Report on the eel stock and fishery in France 2008/2009

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FR.2. Introduction

FR.2.1. Presentation of eel fisheries in France

The French eel fisheries occur mainly in inland waters (rivers, estuaries, ponds and lagoons) but also in coastal waters (see Figure FR.1 and Table FR.a). The glass eel fisheries are more important in the Bay of Biscay region but they are also found in the Channel region. The yellow eel fisheries occur in the same areas and concern also the upper parts of the rivers of the Atlantic coast, the Rhine and tributaries. The Mediterranean lagoons produce the most part of yellow eels and bootlace eels are targeted for exportation towards Italy. Silver eel fisheries are limited to some rivers, mostly in the Loire basin and to the Mediterranean lagoons.

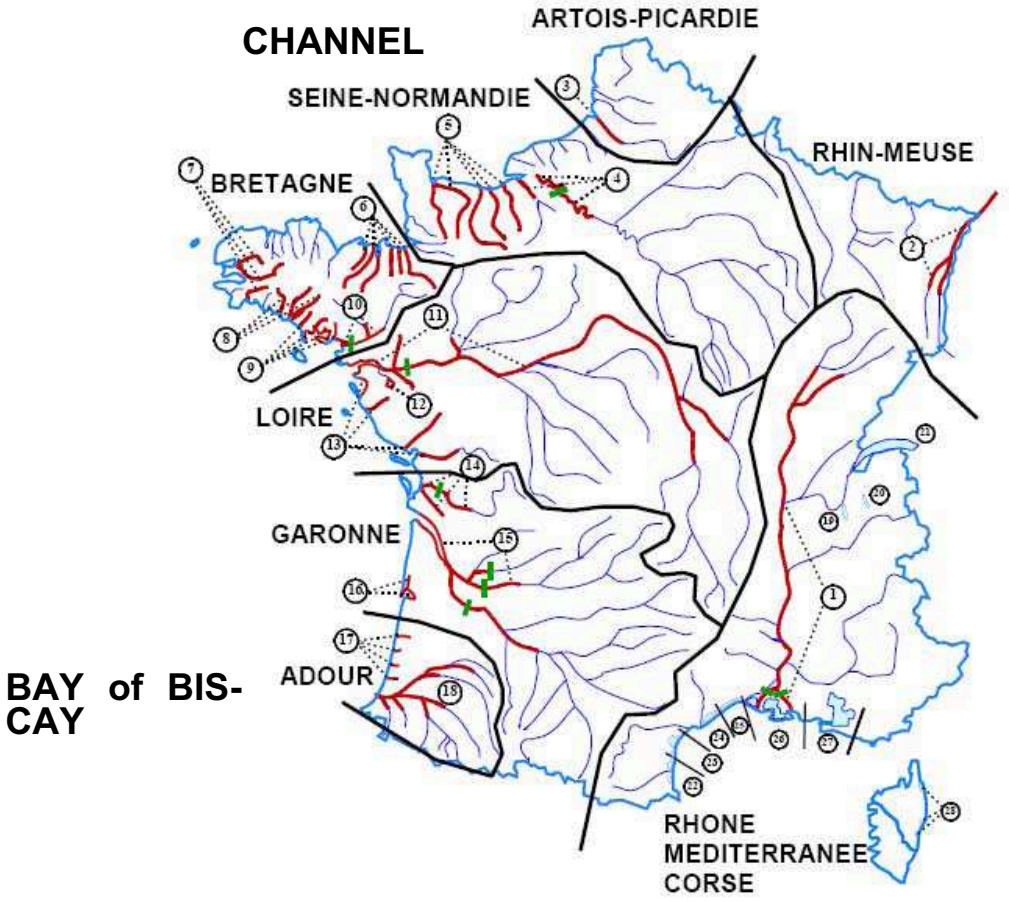


Figure FR.1. Inland waters in France (eel fisheries in red; tidal limits in green). The numbers correspond to the list of fishing zones in Table FR.a. The management unit names and limits are in black (redrawn from Castelnaud, 2000).

Table FR.a. Fishing zones in French inland waters related to the eight management units (COGEPOMI) (modified from Castelnaud *et al.*, 2000, unpublished data).

