EUROPEAN PARLIAMENT

DIRECTORATE-GENERAL FOR RESEARCH

WORKING PAPER

EFFECTS ON THE FISHERIES INDUSTRY OF THE COMMISSION PROPOSALS (SANCO) ON DIOXIN CONTENT OF FISH, FISH OIL AND FISH MEAL AS PART OF ANIMAL FEED REGULATIONS

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1 Background and scope of the study

Background

Dioxins are toxic substances encountered widely. Very small concentrations of these chlorine organic compounds may cause adverse environmental and health effects. Dioxins are chemically comparatively resistant and tend to accumulate in fat tissue.

Recently some fish and fish products of European origin have been identified as major contributors to the dioxin contamination of feed materials finally occurring in the human food chain [SCAN 2000, p. 44] and according to the Scientific Committee on Animal Nutrition emphasis should be put on reducing the impact of the most contaminated feed materials such as fish oil or fish meal from Europe on overall diet contamination. Therefore the European Commission wants to set maximum limits for feed, including fish and fish products by amending Directive 1999/29/EC and to establish action and target limits in a Commission Recommendation to be adopted concurrently. This may affect the fisheries industry.

Scope of the study

To answer the question whether the limit values for dioxin in fish, fish oil and fish meal are adequate, two aspects have to be taken into consideration:

- On the one hand the adverse environmental and health effects of dioxins have to be assessed. These are questions of consumer protection and environmental concern which have inter alia been assessed by the WHO [WHO 2000], the JECFA [JECFA 2001] or the European Commission [SCF 2001; SCF 2001]. At the present state of data availability a fully reliable risk assessment can not be realised. However recommendations for tolerable daily intake rates are given. The proposed limit values shall assure that the daily intake of European citizens shall be at or below the recommended intake rates.
- On the other hand social-economical consequences for the fishing industry have to be assessed.

The scope of the study is the latter aspect. Possible effects on the fisheries industry due to the relevant commission proposal are demonstrated and relevant options are identified.

Methodology

In order to be able to assess possible effects of the proposed dioxin limits on the fisheries industry it was analysed which fish species and which fish products from European fishing areas would be concerned by the introduction of the proposed maximum limits and finally which parts of the fisheries industry would consequently be affected. In a second step, options for the fisheries industry w.r.t. the proposal as well as political options have been identified.

In order to assure objectivity and neutrality the information procurement was based on industry and environmental organisations as well as on public institutions.

2 Information on the EU fisheries industry

2.1 Data on the entire EU fisheries industry

The following table shows the importance of fisheries industry for EU member states. The volume of catches in Denmark is the highest with nearly 1.5 million tons. However, looking on turnover, Spain, Italy and France show significant higher values depending on higher prices for the catches of fish in these member states.

The number of jobs on the other hand is again different. Due to the organisation of fisheries industry most employees can be found in Spain, Italy and Greece.

Member State	Sea fish (1.000 t)	turnover [million €]	Jobs
AT – Austria	0	0	0
BE – Belgium	30	103,4	700
DE – Germany	94	84,4	2.900
DK – Denmark	1.463	447,4	6.400
ES – Spain	965	1.842,0	68.300
FI – Finland	115	20,3	1.000
FR – France	550	932,4	19.100
GR – Greece	124	458,2	41.300
IT – Italy	441	1.523,6	43.300
IRE – Ireland	325	193,9	6.300
LUX – Luxembourg	0	0	0
NL – The Netherlands	546	358,1	2.600
PO – Portugal	190	252,4	27.200
SV – Sweden	401	117,2	2.100
UK – The United Kingdom	614	803,0	17.800
EU	5.860	7.136,0	239.000

Table 1: Social-economic basis data (turnover and jobs) for the whole EU fishery, data of 1998 [EC 2001 c]

If not only the fisheries industry but as well the fish processing industry and other correlated enterprises are analysed a total of about 514.000 jobs and a turn over of about 20 billion EUR is the basis of the economic importance [EC 2001c].

2.2 Data on industrial fish

Industrial fish have to be considered w.r.t. production of feedingstuffs. There are certain species of special importance: Herring, Sand eel, Sprat, Blue Whiting, Mackerel, European Pilchard (Sardine), European Anchovy, Pout and Capelin.

The following economic data are related to these so-called industrial fishes:

Member State	Industrial fish (1000 t)	Turnover [million €]	Jobs
AT	0	0	0
BE	1	0	0
DE	80	5	190
DK	1.342	97	1.390
ES	195	14	510
FI	102	7	360
FR	122	8	170
GR	37	3	230
IRE	149	10	320
IT	70	5	140
LUX	0	0	0
NL	204	14	100
PO	92	6	680
SV	311	23	420
UK	266	19	420
EU	2.970	211	4.920

Table 2: Social-economic basis data for EU industrial fishery (Estimations due to not always unambiguous differentiation of jobs in the fishing industry)

Market shares of member states indicate a major importance of Denmark:

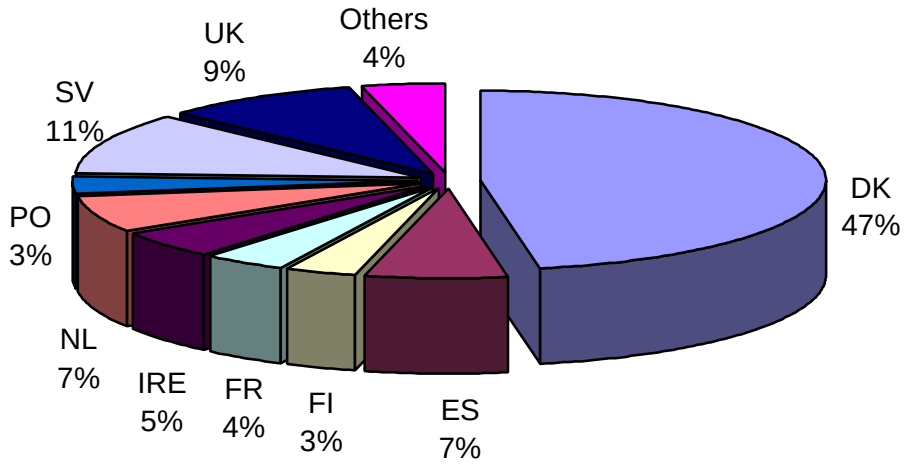

Figure 1: Shares of turnover of member states in industrial fish

2.3 Importance of fishes in selected member states

The following tables show the importance of industrial fishes for the member states:

	AT	BE	DE	DK	ES
Sandeels	0	0	0	536.000	750
Capelin	0	0	0	28.100	0
Blue Whiting	0	0	3.200	184.900	35.400
Horse Mackarel	0	21	24.400	35.600	0
Pout	0	0	0	61.500	0
Sprat	0	2	183	284.000	6
Herring	0	1	50.850	194.000	0
European Pilchard (Sardine)	0	0	1.450	17.670	128.200
European Anchovy	0	0	0	0	31.100

Table 3: Importance of industrial fishes - I [t]

	FI	FR	GR	IT	IRE
Sandeels	0	94	0	0	389
Capelin	0	0	0	0	0
Blue Whiting	0	8.700	630	1.450	35.900
Horse Mackarel	0	28.100	4.500	0	58.200
Pout	0	0	0	0	0
Sprat	18.900	83	110	0	5800
Herring	83.000	25.400	0	0	45.300
European Pilchard (Sardine)	0	32.900	15.200	28.900	3.200
European Anchovy	0	26.300	16.500	39.800	0

Table 4: Importance of industrial fishes - II [t]

	LUX	NL	PO	SV	UK
Sandeels	0	0	13	23.200	14.100
Capelin	0	0	0	0	79
Blue Whiting	0	32.900	2700	15.500	106.500
Horse Mackarel	0	84.900	15.500	2.000	21.000
Pout	0	1	0	0	2
Sprat	0	264	0	112.500	15.200
Herring	0	78.700	1	157.500	104.750
European Pilchard (Sardine)	0	7.600	72.000	0	4.800
European Anchovy	0	3	1.400	0	3

