1.4.7 European eel

State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Comment
SSB indicators are well below any conceivable reference point	Not established	Not available	The eel stock is almost certainly below what would be considered as safe biological limits and the current fishery is unsustainable.

All available information indicates that the current fishery is not sustainable although neither a stock-wide assessment is available, nor reference points for the state of the stock are defined. Recruitment has been declining since 1980, which is more than one eel generation time ago. Recruitment reached a historical minimum in 2001 of 1–2% of the pre-1980 level, and has not improved since then. Eels are exploited in all life stages present in continental waters. Fishing mortality is high both on juvenile (glass eel) and older eel (yellow and silver eel) in many water systems. Total yield has declined to about half that of the mid-1960s. Other anthropogenic factors (habitat loss, contamination, and transfer of diseases) have had negative effects on the stock. All information indicates that the stock is at a historical minimum and continues to decline.

Management objectives

ICES has repeatedly recommended that a recovery plan be developed for the whole stock on an urgent basis, and that exploitation and other anthropogenic impacts be reduced to as close to zero as possible until such a plan is agreed upon and implemented. The EU Commission presented an Action Plan for management of the European eel in 2003 (COM 2003, 573), based on previous ICES advice, aiming at recovery of the stock. Management measures in this plan include restrictions on fisheries, habitat restoration, and restoration of (upstream and downstream) migration routes. Work is still ongoing to develop this plan.

ICES has been requested to advise on the management of the available resource of glass eels arriving in European river systems, for the purpose of best assuring a recovery of the stock of European Eel. See answer to special request in Section 1.3.3.1 in the present report.

Reference points

Considering the many uncertainties in eel management and biology and the uniqueness of the eel stock (one single stock, spawning only once in their lifetime), a precautionary reference point for eel must be stricter than universal provisional reference targets. Exploitation, which leaves 30% of the virgin (F=0) spawning stock biomass is generally considered to be such a reasonable provisional reference target. However, for eel a preliminary value could be 50%, implying a lower exploitation than conventionally accepted.

An appropriate provisional rebuilding target would be the pre-1980s average SSB level which generated normal recruitment in the past.

Single-stock exploitation boundaries

Exploitation boundaries in relation to precautionary considerations

Actions that would lead to a recovery of the stock are urgently required. Management of eel fisheries requires coordinated action at the scale of catchment areas and at larger scales, commonly spanning multiple jurisdictions. Uncoordinated management actions in isolated areas are not likely to lead to a recovery of the stock. Because of the length of the life cycle, it will take 5–20 years before positive effects can be expected.

ICES repeats its recommendation that a recovery plan for the whole stock be developed urgently, and that exploitation and other anthropogenic impacts be reduced to as close to zero as possible, until such a plan is agreed upon and implemented.

Management considerations

Ecosystem considerations

Movement and stocking of eel may involve a risk of decreased genetic variability and may disrupt the migration behaviour. Spreading of diseases and parasites is also a risk when introducing individuals into new areas. Productivity and survival are sensitive to changes in habitats. The effects of the declined stock of eels in the ecosystems where they appear are largely unknown.

Factors affecting the fisheries and the stock

Seasonality of the fisheries

Glass eel fisheries all around Europe show a temporal distribution from October till May. In general, the yellow eel fisheries start in April with an increase in catches to a maximum in June and July and thereafter a decrease in catches until October when most fisheries end the season. The fishing pattern for the silver eel fishery is for the most part the same as for the yellow eel fishery, with the maximum catches being taken a bit later; i.e. in August, September, and October.

Regulations and their effects

Season closures have been applied locally in several areas. The effects of such closures to restrict fishing have not been evaluated. Season closure has been advised as a management measure to restrict the impact of fishing. In some countries there are license systems that control the glass eel fisheries.

The environment

The eel stock is scattered over a multitude of inland waters with divergent characteristics; anthropogenic impacts, such as barriers in migration ways, pollution, habitat loss, etc. presumably affect the eel stock to a degree comparable to the effects of fishing exploitation.

Scientific basis

Data and methods

Current monitoring is based on national programmes. Several of the long-lasting time-series may be stopped in the near future, because of the decreased turnover of the local eel fisheries and the impossibility of addressing the stock decline at the local level. However, in light of the poor state of the stock and the high anthropogenic impacts, it is of utmost importance that existing time-series of monitoring recruitment, effort, and yield continue and are preferably supplemented.