(Number from Figure FR.2.) Fishing zone–Surface for lagoons	COGEPOMI
(1) Delta du Rhône	Rhône-Méditerranée Corse
(1) Fleuve Rhône aval et amont, Saône, Doubs	Rhône-Méditerranée Corse
(2) Fleuve Rhin, Ill	Rhin Meuse
(3) Estuaire Somme	Artois-Picardie
(4) Estuaire Seine, Fleuve Seine aval	Seine Normandie
(4) Fleuve Seine amont, Risle	Seine Normandie
(5) Estuaires Touques, Dives, Orne, Aure, Vire	Seine Normandie
(6) Estuaires Couesnon, Rance, Fremur, Arguenon, Gouessan, Gouet	Bretagne
(7) Estuaires Elorn, Aulne, Odet	Bretagne
(8) Estuaires Laïta, Scorf, Blavet	Bretagne
(9) Rivières d'Etel, d'Auray, de Penerf, Golfe du Morbihan	Bretagne
(10) Estuaire Vilaine aval	Bretagne

(Number from Figure FR.2.) Fishing zone–Surface for lagoons	COGEPOMI
(10) Estuaire Vilaine amont, Fleuve Vilaine aval, Oust, Chere, Don	Bretagne
(11) Estuaire Loire, Loire aval, Erdre, Sèvre Nantaise	Loire
(11) Fleuve Loire amont, Maine, Mayenne, Allier	Loire
(12) Lac de Grand-Lieu	Loire
(13) Baie de Bourgneuf, Estuaires Vie, Lay, Sèvre Niortaise	Loire
(14) Estuaire Charente, Fleuve Charente aval, Estuaire Seudre	Garonne
(14) Fleuve Charente amont	Garonne
(15) Estuaire Garonne, Garonne aval, Dordogne aval, Isle	Garonne
(15) Fleuve Garonne amont, Dordogne amont	Garonne
(16) Canal de Lège	Garonne
(16) Delta d'Arcachon	Garonne
(17) Courants de Mimizan, Contis, Huchet, Vieux-Boucau	Adour
(18) Estuaire Adour, Fleuve Adour, Nive, Bidouze, Gaves de Pau et d'Oloron, Luy	Adour
(19) Lac du Bourget	Rhône-Méditerranée Corse
(20) Lac d'Annecy	Rhône-Méditerranée Corse
(21) Lac Léman	Rhône-Méditerranée Corse
(22) Etang de Canet - 480 ha	Rhône-Méditerranée Corse
(22) Etang de Salses Leucate - 5800 ha	Rhône-Méditerranée Corse
(23) Etang de Lapalme - 600 ha	Rhône-Méditerranée Corse
(23) Etang de Bages-Sigean - 3700 ha	Rhône-Méditerranée Corse
(23) Etang de Campignol – 115 ha	Rhône-Méditerranée Corse
(23) Etang de l'Ayrolle – 1320 ha	Rhône-Méditerranée Corse
(23) Etang de Gruissan – 145 ha	Rhône-Méditerranée Corse
(24) Etang de Thau – 7500 ha	Rhône-Méditerranée Corse
(25) Etang d'Ingril – 685	Rhône-Méditerranée Corse
(25) Etang de Vic – 1255 ha	Rhône-Méditerranée Corse
(25) Etang de Pierre- Blanche – 371 ha	Rhône-Méditerranée Corse
(25) Etang du Prévost – 294 ha	Rhône-Méditerranée Corse
(25) Etang de l'Arnel – 580 ha	Rhône-Méditerranée Corse
(25) Etang du Grec – 270 ha	Rhône-Méditerranée Corse
(25) Etang Latte-Méjean – 747 ha	Rhône-Méditerranée Corse

(Number from Figure FR.2.) Fishing zone–Surface for lagoons	COGEPOMI
(25) Etang de l'Or – 3200 ha	Rhône-Méditerranée Corse
(26) Etang du Ponant – 200 ha	Rhône-Méditerranée Corse
(26) Petite Camargue gardoise – 1200 ha	Rhône-Méditerranée Corse
(26) Etang du Vacares et des Impériaux – 12 000 ha	Rhône-Méditerranée Corse
(27) Etang de Berre – 15 500 ha	Rhône-Méditerranée Corse
(28) Etang de Palo – 210 ha	Rhône-Méditerranée Corse
(28) Etang d'Urbino – 790 ha	Rhône-Méditerranée Corse
(28) Etang de Diana – 570 ha	Rhône-Méditerranée Corse

From 1999 to 2001, the total number of professional fishermen fishing eel, seeking one or several stages, was about 1800 with an estimated total catch of 200 tons of glass eels and 900 tons of yellow or silver eels (Castelnaud and Beaulaton, unpublished data).