Table 5: Importance of industrial fishes - III [t]

2.4 Importance of selected European fishing areas

The following tables show the importance of selected European fishing areas related to the individual industrial fish species:

Sandeel	
Central North Sea	533.161
Northern North Sea	14.660
Skagerrak and Kattegat	11.983
Southern North Sea	10.356
North-west Coast of Scotland and North Ireland	2.627
Faroe Plateau	485
Faroe Bank	420
Portuguese Waters	397
Balearic (WMS 1.1)	367
Southern Central Baltic – West	62
Western English Channel	41
Bay of Biscay – South	4
Porcupine Bank	2

Table 6: Importance of selected European fishing areas for Sandeels (Catches per year in t)

Capelin	
Iceland Grounds	17.587
North-East Greenland	5.953
East Greenland	3.837
Norwegian Sea	814

Table 7: Importance of selected European fishing areas for Capelins (Catches per year in t)

Blue Whiting	
North-west Coast of Scotland and North Ireland	138.663
Northern North Sea	53.494
Faroe Plateau	35.207
Porcupine Bank	32.193
West coast of Ireland and Porcupine Bank	31.810
Rockall	22.154
Skagerrak and Kattegat	21.462
Bay of Biscay - South	20.658
Portuguese Waters	12.625
Iceland Grounds	11.507
North of Azores	11.144
Faroes Grounds	10.195
Norwegian Sea	6.268
Balearic (WMS 1.1)	4.335

Central North Sea	2.543
West of Ireland	1.465
Adreatic (CMS 2.1)	1.056
Ionian (CMS 2.2)	450
Southwest of Ireland -East	360
Aegean (EMS 3.1)	324
Sardinia (WMS 1.3)	251
Bay of Biscay - Central	235
Bay of Biscay - North	173
Faroe Bank	149
Gulf of Lions (WMS 1.2)	138
Southwest of Ireland -West	54
Sound and Belt Sea	45
Celtic Sea South	25
Bay of Biscay - Offshore	9
Bay of Biscay	6
Western English Channel	1

Table 8: Importance of selected European fishing areas for Blue Whitings (Catches per year in t)

Horse Mackarel	
Celtic Sea South	56.722
Bay of Biscay - North	41.175
Southwest of Ireland - East	38.597
North-west Coast of Scotland and North Ireland	27.929
West of Ireland	12.198
Western English Channel	11.095
Eastern English Channel	7.730
Northern North Sea	6.394
Southern North Sea	5.776
Central North Sea	4.749
Aegean (EMS 3.1)	3.712
Skagerrak and Kattegat	1.939
Bay of Biscay - South	838
Ionian (CMS 2.2)	764
Porcupine Bank	554
Irish Sea	327
Faroe Plateau	132
Bay of Biscay	63
Bay of Biscay - Offshore	51
Sound and Belt Sea	48
Southwest of Ireland - West	21

Rockall	4
Bay of Biscay - Central	1
Celtic Sea North	1

Table 9: Importance of selected European fishing areas for Horse Mackarels (Catches per year in t)

Pout	
Northern North Sea	41.853
Skagerrak and Kattegat	7.194
Central North Sea	5.299
North-west Coast of Scotland and North Ireland	4.625
Faroe Plateau	1.511
Southern North Sea	514
East of Gotland or Gulf of Riga	491
Bay of Biscay - Central	2

Table 10: Importance of selected European fishing areas for Pouts (Catches per year in t)

Sprat	
Central North Sea	154.689
Southern Central Baltic - West	55.697
West of Gotland	39.347
Archipelago Sea	35.178
Skagerrak and Kattegat	32.969
East of Gotland or Gulf of Riga	30.616
Baltic Sea	19.487
Southern Central Baltic - East	12.677
Gulf of Finland	11.110
North-west Coast of Scotland and North Ireland	11.004
Belt Sea	10.830
Bothnian Sea	3.750
Western English Channel	3.534
Baltic West of Bornholm	3.251
Eastern English Channel	3.089
Southern North Sea	2.984
Northern North Sea	2.157
Celtic Sea North	1.683
Southwest of Ireland - East	1.580
Sound	780
Faroe Plateau	181
Irish Sea	171
Aegean (EMS 3.1)	58
Ionian (CMS 2.2)	52
Sound and Belt Sea	29

West of Ireland	5
Bay of Biscay - South	5
Portuguese Waters	1

Table 11: Importance of selected European fishing areas for Sprats (Catches per year in t)

Herring	
Norwegian Sea	140.713
Northern North Sea	90.144
North-west Coast of Scotland and North Ireland	75.600
Bothnian Sea	62.606
Skagerrak and Kattegat	60.524
Central North Sea	54.074
West of Gotland	40.010
Archipelago Sea	29.962
Baltic West of Bornholm	25.897
Sound	19.555
Eastern English Channel	12.753
East of Gotland or Gulf of Riga	12.316
Baltic Sea	11.539
Southern Central Baltic - West	11.331
Belt Sea	10.921
Celtic Sea North	10.086
Irish Sea	9.832
Gulf of Finland	6.776
North-East Greenland	5.275
Bothnian Bay	4.192
Southern North Sea	4.039
Spitzbergen and Bear Sea	3.914
Southern Central Baltic - East	3.165
West of Ireland	3.155
Southwest of Ireland - East	2.398
Celtic Sea South	1.137
Iceland Grounds	704
Faroe Plateau	454
Sound and Belt Sea	374
Western English Channel	164
Bristol Channel	12
Portuguese Waters	1

Table 12: Importance of selected European fishing areas for Herrings (Catches per year in t)

European Plichard (Sardine)	
Portuguese Waters	90.412
Balearic (WMS 1.1)	37.183
Adreatic (CMS 2.1)	18.083
Aegean (EMS 3.1)	14.292
Southern North Sea (IVC)	12.108
Bay of Biscay-South (VIIIC)	10.612
Western English Channel (VIIE)	6.598
Ionian (CMS 2.2)	6.486
Eastern English Channel (VIID)	5.260
Sardinia (WMS 1.3)	5.229
Celtic Sea South (VIIh)	4.866
Central North Sea (IVb)	2.471
Bay of Biscay-Central (VIIIB)	2.383
Gulf of Lions (WMS 1.2)	425
Bay of Biscay-North (VIIIA)	144
Azores ground	133
Northern North Sea (IVA)	40
Skagerrak and Kattegat (IIIA)	35
Porcupine Bank (VIIC)	8
Bristol Channel (VIIF)	6
Bay of Biscay-Offshore (VIIID)	1

Table 13: Importance of selected European fishing areas for European Plichards (Catches per year in t)

European Anchovy	
Adreatic (CMS 2.1)	23.679
Aegean (EMS 3.1)	15.369
Bay of Biscay-South (VIIIC)	13.866
Gulf of Lions (WMS 1.2)	12.145
Ionian (CMS 2.2)	10.344
Balearic (WMS 1.1)	9.811
Sardinia (WMS 1.3)	6.856
Portuguese Waters (IX)	6.112
Bay of Biscay-Central (VIIIB)	1.526
Bay of Biscay-North (VIIIA)	269
Bay of Biscay-Offshore (VIIID)	96
Southern North Sea (IVC)	3
Western English Channel (VIIE)	3

Table 14: Importance of selected European fishing areas for European Anchovies (Catches per year in t)

2.5 Importance of fish processing industry

Industrial fish does not only affect jobs and turn over within the fisheries industry. Consequences for the fish processing industry also have to be analysed. The enterprises of this industry in total have about 90.000 employees and a turnover of 10 billion EUR per year. [EC 2001c,]. The share of fish meal and fish oil in the fish processing industry is comparatively small (1-2%).