For some years there are major inconsistencies between the official statistics on eel landings and ICES estimates. ICES finds that a major revision of the databases is required and has started this work. This report therefore does not include an updated catch table, the existing data are available in the 2002 ACFM report (*ICES Cooperative Research Report* No. 255). For information, the graph below summarizes the data (up to 2002) which is currently available.

Source of information

Report from the ICES/EIFAC Working Group on Eels, ICES CM 2005/I:01, Ref. G, ACFM.
Report of the ICES Advisory Committee on Fishery Management, 2002. *ICES Cooperative Research Report* No. 255.

Table 1.4.7.1 Recruitment data series. Recruitment data series are listed, in the units in which they were reported. Part 1. Scandinavia and British Isles.

	N	S	S	S	S	DK	D	N.IRL.	IRL	IRL	UK
	IMSA	GÖTA ÄLV	VISKAN	MOTALA	DALÄLVEN	VIDAA	EMS	BANN	ERNE	SHANNON	SEVERN
1950		2947		305			875				
1951		1744		2713	210		719				
1952		3662		1544	324		1516				
1953		5071		2698	242		3275				
1954		1031		1030	509		5369				
1955		2732		1871	550		4795		167.00		
1956		1622		429	215		4194				
1957		1915		826	162		1829				
1958		1675		172	337		2263				
1959		1745		1837	613		4654		244.00		
1960		1605		799	289		6215	7409	1229		
1961		269		706	303		2995	4939	625		
1962		873		870	289		4430	6740	2469		
1963		1469		581	445		5746	9077	426		
1964		622		181.6	158		5054	3137	208		
1965		746		500	276		1363	3801	932		
1966		1232		1423	158		1840	6183	1394		
1967		493		283	332		1071	1899	345		
1968		849		184	266		2760	2525	1512		
1969		1595		135	34		1687	422	600		
1970		1046		2	150		683	3992	60		
1971		842	12	1	242	787	1684	4157	540		
1972		810	88	51	88	780	3894	2905			
1973		1179	177	46	160	641	289	2524			
1974		631	13	58.5	50	464	4129	5859	794		
1975	42945	1230	99	224	149	888	1031	4637	392		
1976	48615	798	500	24	44	828	4205	2920	394		
1977	28518	256	850	353	176	91	2172	6443	131	1.02	
1978	12181	873	533	266	34	335	2024	5034	320	1.37	
1979	2457	190	505	112	34	220	2774	2089	488	6.69	40.1
1980	34776	906	72	7	71	220	3195	2486	1352	4.50	32.8
1981	15477	40	513	31	7	226	962	3023	2346	2.15	32.0
1982	45750	882	380	22	1	490	674	3854	4385	3.16	30.4
1983	14500	113	308	12	56	662	92	242	728	0.60	6.2
1984	6640	325	21	48	34	123	352	1534	1121	0.50	29.0
1985	3412	77	200	15.2	70	13	260	557	394	1.09	18.6
1986	5145	143	151	26	28	123	89	1848	684	0.95	15.5
1987	3434	168	146	201	74	341	8	1683	2322	1.61	17.7
1988	17500	475	92	170	69	141	67	2647	3033	0.15	23.1
1989	10000	598	32	35.2		9	13	1568	1718	0.03	13.5
1990	32500	149	42	21		5	99	2293	2152	0.47	16.0
1991	6250	264	1	2			52	677	482	0.09	7.8
1992	4450	404	70	108	10		6	978	1371	0.03	17.7
1993	8625	64	43	89	7		20	1525	1785	0.02	20.9
1994	525	377	76	650	72		52	1249	4400	0.29	22.3
1995	1950		6	32	8		40	1403	2400	0.40	36.0
1996	1000	277	1	14	18		20	2667	1000	0.33	25.7
1997	5500	180	8	8	8		5	2533	1038	2.12	16.9
1998	1750		5	6	15		4	1283	782	0.28	20.0
1999	3750		2	85	16		3	1345	1100	0.02	18.0
2000	1625		14	270	12		4	563	900	0.04	7.6
2001	1875		2	178	8		1	250	699	0.003	5.4
2002		685	26.2	338.8	58.6		-	1000	112	0.16	5.1
2003		261	44.13	19	126.7		-	1010	580	0.378	19
2004		125	5.0	42	26.4		-	308	269	0.057	10

Table 1.4.7.2 Recruitment data series; continued. Part 2: Mainland Europe.