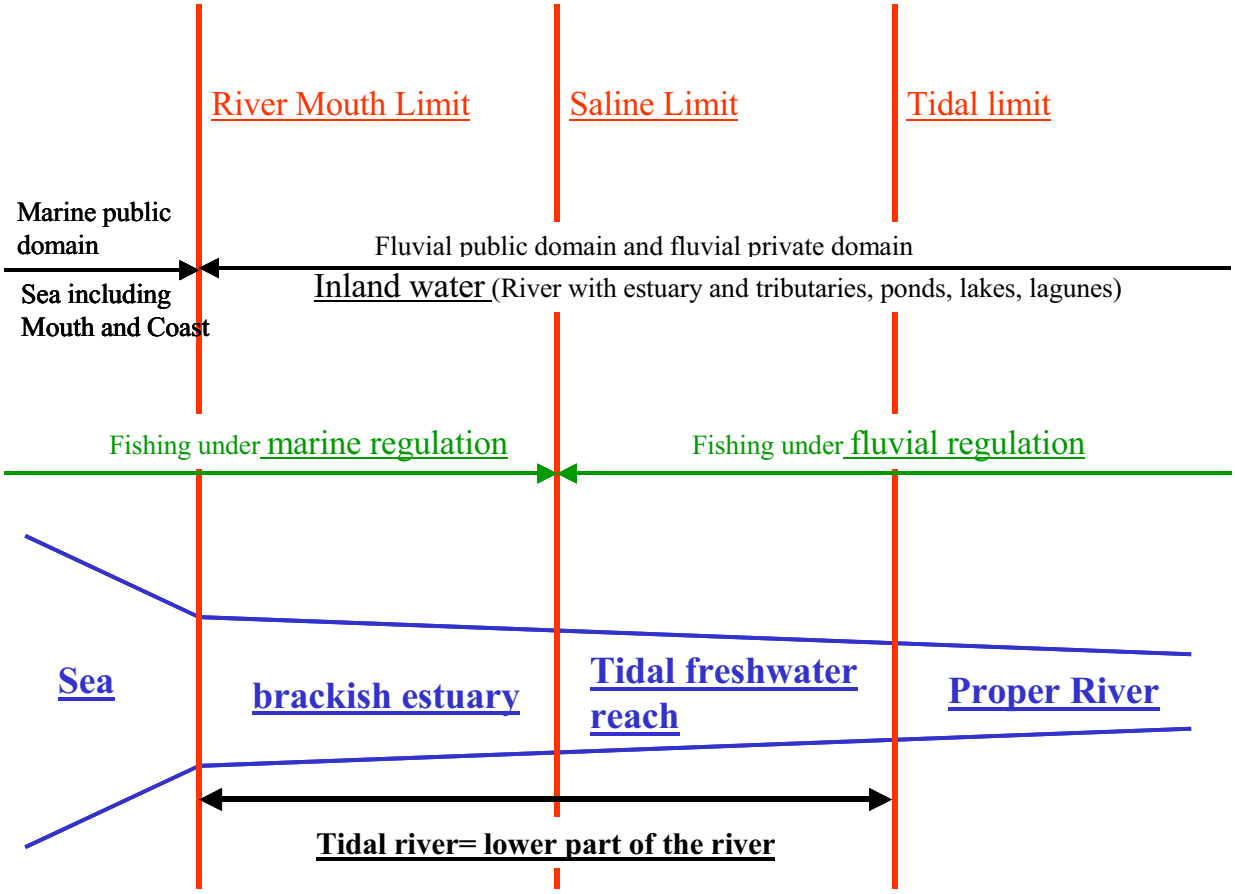
Illegal fishermen are targeting glass eels in the tidal parts of rivers for commercial purpose. Their number and the amount of their catches had never been clearly quantified.