In an international ranking of exports Denmark is the most important EU-member state for fish oil and fish meal representing the major products of industrial fish.

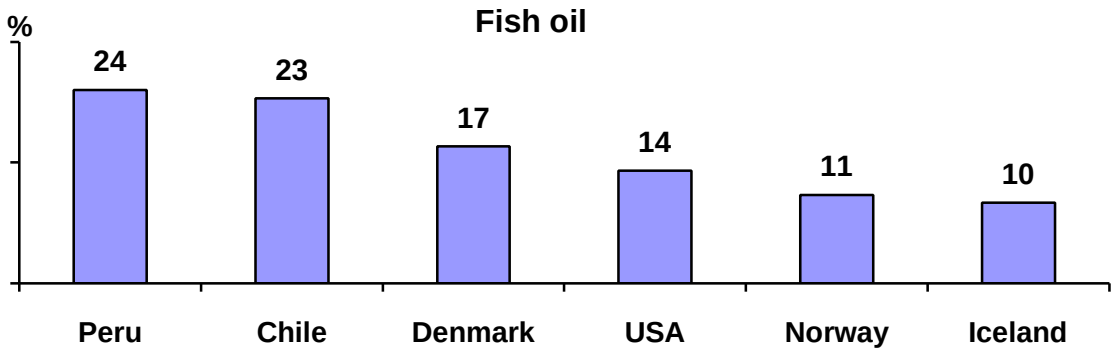

Figure 2: International ranking of exports for fish oil [IFOMA]

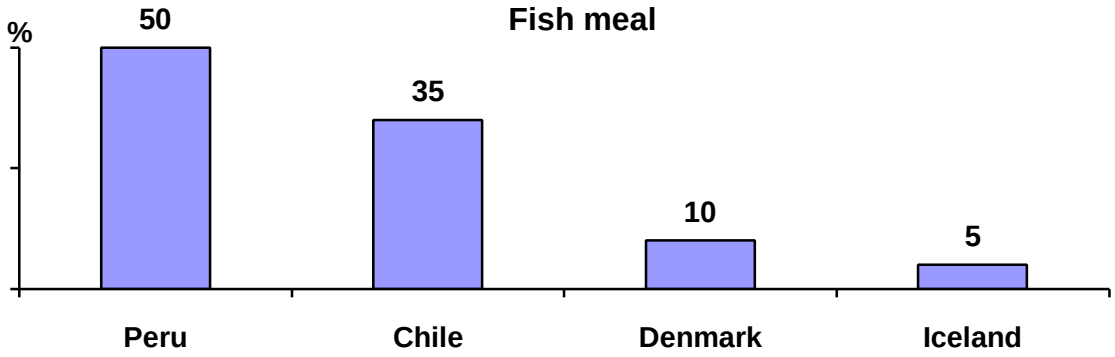

Figure 3: International ranking of exports for fish meal [IFOMA]

3 The Commission Proposal

The proposed amendment of Directive 1999/29/EC [CD 1999/29/EC] on the undesirable substances and products in animal nutrition proposes dioxin limit values. A concurrent Commission Recommendation will contain corresponding action values. The following limit and action values for dioxins in feedingstuff are proposed:

Feedingstuff	Maximum dioxin content relative to a feedingstuff with a moisture content of 12% [ng]	
	Limit value	Action Value
Fish oil	6,0	4,5
Fish, their products and by-products with the exception of fish oil	1,25	1,0
Compound feedingstuff, with the exception of feedingstuff for fur animals and feedingstuff for fish	0,75	0,40
Feedingstuff for fish	2,25	1,5

Table 15: proposed limit and action values for feedingstuff (in ng WHO TEQ upperbound concentrations; sum of dioxin and furan congeners according to [WHO 1998], see Annex 1)

The commission strategy w.r.t. the proposed legislative measures consists of three components:

1. The establishment of maximum limits (= limit values)

The proposed maximum limits mean that a product such as fish oil or fish meal – with a contamination level above the corresponding maximum limit will not be allowed to be used for the production of feedingstuffs (e.g. fish oil with a contamination level above 6 ng/kg or fish and fish meal with a contamination level above 1,25 ng/kg whole weight).

The proposal is restricted to dioxins because on the basis of the current data it seems to be inappropriate to include dioxin-like PCBs. It is planned to review the maximum limits before the end of 2004 in the light of new data in particular to include dioxin-like PCBs in the levels to be set. A further review is planned before the end of 2006 to significantly reduce the maximum levels.

2. The establishment of action values (= action value)

The action values shall be a tool of early warning for higher than desirable levels and trigger a proactive approach from competent actors to identify sources and pathways of contamination and to take measures to reduce the contamination. The exceeding of action values will not have direct consequences on the marketing or use of the feedingstuff concerned as long as maximum limits are followed.

3. The establishment of target levels

Target levels would be levels to be achieved over time in order to bring human exposure to dioxins and dioxin-like PCBs below the recommended tolerable weekly intake (TWI). At present the Scientific Committee on Food recommends a TWI of 14 pg per kg body weight [SCF 2001]. The current proposal does not contain target levels. The target levels are foreseen to be set before 31 December 2004.

4 Assessment of the effects of the proposed limit and action values on the fisheries industry

4.1 Methodology

The dioxin contamination of fish from European waters varies considerably according to the fish species and the fishing areas. For the assessment of the contamination of industrial fish from European waters, recent literature data has been integrated as well as unpublished data from the fisheries industry.

The available data have been evaluated with respect to their potential effects - "conflict potential (CP)" - on the fisheries industry due to the proposed limit and action values for feedingstuff. The following socio-economic conflict potential classes have been differentiated:

low CP	contamination level	below	Action value
medium CP	contamination level	between	Action value And Limit value
high CP	contamination level	above	Limit value

Table 16: Social-economic conflict potential (CP)

High conflict potential (CP) means a risk for jobs and turnover due to the high contamination levels of fish exceeding the proposed limit value.

Medium conflict potential means a risk for jobs and turnover due to the possibility that the contamination of certain catches with a contamination slightly higher than the average contamination may exceed the proposed limit values and furthermore that an elevated average contamination may result in high conflict potential.

Low conflict potential means no present conflict potential.

4.2 Overview on conflict potentials

The available fish-specific data on contamination of fish caught in European waters have been connected with these conflict potentials to give the following picture for the EU industrial fishery:

	Total	low CP	medium CP	high CP	no data
Catches [1000 t]	2.771	860	161	555	1.196
Jobs	4.920	1.530	290	980	2.120
Turnover [mio €]	211	66	12	42	91

Table 17: Social-economic conflict potential (CP)

These data suggest that – according to the Commission proposal – approximately 20% of industrial fish will not be usable for the production of feedingstuff. However, it should be kept in mind that due to insufficient data on the contamination of fishes from EU waters no conflict potential can be attributed to approximately 43% of industrial fish.

In order to estimate the conflict potential for all industrial fishes from EU waters it has been assumed that a measured high contamination level of a fish species in a certain fishing area indicates a comparable contamination of similar fish species (assumption of comparable contamination levels). The connection of the available data (which are not always representative or fish species specific) gives the following result for the EU industrial fishery:

	Total	low CP	medium CP	high CP
Catches [1000 t]	2.771	1.928	253	591
Jobs	4.920	3.420	450	1.050
Turnover [mio €]	211	147	19	45

Table 18: Estimated social-economic conflict potential (CP)

The result shows that – with the assumption made – approximately 70% could be used without any measures and 21% would not be usable for the production of feedingstuff without any measures (e.g. decontamination). In the case of approximately 9% proactive measures should be triggered.

However it is important to mention, that the "assumption of comparable contamination levels" includes considerable uncertainties due to the fact that no data are available for important fishing areas – such as the ICES fishing areas VI (Rockall, North-West Coast of Scotland and North Ireland) and VII (Irish Sea to Southwest of Ireland – West) around the British Isles. Consequently no statement on the dioxin contamination level in these areas and the conflict potential and possible effects on the relevant fisheries industry is possible. If not stated otherwise, the following assessment includes the "assumption of comparable contamination levels".