	NL	B	F	F	F	F	F	E	P/E	IT
	DENOEVER	IJZER	VILAINE	LOIRE	GIRONDE (CPUE)	GIRONDE (YIELD)	ADOUR	NALON	MINHO	TIBER
1950	6.92			86						
1951	13.84			166						
1952	89.37			121						
1953	13.97			91				14,529		
1954	20.99			86				8,318		
1955	28.82			181				13,576		
1956	7.58			187				16,649		
1957	17.20			168				14,351		
1958	55.22			230				12,911		
1959	30.26			174				13,071		
1960	22.87			411				17,975		
1961	39.62			334				13,060		
1962	91.79			185				17,177		
1963	131.13			116				11,507		
1964	40.95	3.7		142				16,139		
1965	85.94	115.0	5.0	134				20,364		
1966	20.63	385.0	4.0	253				11,974		
1967	31.46	575.0	9.0	258				12,977		
1968	21.66	553.5	12.0	712				20,556		
1969	18.37	445.0	10.0	225				15,628		
1970	41.43	795.0	8.0	453				18,753		
1971	18.49	399.0	44.0	330				17,032		
1972	33.20	556.5	38.0	311				11,219		
1973	24.22	356.0	78.0	292				11,056		
1974	27.97	946.0	107.0	557				24,481	1.642	
1975	36.07	264.0	44.0	497				32,611	10.578	11.00
1976	29.33	618.0	106.0	770				55,514	20.048	6.70
1977	62.94	450.0	52.0	677				37,661	36.637	5.90
1978	41.66	388.0	106.0	526				59,918	24.334	3.60
1979	57.84	675.0	209.0	642	19.7	286.2		37,468	28.435	8.40
1980	28.92	358.0	95.0	525.5	25.9	404.8		42,110	21.32	8.20
1981	24.72	74.0	57.0	302.7	20.0	332.2		34,645	54.208	4.00
1982	15.59	138.0	98.0	274	15.0	123.3		26,295	16.437	4.00
1983	10.43	10.0	69.0	259.5	13.6	80.3		21,837	30.447	4.00
1984	14.02	6.0	36.0	182.5	19.2	82.0		22,541	31.387	1.80
1985	15.08	13.0	41.0	154	9.6	64.5		12,839	20.746	2.50
1986	15.83	26.0	52.6	123.4	10.6	45.2	8	13,544	12.553	0.20
1987	6.17	33.0	41.2	145	14.0	82.4	9.5	23,536	8.219	7.40
1988	4.43	48.0	46.6	176.6	10.9	33.0	12	15,211	8.001	10.50
1989	3.04	30.0	36.7	87.1	7.2	80.0	9	13,574	9.000	5.50
1990	3.66	218.2	35.9	96	5.6	48.1	3.2	9,216	6.000	4.40
1991	1.12	13.0	15.4	35.7	7.7	64.0	1.5	7,117	9.000	0.80
1992	2.96	18.9	29.6	39.3	3.7	41.7	8	10,259	10.000	0.60
1993	2.96	11.8	31.0	90.5	8.2	69.4	5.5	9,673	7.600	0.50
1994	4.93	17.5	24.0	94.6	8.7	45.8	3	9,900	4.700	0.50
1995	6.98	1.5	29.7	132.5	8.2	73.2	7.5	12,500	15.200	0.30
1996	7.82	4.5	22.4	80.8	4.8	30.7	4.1	5,900	8.700	0.10
1997	12.70	9.8	22.6	70.8	6.5	50.5	4.6	3,656	7.400	0.10
1998	2.27	2.3	17.5	60.7	4.3	25.0	1.5	3,273	7.400	0.13
1999	3.53		15.3	86.9	7.5	44.1	4.3	3,815	3.800	0.06
2000	1.73	17.85	14.2	79.9	6.6	25.1	10	1,330	1.200	0.07
2001	0.57	0.7	8.1	30	1.9	9	4	1,285	1.100	0.04
2002	1.15	1.4	16.0	41	4.9	36.8	6	1,569		0.02
2003	1.54	0.539	8.9	55				1,231		0.02
2004	1.52	0.381	7.0	20				506		0.03

Table 1.4.7.3 Re-stocking of glass eel. Numbers of glass eels (in millions) re-stocked in (eastern) Germany (D east), the Netherlands (NL), Sweden (S), Poland (PO), Northern Ireland (N.Irl.), and Belgium (Flanders).

