european waters, it is to a large degree difficult to predict what the direction of the research will be. Thus not being able to be pro-active on the research, we consider that being reactive will help maintain the interest and demonstrate the advantages of the work that can be carried out, while submitting results and analyses that will be directly applicable to the ICES action plan. It is expected that several new research projects will be developed on a local basis, which will be relevant to several action plan points [e.g. assessment in the U.K. to Action Number 1.2.1] c) The final ToR aims to disperse the findings of the CEPHSTOCK project to the wider community. A CRR aimed manuscript is to a large degree compiled but actual production and presentation for publication requires aditional work to be carried out during 2006 [Action Number 10.4].
RESOURCE REQUIREMENTS:	WGCEPH, more than most ICES Working Groups, relies on participation from a wide range of scientists working outside the traditional government fisheries laboratories in ICES countries and has, indeed, benefited enormously over the last 10-15 years from the input of other scientists working often in universities where no funding is available for participation in ICES activities. This must be taken into account in the organisation of WGCEPH meetings. In particular, the opportunity to use project funding must be seized when they present themselves. Without this source of funding, the group must resort to meeting by correspondance.
PARTICIPANTS:	In addition to European Atlantic Scientists involved in CEPHSTOCK, input from scientists in the USA and Canada (where some cephalopod fisheries are routinely assessed and managed) is useful.
SECRETARIAT FACILITIES:	None
FINANCIAL:	None

LINKAGES TO ADVISORY COMMITTEES:	Terms of Reference a) and b) are set up to provide ACFM with the information required to respond to requests for advice/information from NEAFC and EC DGXIV.
LINKAGES TO OTHER COMMITTEES OR GROUPS:	None
LINKAGES TO OTHER ORGANISATIONS:	None