An analysis of how the fishing industry of single Member States would be concerned is shown in Table 19 on the following page. The table shows that the conflict potential for Danish, Finnish and Swedish fisheries is the highest and considerable effects on turnover and jobs may be expected. It is noteworthy that the U.K., Ireland and the Netherlands also catch an important share of their industrial fish in the above mentioned fishing areas ICES VI and VII. The small amounts of medium and high conflict potential for the fisheries industry in these countries may thus be underestimated due to the lack of contamination data.

member state		Total	low CP	medium CP	high CP
AT	Catches	0	0	0	0
	Jobs	0	0	0	0
	Turnover	0	0	0	0
BE	Catches	0	0	0	0
	Jobs	0	0	0	0
	Turnover	0	0	0	0
DE	Catches	54	44	0	10
	Jobs	190	150	0	40
	Turnover	5	4	0	1
DK	Catches	1.342	977	156	210
	Jobs	1.390	1.010	160	220
	Turnover	97	71	11	15
ES	Catches	136	94	42	0
	Jobs	510	350	160	0
	Turnover	14	9	4	0
FI	Catches	101	0	0	101
	Jobs	360	0	0	360
	Turnover	7	0	0	7
FR	Catches	12	12	0	0
	Jobs	170	170	0	0
	Turnover	8	8	0	0
GR	Catches	37	16	20	0
	Jobs	230	100	130	0
	Turnover	3	1	1	0
IRE	Catches	149	149	0	0
	Jobs	320	320	0	0
	Turnover	10	10	0	0
IT	Catches	70	40	30	0
	Jobs	140	80	60	0
	Turnover	5	3	2	0
LUX	Catches	0	0	0	0
	Jobs	0	0	0	0
	Turnover	0	0	0	0
NL	Catches	202	202	0	0
	Jobs	100	100	0	0
	Turnover	14	14	0	0
PO	Catches	91	91	0	0
	Jobs	680	680	0	0
	Turnover	6	6	0	0
SV	Catches	311	40	1	270
	Jobs	420	50	0	370
	Turnover	23	3	0	20
UK	Catches	266	263	3	0
	Jobs	420	420	0	0
	Turnover	19	19	0	0
Whole EU	Catches	2.771	1.928	253	591
	Jobs	4.920	3.420	450	1.050
	Turnover	211	147	19	45

Table 19: Estimated social-economic conflict potential (CP) for the fisheries industry in the Member States

4.3 Conflict potential in EU member states

4.3.1 Austria

In Austria there is no fishing industry for industrial fish. No conflict potential exists.

4.3.2 Belgium

Industrial fish is of nearly no importance for Belgium.

4.3.3 Germany

In Germany Herring is by far the most important industrial fish. About 20% of the German catches of herring show a high conflict potential.

Fish species	Conflict potential	DE
Sandeel	no	0
Capelin	no	0
Blue whiting		3.171
	low	3.171
	medium	0
	high	0
Mackerel	no	0
Pout	no	0
Sprat		182
	low	0
	medium	0
	high	182
Herring		50.858
	low	40.743
	medium	0
	high	10.115
Sardine		144
	low	144
	medium	0
	high	0
Anchovy	no	0
Total		54.355
	low	44.058
	medium	0
	high	10.297

Table 20: Conflict potential in Germany

4.3.4 Denmark

Denmark is the most important producer of industrial fish. More than 200.000 t of catches show a high conflict potential. This means possibly significant consequences for the Danish fisheries industry.

Fish species	Conflict potential	DK
Sandeel		536.038
	low	524.803
	medium	0
	high	11.235
Capelin		28.112
	low	28.112
	medium	0
	high	0
Blue whiting		184.900
	low	178.801
	medium	0
	high	6.099
Mackerel		35.690
	low	35.605
	medium	0
	high	85
Pout		61.486
	low	60.995
	medium	0
	high	491
Sprat		284.017
	low	3.245
	medium	155.592
	high	125.180
Herring		194.056
	low	127.566
	medium	0
	high	66.490
Sardine		17.676
	low	17.676
	medium	0
	high	0
Anchovy	no	0
Total		1.341.975
	low	976.803
	medium	155.592
	high	209.580

Table 21: Conflict potential in Denmark

4.3.5 Spain

In Spain only Sardines show a significant amount of a medium conflict potential, high conflict potential does not exist at present.

Fish species	Conflict potential	ES
Sandeel		757
	low	390
	medium	367
	high	0
Capelin	no	0
Blue whiting		35.371
	low	30.926
	medium	4.445
	high	0
Mackerel	no	0
Pout	no	0
Sprat		6
	low	6
	medium	0
	high	0
Herring	no	0
Sardine		69.202
	low	31.594
	medium	37.608
	high	0
Anchovy		30.930
	low	30.930
	medium	0
	high	0
Total		136.266
	low	93.846
	medium	42.420
	high	0

Table 22: Conflict potential in Spain

4.3.6 Finland

In Finland the relevant catches of Sprat and Herring with more than 100.000 t show a high conflict potential. Therefore the Finnish fisheries industry may be affected significantly by the proposed limit values

Fish species	Conflict potential	FI
Sandeel	no	0
Capelin	no	0
Blue whiting	no	0
Mackerel	no	0
Pout	no	0
Sprat		18.886
	low	0
	medium	0
	high	18.886
Herring		82.237
	low	0
	medium	0
	high	82.237
Sardine	no	0
Anchovy	no	0
Total		101.123
	low	0
	medium	0
	high	101.123

Table 23: Conflict potential in Finland

4.3.7 France

The French catches are nearly not affected by conflict potentials.

Fish species	Conflict potential	FR
Sandeel	no	0
Capelin	no	0
Blue whiting		28
	low	0
	medium	28
	high	0
Mackerel	no	0
Pout	no	0
Sprat	no	0
Herring	no	0
Sardine	no	0
Anchovy		11.495
	low	11.495
	medium	0
	high	0
Total		11.523
	low	11.495
	medium	28
	high	0

Table 24: Conflict potential in France

4.3.8 Greece

Especially with the Sardine and its medium conflict potential more than 50% of Greek catches of industrial fish might suffer consequences from the proposed limit values.

Fish species	Conflict potential	GR
Sandeel	no	0
Capelin	no	0
Blue whiting		630
	low	0
	medium	630
	high	0
Mackerel		4.476
	low	0
	medium	4.476
	high	0
Pout	no	0
Sprat		110
	low	0
	medium	110
	high	0
Herring	no	0
Sardine		15.214
	low	0
	medium	15.214
	high	0
Anchovy		16.456
	low	16.456
	medium	0
	high	0
Total		36.886
	low	16.456
	medium	20.430
	high	0

Table 25: Conflict potential in Greece

4.3.9 Ireland

Present data available do not indicate a significant conflict potential for the Irish catches.

Fish species	Conflict potential	IRE
Sandeel		389
	low	389
	medium	0
	high	0
Capelin	no	0
Blue whiting		35.880
	low	35.880
	medium	0
	high	0
Mackerel		58.201
	low	58.201
	medium	0
	high	0
Pout	no	0
Sprat		5.826
	low	5.826
	medium	0
	high	0
Herring		45.436
	low	45.436
	medium	0
	high	0
Sardine		3.195
	low	3.195
	medium	0
	high	0
Anchovy	no	0
Total		148.927
	low	148.927
	medium	0
	high	0

Table 26: Conflict potential in Ireland

4.3.10 Italy

Italy shows a similar situation like Greece. Nearly half of the Italian catches show a medium conflict potential due to risks for Sardines.