	D EAST	NL	SE	PO	N.IRL.	FLANDERS
1945					17.0	
1946		7.3			21.0	
1947		7.6				
1948		1.9				
1949		10.5				
1950	0.0	5.1				
1951	0.0	10.2				
1952	0.0	16.9		17.6		
1953	2.2	21.9		25.5		
1954	0.0	10.5		26.6		
1955	10.2	16.5		30.8	0.5	
1956	4.8	23.1		21.0		
1957	1.1	19.0		24.7		
1958	5.7	16.9		35.0		
1959	10.7	20.1		52.5	0.7	
1960	13.7	21.1		64.4	25.9	
1961	7.6	21.0		65.1	16.7	
1962	14.1	19.8		61.6	27.6	
1963	20.4	23.2		41.7	28.5	
1964	11.7	20.0		39.2	10.0	
1965	27.8	22.5		39.8	14.2	
1966	21.9	8.9		69.0	22.7	
1967	22.8	6.9		74.2	6.7	
1968	25.2	17.0			12.1	
1969	19.2	2.7			3.1	
1970	27.5	19.0			12.2	
1971	24.3	17.0			14.1	
1972	31.5	16.1			8.7	
1973	19.1	13.6			7.6	
1974	23.7	24.4			20.0	
1975	18.6	14.4			15.1	
1976	31.5	18			9.9	
1977	38.4	25.8			19.7	
1978	39.0	27.7			16.1	
1979	39.0	30.6			7.7	
1980	39.7	24.8			11.5	
1981	26.1	22.3			16.1	
1982	30.6	17.2			24.7	
1983	25.2	14.1			2.9	
1984	31.5	16.6			12.0	
1985	6.0	11.8			13.8	
1986	23.8	10.5			25.4	
1987	26.3	7.9			25.8	
1988	26.6	8.4			23.4	
1989	14.3	6.8			9.9	
1990	10.65	6.1	0.7		13.3	
1991	2.01	1.9	0.3		3.5	
1992	6.36	3.5	0.3		9.4	
1993	7.62	3.8	0.6		9.9	0.8
1994	7.6	6.2	1.7		16.4	0.5
1995	0.99	4.8	1.5		13.5	0.5
1996	0.05	1.8	2.4		11.1	0.5
1997	0.38	2.3	2.5		10.9	0.4
1998	0.3	2.5	2.1		6.2	0.0
1999	0.0	2.9	2.3		12.0	0.8
2000	0.0	2.8	1.3		5.4	0.0
2001		0.9	0.8		3.04	0.2
2002		1.6	1.4		6.6	0
2003		1.6	0.6		9.2	4.5
2004		0.3	0.8		3.0	0

Table 1.4.7.4 Re-stocking of young yellow (bootlace) eel. Numbers of young yellow eels (in millions) re-stocked in (eastern) Germany (D east), the Netherlands (NL), Sweden (S), Denmark (DK), and Belgium (Flanders).

	D EAST	NL	SE	DK	FLANDERS
1945					
1946					
1947		1.6			
1948		2.0			
1949		1.4			
1950	0.9	1.6			
1951	0.9	1.3			
1952	0.6	1.2			
1953	1.5	0.8			
1954	1.1	0.7			
1955	1.2	0.9			
1956	1.3	0.7			
1957	1.3	0.8			
1958	1.9	0.8			
1959	1.9	0.7			
1960	0.8	0.4			
1961	1.8	0.6			
1962	0.8	0.4			
1963	0.7	0.1			
1964	0.8	0.3			
1965	1.0	0.5			
1966	1.3	1.1			
1967	0.9	1.2			
1968	1.4	1.0			
1969	1.4	0.0			
1970	0.7	0.2			
1971	0.6	0.3			
1972	1.9	0.4			
1973	2.7	0.5			
1974	2.4	0.5			
1975	2.9	0.5			
1976	2.4	0.5			
1977	2.7	0.6			
1978	3.3	0.8			
1979	1.5	0.8			
1980	1.0	1.0			
1981	2.7	0.7			
1982	2.3	0.7			
1983	2.3	0.7			
1984	1.7	0.7			
1985	1.1	0.8			
1986	0.0	0.7			
1987	0.0	0.4		1.6	
1988	0.0	0.3		0.8	
1989	0.0	0.1		0.4	
1990	0.1	0.0	0.8	3.5	
1991	0.1	0.0	0.9	3.1	
1992	0.1	0.0	1.1	3.9	
1993	0.2	0.2	1.0	4.0	0.2
1994	0.2	0.0	1.0	7.4	0.1
1995	0.7	0.0	0.9	8.4	0.1
1996	0.9	0.2	1.1	4.6	0.1
1997	1.5	0.4	1.1	2.5	0.1
1998	1.2	0.6	0.9	3.0	0.1
1999	1.1	1.2	1.0	4.1	0.1
2000	1.0	1.0	0.7	3.8	0.0
2001		0.1	0.4	1.7	0.0
2002	0.4	0.1	0.3	2.4	
2003		0.1	0.3	2.2	
2004		0.1	0.1		

Table 1.4.7.5 Aquaculture production of European eel in Europe and Japan. Compilation of production estimates (tonnes) derived from reports of previous WG meetings, FAO, FEAP and others. Data for Sweden and the Netherlands have been revised.