Fish species	Conflict potential	IT
Sandeel	no	0
Capelin	no	0
Blue whiting		1.451
	low	0
	medium	1.451
	high	0
Mackerel	no	0
Pout	no	0
Sprat	no	0
Herring	no	0
Sardine		28.876
	low	0
	medium	28.876
	high	0
Anchovy		39.783
	low	39.783
	medium	0
	high	0
Total		70.110
	low	39.783
	medium	30.327
	high	0

Table 27: Conflict potential in Italy

4.3.11 Luxembourg

In Luxembourg there is no fishing industry for industrial fish. No conflict potential exists.

4.3.12 Netherlands

The catches of the Netherlands are nearly not affected with conflict potential.

Fish species	Conflict potential	NL
Sandeel	no	0
Capelin	no	0
Blue whiting		32.889
	low	32.889
	medium	0
	high	0
Mackerel		84.891
	low	84.891
	medium	0
	high	0
Pout		1
	low	1
	medium	0
	high	0
Sprat		264
	low	1
	medium	263
	high	0
Herring		78.741
	low	78.741
	medium	0
	high	0
Sardine		5698
	low	5698
	medium	0
	high	0
Anchovy		3
	low	3
	medium	0
	high	0
Total		202.487
	low	202.224
	medium	263
	high	0

Table 28: Conflict potential in the Netherlands

4.3.13 Portugal

For the industrial fish from Portugal no conflict potential exists at present.

Fish species	Conflict potential	PO
Sandeel		13
	low	13
	medium	0
	high	0
Capelin	no	0
Blue whiting		2.676
	low	2.676
	medium	0
	high	0
Mackerel		14.524
	low	14.524
	medium	0
	high	0
Pout	no	0
Sprat	no	0
Herring		1
	low	1
	medium	0
	high	0
Sardine		71.955
	low	71.955
	medium	0
	high	0
Anchovy		1.409
	low	1.409
	medium	0
	high	0
Total		90.578
	low	90.578
	medium	0
	high	0

Table 29: Conflict potential in Portugal

4.3.14 Sweden

Nearly 90% of the Swedish industrial fish is affected with a high conflict potential. Significant consequences can be expected for Swedish fishing industry.

Fish species	Conflict potential	SV
Sandeel		23.225
	low	22.415
	medium	0
	high	810
Capelin	no	0
Blue whiting		15.511
	low	103
	medium	0
	high	15.408
Mackerel		2.004
	low	102
	medium	0
	high	1.902
Pout	no	0
Sprat		112.453
	low	0
	medium	980
	high	111.473
Herring		157.540
	low	17.214
	medium	0
	high	140.326
Sardine	no	0
Anchovy	no	0
Total		310.733
	low	39.834
	medium	980
	high	269.919

Table 30: Conflict potential in Sweden

4.3.15 United Kingdom

Following existing data there is no significant conflict potential for British industrial fisheries industry.

Fish species	Conflict potential	UK
Sandeel		14.143
	low	14.143
	medium	0
	high	0
Capelin		79
	low	79
	medium	0
	high	0
Blue whiting		106.492
	low	106.492
	medium	0
	high	0
Mackerel		21.034
	low	21.034
	medium	0
	high	0
Pout		2
	low	2
	medium	0
	high	0
Sprat		15.168
	low	12.175
	medium	2.993
	high	0
Herring		104.753
	low	104.753
	medium	0
	high	0
Sardine		4.815
	low	4.815
	medium	0
	high	0
Anchovy		3
	low	3
	medium	0
	high	0
Total		266.489
	low	263.496
	medium	2.993
	high	0

Table 31: Conflict potential in the UK

5 Fishes and fishing areas concerned

5.1 Overview for industrial fishes

As demonstrated in the following, the fish species mainly concerned are Herring and Sprat and to a lesser degree Blue whiting and Sandeel. The origin of the fish concerned from important EU fishing areas are the Baltic Sea (ICES fishing area III), the North Sea (ICES fishing area IV) and the Mediterranean Sea (fishing area M.S.).Fishes concerned

The concernment of relevant industrial fishes is demonstrated in the next table:

Fish species	Catches	CP	CP(%)
Sandeel	574.565	low	98
		medium	0
		high	2
Capelin	28.191	low	100
		medium	0
		high	0
Blue whiting	418.999	low	93
		medium	2
		high	5
Mackerel	220.820	low	97
		medium	2
		high	1
Pout	61.489	low	88
		medium	0
		high	12
Sprat	436.914	low	5
		medium	37
		high	58
Herring	713.623	low	58
		medium	0
		high	42
Sardine	216.775	low	62
		medium	38
		high	0
Anchovy	100.079	low	100
		medium	0
		high	0
Total	2.771.455	low	60
		medium	9
		high	31

Table 32: Concernment of relevant industrial fish species

Herring and Sprat are the most concerned species. These two species provide approximately 550.000 t with high conflict potential representing nearly 20% of the total catch of industrial fish. Furthermore Blue whiting (approx. 21.000 t with high CP) and Sandeel (approx. 12.000 t with high CP) are considerably concerned. The amounts of catches of Capelin, Mackerel, Pout, Sardine and Anchovy which may be concerned are of minor importance. However it has to be noted that an important share of the Sardine catch (approx. 81.000 t) shows medium conflict potential.

5.1.1 Herring

The conflict potential for Herring ranges from low to high (contamination 0,61 to 10,56 ng/kg whole weight). Data on Herring with low conflict potential are reported in studies with fish originating from the North Sea, the Atlantic and and the Norwegian Sea. According to available data the origin of Herring with high conflict potential is generally the Baltic Sea. In other studies with high contamination levels the origin of the Herring samples is not specified.

Table 33 shows that about 42% of the Herring catches or 11% of the total catches of industrial fish are concerned with a high conflict potential.

Herring	fishing area	total	low CP	medium CP	high CP
	EU waters	713623	414.455	0	299.168
	ICES III	299168	0	0	299168
	ICES IV	148257	148257	0	0
	M.S.	0	0	0	0

Table 33: Catches and conflict potential for Herring in EU waters and in fishing areas concerned

5.1.2 Sprat

Available information on Sprat is mainly selective. The conflict potential for Sprat ranges from low to high (contamination 0,90 to 3,7 ng/kg whole weight). Data on Sprat with low and medium conflict potential are reported in studies with fish originating from the North Sea. High conflict potential is reported from the Baltic Sea.

Table 34 shows that about 58% of the Sprat catches or 9% of the total catches of industrial fish are concerned with a high conflict potential and 37% or 6% respectively with a medium conflict potential.

Sprat	fishing area	total	low CP	medium CP	high CP
	EU waters	436914	21253	159940	255.721
	ICES III	255721	0	0	255.721
	ICES IV	159830	0	159830	0
	M.S.	110	0	110	0

Table 34: Catches and conflict potential for Sprat in EU waters and in fishing areas concerned

5.1.3 Blue whiting

Available information on Blue whiting is very scarce. The conflict potential for Blue whiting from the North Sea is low (contamination 0,24 ng/kg whole weight). Following the assumption of comparative contamination levels (see above, chapter 4.2) Blue whiting may show high conflict potential in the Baltic Sea and medium conflict potential in the Mediterranean Sea.

According to this Table 35 demonstrates that about 5% of the Blue whiting catches or 0,8% of the total catches of industrial fish are concerned with a high conflict potential and 2% or 0,2% respectively with a medium conflict potential.

Blue whiting	fishing area	total	low CP	medium CP	high CP
	EU waters	418999	390938	6554	21.507
	ICES III	21507	0	0	21.507
	ICES IV	56037	56037	0	0
	M.S.	6554	0	6554	0

Table 35: Catches and conflict potential for Blue whiting in EU waters and in fishing areas concerned

5.1.4 Sandeel

There are only little data available on Sandeel. These data show low conflict potential for Sandeel from the North Sea (contamination ranging from 0,19 to 0,48 ng/kg whole weight). However, presuming the assumption of comparative contamination levels Sandeel may show high conflict potential in the Baltic Sea and medium conflict potential in the Mediterranean Sea.

According to this Table 36 shows that about 2% of the Sandeel catches or 0,4% of the total catches of industrial fish are concerned with a high conflict potential. Furthermore the small amount of Sandeel which is caught in the Mediterranean Sea (367 t) shows medium conflict potential.

Sandeel	fishing area	total	low CP	medium CP	high CP
	EU waters	574565	562153	367	12045
	ICES III	12045	0	0	12045
	ICES IV	558177	558177	0	0
	M.S.	367	0	367	0

Table 36: Catches and conflict potential for Sandeel in EU waters and in fishing areas concerned

5.1.5 Capelin

There are no specific data available on Capelin. Following the assumption of comparative contamination levels Capelin may show high conflict potential in the Baltic Sea and medium conflict potential in the Mediterranean Sea.

Capelin is generally a less important industrial fish species. The total catch in European fishing areas amounts 28.191 tons or 1,0% of the total catch of industrial fish. However Capelin is not caught in

European waters of concern. Consequently it can be assumed that no conflict potential has to be expected for this species.

5.1.6 Mackerel

Available data on Mackerel show low to medium conflict potential (contamination in EU waters ranging from 0,29 [Biscaya] to 1,07 [Mediterranean Sea] ng/kg whole weight). There are no data on Mackerel from the North Sea or the Baltic Sea. However a recent selective study indicates a high conflict potential for Mackerel from Belgian retail (contamination value approx. 6 ng/kg whole weight) [Focant 2000]. In addition to a medium conflict potential in the Mediterranean Sea Mackerel may show high conflict potential in the Baltic Sea according to the assumption of comparative contamination levels.

Table 37 shows that about 1% of the Mackerel catches or 0,1% of the total catches of industrial fish are concerned with a high conflict potential and 2% or 0,2% respectively with a medium conflict potential.

Mackerel	fishing area	total	low CP	medium CP	high CP
	EU waters	220820	214357	4476	1987
	ICES III	1987	0	0	1987
	ICES IV	16919	0	0	0
	M.S.	4476	0	4476	0

Table 37: Catches and conflict potential for Mackerel in EU waters and in fishing areas concerned

5.1.7 Pout

There are no specific data available on Pout. Presuming the assumption of comparative contamination levels Pout may show high conflict potential in the Baltic Sea and medium conflict potential in the Mediterranean Sea.

Table 38 shows that the Baltic Sea catches which amount about 12% of the Pout catches or 0,3% of the total catches of industrial fish may be concerned with a high conflict potential.

Pout	fishing area	total	low CP	medium CP	high CP
	EU waters	61489	47666	0	7685
	ICES III	7685	0	0	7685
	ICES IV	47666	47666	0	0
	M.S.	0	0	0	0

Table 38: Catches and conflict potential for Pout in EU waters and in fishing areas concerned

It is noteworthy, that the major share (7194 tons) of the Pout catches in the Baltic Sea are made in the Skagerrak and Kattegat fishing area (ICES III A). For this area only little specific dioxin contamination data are available. These representative data indicate low conflict potential for Plaice muscle (0,36 ng/kg whole weight) and Herring muscle (0,73 ng/kg whole weight) and high conflict potential for Herring muscle (1,85 ng/kg whole weight). The conflict potential for Pout may thus be overestimated.

5.1.8 Sardine

There is only very little specific information on Sardine dioxin contamination. A representative study on Sardine from the Biscay (ICES VIII) shows a mean contamination of 0,43 ng/kg whole weight and consequently a low conflict potential. Following the assumption of comparative contamination levels Sardines may show high conflict potential in the Baltic Sea and medium conflict potential in the Mediterranean Sea.

Table 39 shows that an important share of the Sardine catches (38%) and of the total catches of industrial fish (2,9%) is caught in the Mediterranean Sea and may consequently be concerned with a medium conflict potential. The Sardine catches in the Baltic Sea (35 tons) with high conflict potential are of minor importance.

Sardine	fishing area	total	low CP	medium CP	high CP
	EU waters	216775	135402	81698	35
	ICES III	35	0	0	35
	ICES IV	14619	14619		0
	M.S.	81698	0	81698	0

Table 39: Catches and conflict potential for Sardine in EU waters and in fishing areas concerned

5.1.9 Anchovy

Specific data from representative studies on Anchovy from the Mediterranean Sea report mean dioxin contamination levels between 0,32 and 0,47 ng/kg whole weight and consequently a low conflict potential. Following the assumption of comparative contamination levels Anchovys could show elevated conflict potential in the Baltic Sea.

Table 40 shows that the major share of the Anchovy catches are made in the Mediterranean Sea. According to the representative and specific studies for this region the conflict potential is low. The other EU catches of Anchovy are made in not concerned EU waters.

Anchovy	fishing area	total	low CP	medium CP	high CP
	EU waters	100079	100079	0	0
	ICES III	0	0	0	0
	ICES IV	3	3	0	0
	M.S.	78204	78204	0	0

Table 40: Catches and conflict potential for Anchovy in EU waters and in fishing areas concerned

5.2 Fishing areas concerned

The origin of the fish concerned from important EU fishery areas are the Baltic Sea, the North Sea and the Mediterranean Sea. However it is important to repeat that no data are available on the ICES fishing areas around the British Isles. Consequently no statement on the dioxin contamination level in these areas and the conflict potential and possible effects on the relevant fisheries industry can be made.

The evaluation of available data on the dioxin contamination of fish (including industrial fish, other fish and seafood) allows to contribute certain conflict potentials to fishing areas. The contribution of the conflict potential has been made according to the concernment w.r.t. to the setting of the proposed limit values. That means the conflict potential low/medium/high is attributed to fishing areas with fish stocks exhibiting contamination values below the action value, between action and limit value and above the maximum level respectively. As regards conflict potential resulting from present dioxin contamination the EU waters concerned are the Baltic Sea, the North Sea and the Mediterranean Sea:

Baltic Sea (ICES Fishing Area III)

- CP for fish from low (e.g. Blue Whiting) to high (e.g. Sprat, Herring)
- CP for fish meal or fish oil generally high (e.g. Blue Whiting, Sprat)
- large EU catches (598 thousand tonnes per year)

North Sea (ICES Fishing Area IV)

- CP for fish generally low (e.g. Sand eel, Blue Whiting, Sprat)
- CP for fish meal low (e.g. Sand eel), medium (e.g. Sprat) to high (e.g. Blue whiting), for fish oil medium to high (e.g. Sand eel, Blue Whiting, Herring, Sprat ...)
- large EU catches (1.001 thousand tonnes per year)

Mediterranean Sea

- CP for fish generally low (e.g. Anchovy) to medium (e.g. Mackerel)
- no data on CPs for fish meal or fish oil
- sizeable EU catches (171 thousand tonnes per year)

The following table shows the importance of those fish in EU waters. It is obvious that almost the total Baltic Sea catch is concerned.