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Japan		3000															10000			
Sum EU	1950	2229	3448	4729	5517	5159	6667	6098	6818	7721	7689	8935	9031	10646	11059	10839	10510	8435		
Czech. Rep.									2	4	4	3	3	3	1	1	1	1		
Hungary					90	39	73	33		50		50			19	19				
Croatia								7	5	5	7	6	7							
Yugoslavia	44	52	48	49	19	10	5	1	8	2	9	5	5	5	6	6	5	4		
Macedonia									1	0	70	83	60	72	60	50	32			
Turkey																				
Greece			6	4	10	54	94	132	337	341	659	550	312	500	500	300	600	735		
Italy	2600	2800	4200	4600	4250	4500	3700	4185	3265	3000	2800	3000	3000	3100	3100	3100	2750	2500	1900	
Tunisia							150	151	250	260	108	158	147	108						
Algeria					72	53	22	1	0	22	20	17	17	17	22	15	18	20		
Morocco							35	41	68	85	55	55	56	42	27	28	60	28		
Portugal	60	60	590	566	501	6	270	622	505	979	200	110	200	200	200	200				
Spain	15	20	25	37	32	57	98	105	175	134	214	249	266	270	300	425	200	259		
Belgium/Lux.					30	30	125	125	125	125	150	140	150	150	40	20	50	55		
Netherlands				100	300	200	600	900	1100	1300	1450	1540	2800	2450	3250	3500	3800	4000	4000	*4200*
Germany										100	100	100	150	150	150	150	300	160		
UK				20	30	0	0				25		25							
Ireland																	100			
Denmark	18	40	200	240	195	430	586	866	748	782	1034	1324	1568	1913	2483	2718	2674	2000	1880	2050
Sweden	12	41	51	90	203	166	157	141	171	169	160	139	161	189	204	222	273	200	167	170
Norway										120	200	200	200	200						

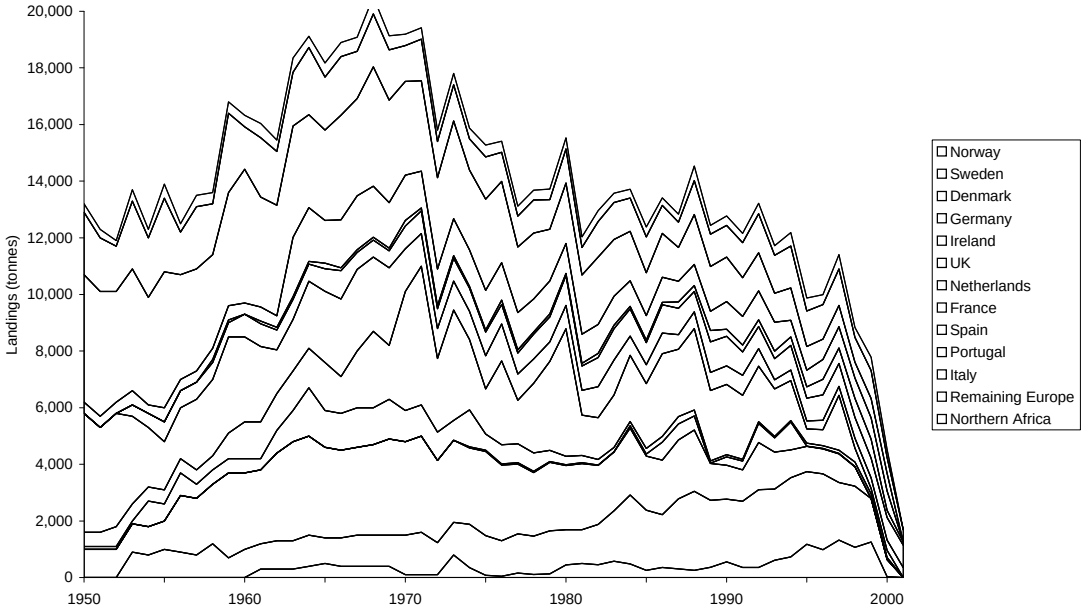

Figure 1.4.7.1 Landing statistics of the European eel in the past 50 years.
FAO data, with minor corrections. Data for 2000 and later are incomplete.

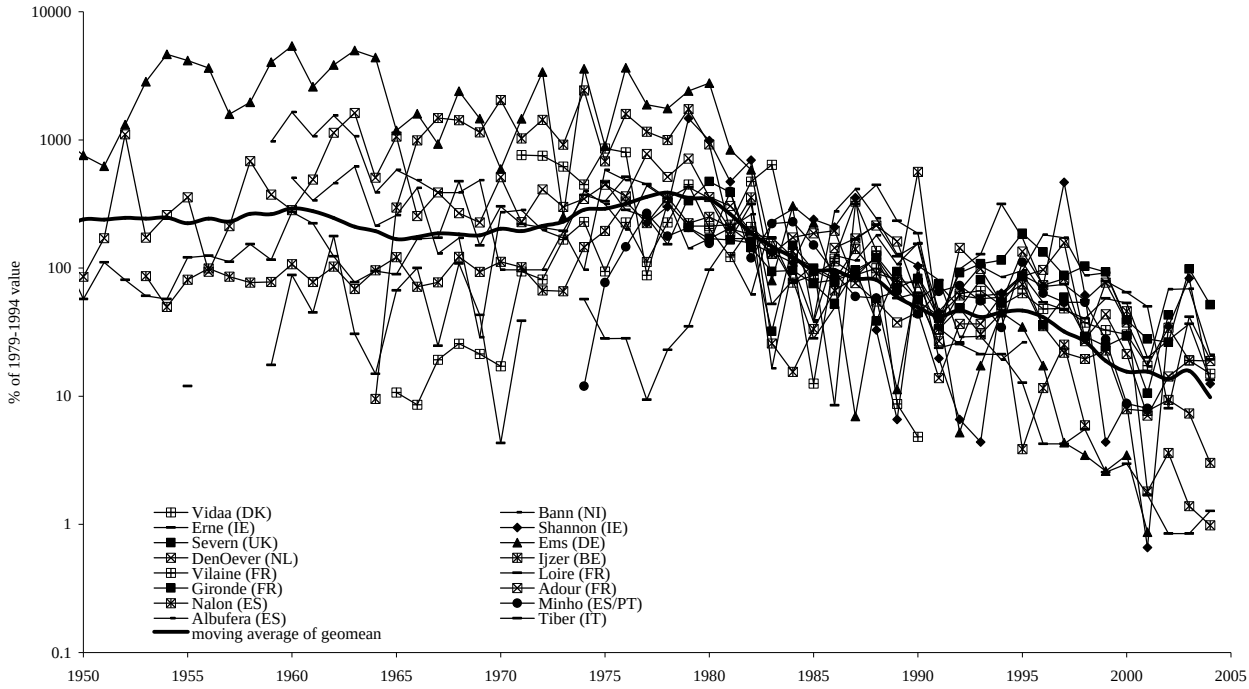

Figure 1.4.7.2 Time-series of glass eel monitoring in Europe. Each series has been scaled to the 1979–1994 average. The heavy line indicates the geometric mean of the series from Loire (F), Ems (D), Göta Älv (S), and DenOever (NL), which are the longest and most consistent time-series.