	Baltic Sea	North Sea	Mediterranean Sea
Total	598	1.001	171
low conflict potential	7	841	78
medium conflict potential	0	160	93
high conflict potential	591	0	0

Table 41: Catches [1000 t] and conflict potential in the Baltic Sea, North Sea and Mediterranean Sea

The picture on the following page illustrates the fishing areas and amounts of catches concerned:

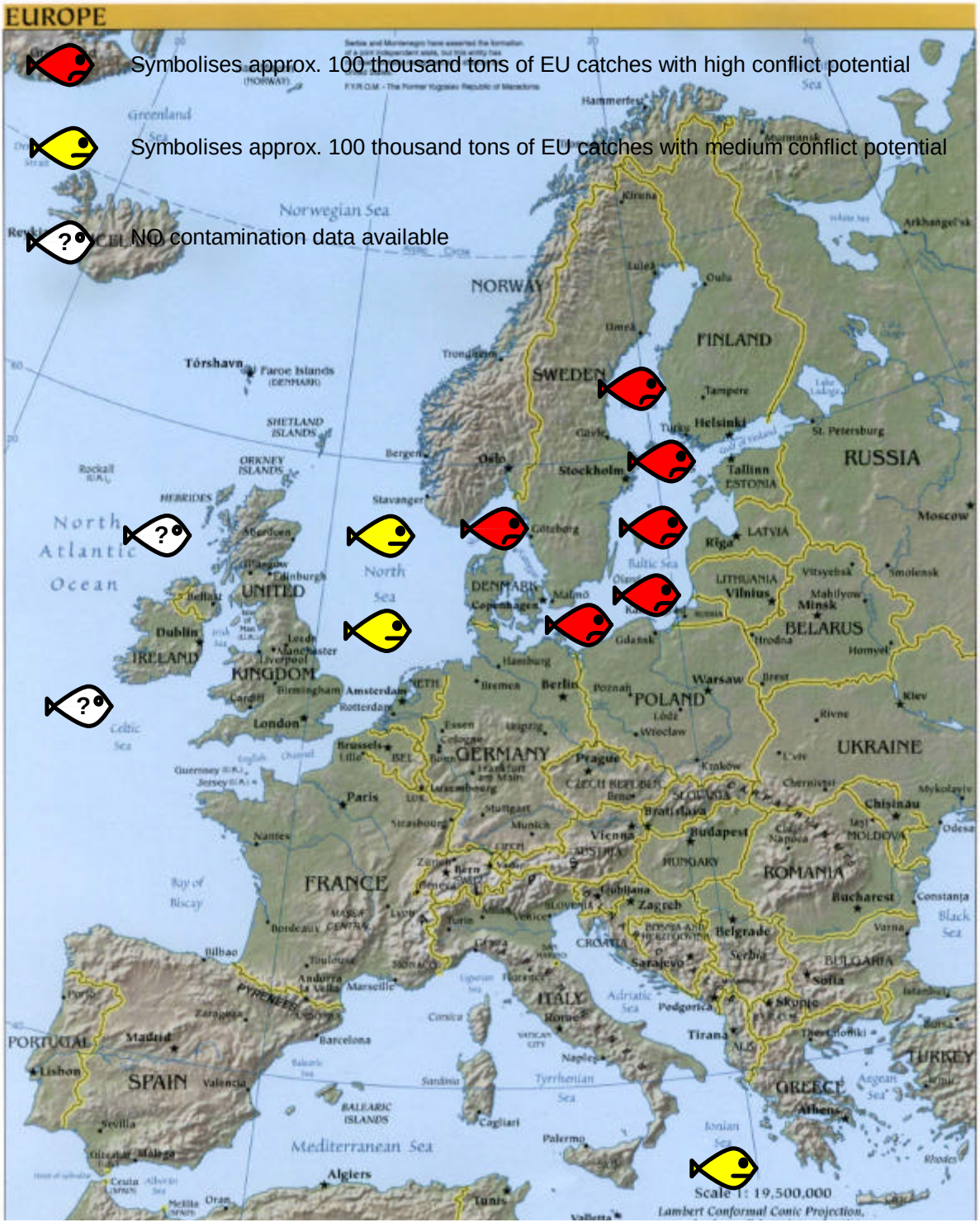

Figure 1: Areas and amounts concerned

6 Fish products and by-products

Up to now the conflict potential has only been assessed for "industrial fish". However, also fish oil, fish meal and the fish processing industry have to be considered. In the EU roughly 1.100 jobs depend on the production of fish oil and fish meal, 45% thereof in Denmark.

Few dioxin analyses have been carried out in fish meal and fish oil. The SCAN report gives an overview of dioxin concentrations found in fish meal and fish oil samples [SCAN 2000, pp. 44]. There is a clear difference in contamination levels between fish meal and fish originating from the (South) Pacific (Chile and Peru) and those originating from European waters (being about 8 fold higher). Within Europe no clear difference could be found. The available database may be too small to see such differences. The following ranges and means expressed as dioxin in ng WHO-TEQ/kg dry matter have been retained for fish meal (including only PCDDs/PCDFs) [SCAN 2000]:

Fish meal	Low	0.02 ng WHO-TEQ/kg dry matter
	Mean	0.14 ng WHO-TEQ/kg dry matter
	High	0.25 ng WHO-TEQ/kg dry matter

Table 42: Fish meal originating from the South Pacific area (Chile, Peru) [SCAN 2000]

Fish meal	Low	0.04 ng WHO-TEQ/kg dry matter
	Mean	1.2 ng WHO-TEQ/kg dry matter
	High	5.6 ng WHO-TEQ/kg dry matter

Table 43: Fish meal originating from the European area [SCAN 2000]

The picture for fish oil is similar to that of fish meal: higher contamination levels in European fish oil compared to fish oil of South Pacific (Chile, Peru) origin. The following ranges for dioxin have been retained (expressed in ng WHO-TEQ/kg fat):

Fish oil	Low	0.16 ng WHO-TEQ/kg fat
	Mean	0.61 ng WHO-TEQ/kg fat
	High	2.6 ng WHO-TEQ/kg fat

Table 44: Fish oil originating from the Pacific area [SCAN 2000]

Fish oil	Low	0.7 ng WHO-TEQ/kg fat
	Mean	4.8 ng WHO-TEQ/kg fat
	High	20 ng WHO-TEQ/kg fat

Table 45: Fish oil originating from the European area [SCAN 2000]

If the fish used for industrial purposes shows a certain conflict potential and there are no possibilities for imports, generally a different conflict potential exists for the following products. The following data illustrate how the conflict potential may change during processing:

Fish species		Dioxin contamination [ng TEQ/g whole weight]		
		Raw material (%fat)	Fish meal	Fish oil
Sprat	TEQ	0,90 (12,3)	0,58	7,19
(North Sea)	CP	low	low	high
Herring	TEQ	0,43 (12,0%)	0,33	4,07
(Atlantic)	CP	low	low	low
Blue whiting	TEQ	0,24 (3,5%)	n.d.	6,73
(North Sea)	CP	low	?	high
Sandeel	TEQ	0,19 (3,0%)	n.d.	9,96
(North Sea)	CP	low	?	high

Table 46: TEQ variation during the production of fish oil and fish meal

For example, fish such as sand eels from the North Sea with a contamination level of 0,19 ng TEQ/g whole weight and a low conflict potential lead to a contamination level of fish oil of 9,96 ng TEQ/g with a high conflict potential. The processed fish oil would not be accepted for feedingstuffs.

Based on the few data available, it can be assumed that dioxin contamination in relation to fat remains more or less constant during processing. Consequently the processing of less fatty fish (below 10%) e.g. Blue Whiting, Sand eel, Sardine or Anchovy) generally leads to increasing contamination values as we go from fish → fish meal → fish oil. On the other hand the processing of more fatty fish (more than 10% fat) generally leads to a slight decrease with respect to fish meal (approx. 10 % fat) and increased contamination in fish oil.

It has to be noted that the fat content of industrial fish varies to a large degree (e.g. Anchovy 2 to 3%, Herring 10 to 20%). Large amounts of EU industrial fish are more fatty such as Herring, Sprat or Mackerel (together approx. 1.370 thousand tons), the conflict potential in the field of fish meal will be less than in the case of the raw material. On the other hand less fatty fish such as Sand eel, Blue Whiting, Sardine and Anchovy is caught in comparable amounts (together approx. 1.380 thousand tons). It can be assumed that the conflict potential for fish meal from less fatty fish may increase with the consequence that the fish meal will not be usable for the production of feedingstuff.

With respect to fish oil the conflict potential and consequently the concern of the fisheries industry can be assumed to be even greater (due to a stronger concentration effect).