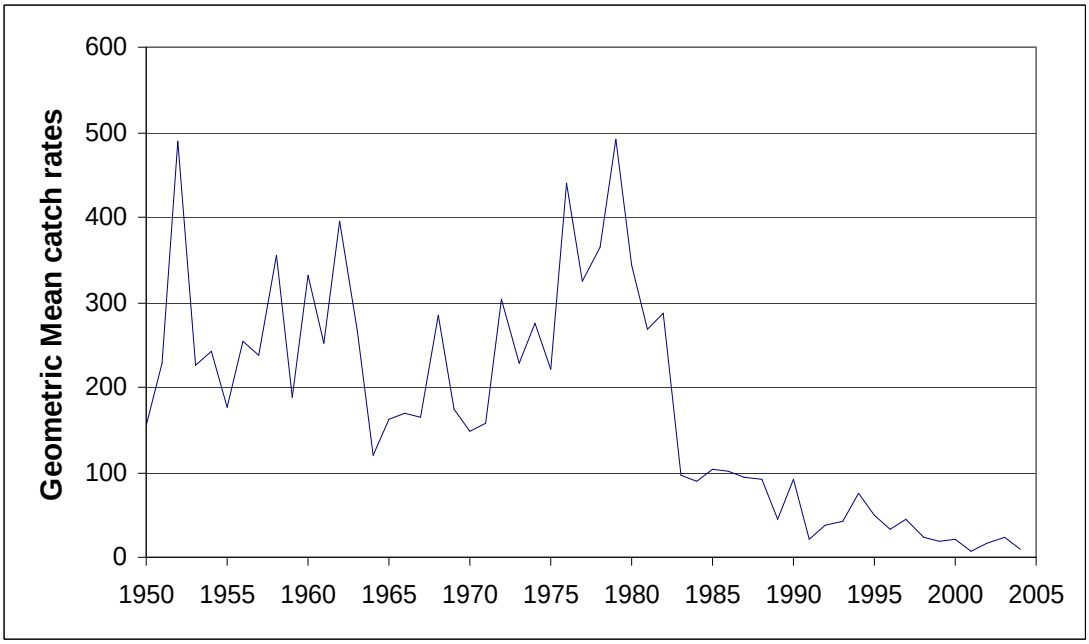

Figure 1.4.7.3 Time-series of glass eel monitoring in Europe. The line indicates the geometric mean of the series from Loire (F), Ems (D), and DenOever (NL), which are the longest and most consistent time-series. Each series has been scaled to the 1979–1994 average.

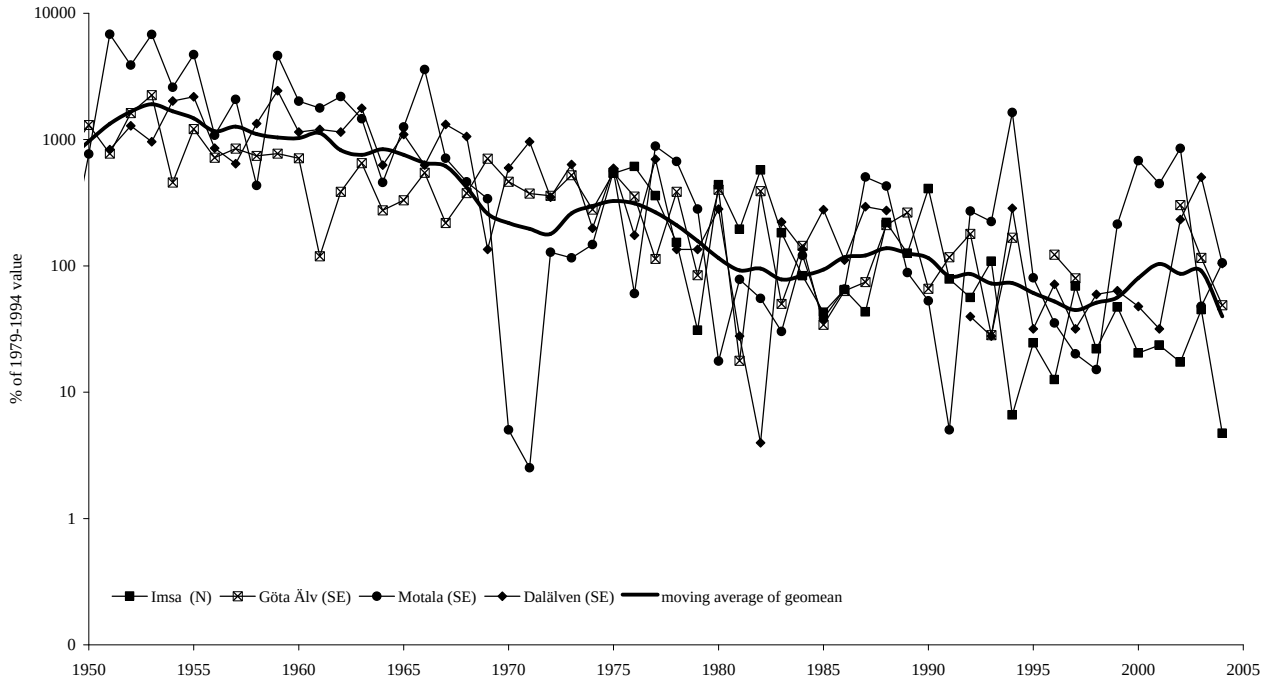

Figure 1.4.7.4 Time-series of yellow eel recruitment (older than one year). Each series has been scaled to the 1979–1994 average. The heavy line indicates the geometric mean of all time-series.