However a precise assessment of the degree of concern for the processing industry in the field of fish meal and fish oil is difficult due to considerable uncertainties.

Following a rough estimation and assuming no increased imports the 1.100 jobs in the production of fish meal and fish oil can be characterised as follows:

	Total	low CP	medium CP	high CP
Jobs	1.100	780	100	220

Table 47: Estimated effects on the jobs in the production of fish meal and fish oil

A loss of demand for raw material in the fish processing industry exerts a negative feedback on the fishing industry which may finally lead to job losses and turnover reduction.

Reduced production of fish meal and fish oil will have significant impact on the aquaculture industry because it may be difficult to satisfy the demand for fish feed materials.

7 Options

7.1 Decontamination technologies

An option to comply with the proposed limit values would be the application of decontamination technologies in the production of fish meal and fish oil. The fisheries industry has already started efforts to remove dioxin contamination from their products.

According to fisheries industry statements fish oil for human consumption is usually decontaminated and the fish meal and fish oil producing industry will also be able to clean fish oil for the production of feed materials. Consequently technical solutions for the decontamination of fish oil, e.g. by the application of active carbon are available and they seem to be economically viable.

The situation in the case of fish meal is different. According to industry statements there is no economically viable solution for the decontamination or purification of fish meal.

Consequently the option of decontamination technologies can be applied only on the conflict potential resulting from fish oil production which means it cannot improve the situation for the fishermen.

7.2 Mixture of raw material

Another option to comply with the proposed limit values would be the mixture of raw material for the production of fish meal and fish oil.

Article 7 of Council Directive 1999/29/EC of 22 April 1999 on the undesirable substances and products in animal nutrition lays down:

"Member States shall prescribe that a consignment of a feed material ... ...with a content of an undesirable substance or product higher than the maximum level ... ... must not be mixed with other consignments of feed materials or with consignments of feedingstuffs."

As shown above the contamination levels of raw material used for the production of fish meal or fish oil are often below the proposed maximum levels whereas the finished products may be contaminated above the corresponding maximum level. This opens the possibility to mix contaminated raw material consignments – with contamination levels below the maximum limit – with very low contaminated raw material (e.g. from low contaminated EU fishing areas or imported from other fishing areas such as the South Pacific) to be able to produce fish meal and fish oil below limit values.

Generally it would be possible to substitute contaminated raw material from EU waters with low contaminated imported raw material.

This option is only valuable to protect jobs and turnover in the fish processing industry.

Proposal of fat-based limit values for feed materials

Because of great differences in the fat content of fish, levels on a whole weight basis are often preferred for the specification of dioxin levels in fish. This differs from the practice in most other materials where the dioxin content is indicated on a fat basis.

In the case of fish for consumption it is reasonable to specify the dioxin content on a whole weight basis because it enables to assess the intake of dioxins only knowing the amount of fish consumed.

In contrary to consumer fish, industrial fish for the production of feed materials is usually processed into fish meal and fish oil. As explained above the dioxin content on a fat basis remains more or less constant during production of fish meal and fish oil. Therefore, in the case of industrial fish for feed material, it seems to be reasonable to specify the dioxin content on a fat basis. As a consequence the conflict potential of the resultant products would then be consistent with the conflict potential of the raw material.

This option might cause a readjustment of appropriate limit values as well as the conflict potential in the fishing industry.

7.3 Improvement of risk assessment

Important institutions have completed risk assessments of the adverse environmental and health effects of dioxins. These questions of consumer protection and environmental concern have inter alia been assessed by the WHO, the JECFA or the European Commission [see WHO 2000, JECFA 2001, SCF 2000 and SCF 2001]. At the present state of data availability a fully reliable risk assessment cannot be realised and is an ongoing process. However recommendations for tolerable daily intake rates are given (ranging from 1 to 4 pg WHO TEQ/kg body weight and day[1]).

The proposed limit values should assure that the daily intake of European citizens shall be at or below the recommended intake rates. However an option would be to support the ongoing risk assessment process and to establish limit values not now on a provisional basis but at a later stage on an improved data basis. Note that the Commission proposes to review the limit values (see above), which will enable re-assessment of the limit values on the current state of knowledge.

Note that the proposed limits are restricted to dioxins, but dioxin-like PCBs contribute the major share of total toxicity (WHO TEQ) of fish and fish products: compared to dioxin-related toxicity the limited data available indicate approx. a five fold toxicity due to dioxin-like PCBs. Data on dioxin-like PCBs are very limited but essential for a conclusive risk assessment.

[1] - WHO: 1-4 pg WHO TEQ/kg bw/day
- SCF: 14 pg WHO TEQ/kg bw/week (corresponding to 2 pg WHO TEQ /kg body weight and day)
- JECFA: 70 pg WHO TEQ/kg bw/week (corresponding to 2,3 pg WHO TEQ /kg body weight and day)

7.4 Improvement of the present data base

There is a clear lack of data in the sector of fish related to feed materials. Most of the study results available provide only poor information on important study features, sampling or geographical distribution. Moreover they refer mainly or only to dioxins whereas data on PCBs are also needed. The knowledge should be improved by monitoring of dioxin and PCB levels with consistent and standardised measuring programs.

With a special focus on industrial fish it is noteworthy that little data has been published about the contamination of industrial fish and the corresponding fish meal and fish oil. For this study unpublished industry data could be evaluated. Certainly more studies have been carried out within the fisheries industry and it would be reasonable to use these already existing resources for the improvement of current knowledge.

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8 Annex

WHO Toxic Equivalency Factors (WHO-TEFs) for mammals, fish and birds for PCDD/Fs and dioxin-like PCBs [van den Berg 1998]

Congener	Humans/Mammals	Birds	Fish
2,3,7,8-TCDD	1	1	1
1,2,3,7,8-PeCDD	1	1	1
1,2,3,4,7,8-HxCDD	0.1	0.05	0.5
1,2,3,6,7,8-HxCDD	0.1	0.01	0.01
1,2,3,7,8,9-HxCDD	0.1	0.1	0.01
1,2,3,4,6,7,8-HpCDD	0.01	<0.001	0.001
OCDD	0.0001	0.0001	<0.0001
2,3,7,8-TCDF	0.1	1	0.05
1,2,3,7,8-PeCDF	0.05	0.1	0.05
2,3,4,7,8-PeCDF	0.5	1	0.5
1,2,3,4,7,8-HxCDF	0.1	0.1	0.1
1,2,3,6,7,8-HxCDF	0.1	0.1	0.1
1,2,3,7,8,9-HxCDF	0.1	0.1	0.1
2,3,4,6,7,8-HxCDF	0.1	0.1	0.1
1,2,3,4,6,7,8-HpCDF	0.01	0.01	0.01
1,2,3,4,7,8,9-HpCDF	0.01	0.01	0.01
OCDF	0.0001	0.0001	<0.0001
3,4,4’,5-TCB (81)	0.0001	0.1	0.0005
3,3’,4,4’-TCB(77)	0.0001	0.05	0.0001
3,3’,4,4’,5-PeCB (126)	0.1	0.1	0.005
3,3’,4,4’,5,5’-HxCB (169)	0.01	0.001	0.00005
2,3,3’,4,4’-PeCB (105)	0.0001	0.0001	<0.000005
2,3,4,4’,5-PeCB (114)	0.0005	0.0001	<0.000005
2,3’,4,4’,5-PeCB (118)	0.0001	0.00001	<0.000005
2’,3,4,4’,5-PeCB (123)	0.0001	0.00001	<0.000005
2,3,3’,4,4’,5-HxCB (156)	0.0005	0.0001	<0.000005
2,3,3’,4,4’,5’-HxCB (157)	0.0005	0.0001	<0.000005
2,3’,4,4’,5,5’-HxCB (167)	0.00001	0.00001	<0.000005
2,3,3’,4,4’,5,5’-HpCB (189)	0.0001	0.00001	<0.000005