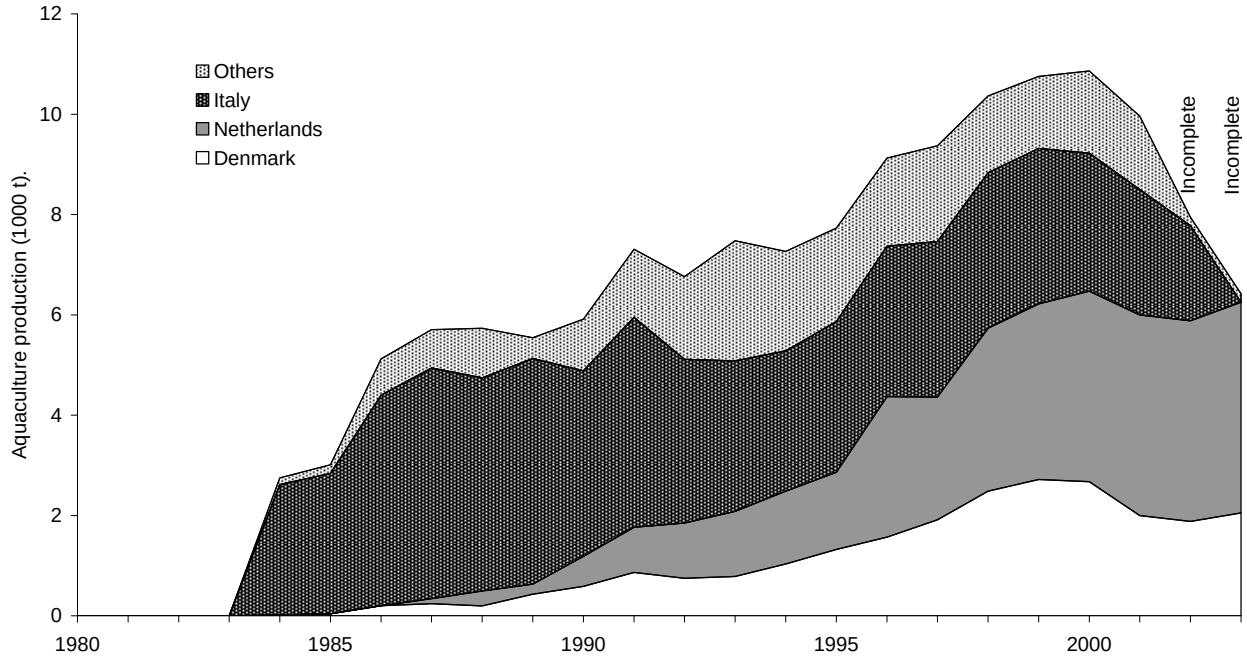

Figure 1.4.7.5 Trends in aquaculture production of the European eel.

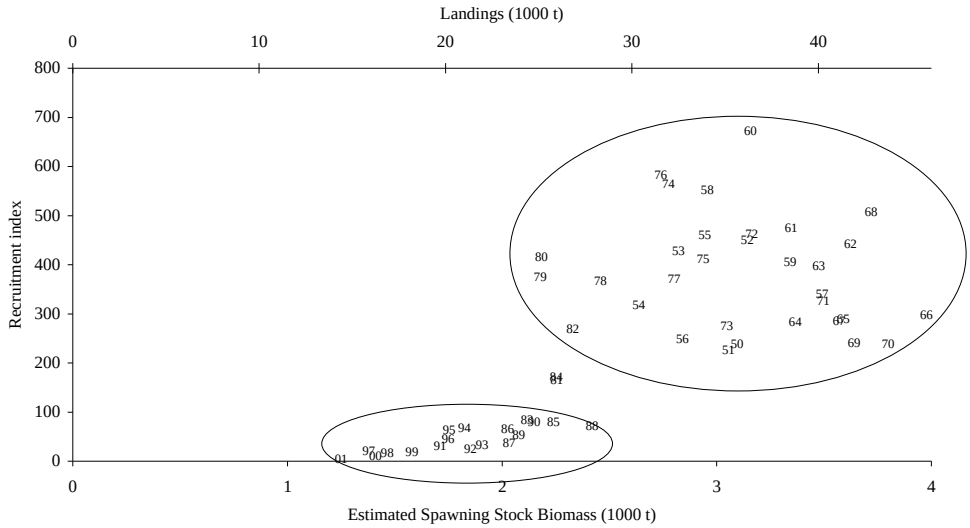

Figure 1.4.7.6 Estimated stock-recruitment relationship for the European eel. Numbers indicate the year of recruitment. The spawning stock is assumed proportional to the landings from the continental stock.