FR.2.2. Management and monitoring system

The administrative saline limit separates two different fishery regulations: marine and fluvial (freshwater) (Figure FR.1). The marine fisheries are located in coastal water, brackish estuaries and in the Mediterranean lagoons. The freshwater fisheries are located upstream from the saline limit and comprise rivers, lakes, ponds, ditches and canals. In large estuaries there is a special zone, called the "tidal freshwater reach", located between the saline limit and the tidal limit, where some marine professional fishermen can fish along with river fishermen while these are not allowed to go downstream the saline limit.

In brackish and coastal waters, amateur fishermen do not need licences to fish with authorized fishing gears. A system of licences is set up for marine professional fishermen, for river professional and amateur fishermen in inland waters. The glass eel fishery is limited with quotas of glass eel stamps and the silver eel fishery is limited by personal authorizations. In the Mediterranean lagoons, where glass eel fishing is forbidden, there are also limitations in the number of marine professional fishermen and fishing capacities but no system of licences exists.

In the rivers under fluvial regulation, the fishing rights are delivered to fishermen by the local Fluvial Fisheries Administrations. The regulation systems in brackish estuaries and Mediterranean lagoons are the result of a negotiation between fishermen organizations (respectively "Commission des poissons migrateurs et des estuaires" and "Prud'homies") and Marine Fisheries Administrations.



Fishermen category	Marine professional fisherman=MP Marine amateur fisherman with or without boat =MA	Marine professional fisherman=MP River professional fisherman =FP River amateur fisherman with gears with or without boat =FA Anglers (with rods and sometines with gears) =AN
Fishing rights	MP : quota of licences CIPE (quota of glass eels stamps) MA : no licences, gears limited by rules	MP et FP : quota of licences (quota of glass eels stamps) FA : quota of licences AN : rod licence and quota of licences for gears

Figure FR.2. Inland waters and fisheries limits, fishermen categories and fishing rights by zones (Castelnaud and Beaulaton, 2005, unpublished data).

The marine professional fisheries in Atlantic coastal areas, estuaries and tidal part of rivers in France have been monitored since 1993 by the Centre National de Traitement Statistiques (CNTS, ex-CRTS) depending from the Direction des Pêches Maritimes et de l'Aquaculture (DPMA) of the Ministry of Agriculture and fisheries. This system is evolving and should also include marine professional fishermen from Mediterranean lagoons. From this system, glass eels are distinguished from subadult eel, meaning that yellow and silver eels cannot be separated.

The river professional and amateur fishermen in rivers above marine estuaries (and in lakes) have been monitored since 1999 by the ONEMA (Office National de l'Eau et des Milieux Aquatiques, ex-CSP) in the frame of the «Suivi National de la Pêche aux Engins et aux filets» (SNPE).

These two monitoring systems are based on compulsory declarations of captures and effort (logbooks) using similar fishing forms collected monthly (Table FR.b) with the help of some local data collectors.

Beside these obligatory systems, for which reliability, accuracy and availability of data are variable, local scientific monitoring are developed in the Gironde, the Adour and the Vilaine basin for instance. Also data on annual captures are provided for some sectors by the local fishery administrations: Directions Départementales des Affaires Maritimes (DDAM), Directions Départementales de l'Agriculture et de la Forêt (DDAF). At some occasions some punctual occasion made by scientific institute, local fishery administration or fishermen themselves are available.

Table FR.b. Official administrative monitoring systems in France.

SEA	INLAND WATERS	
Salt water	**Brackish water**	**Freshwater**
Marine Public domain: Sea Coast	**Marine Public domain: Estuaries**	**Fluvial Public domain: parts of rivers above estuaries, lakes**
Professionnal fishermen	Professionnal fishermen	Professionnal fishermen
no specific license	Quota of licenses by estuary (specific for glass eel since 1993 and for eel since 2005)	Quota of licenses by river section and by lake (specific for glass eel since 1988)
Logbook for sea fishing	Compulsory logbook (by day, by gear) since 1993 treated by CNTS (ex-CRTS) and Ifremer until 2001, no more data available	Compulsory logbook (by day, by gear) since 1999 treated by ONEMA (ex-CSP) until 2002
Few oriented fishery on eel, few data available		Local scientific monitoring of landings and effort since 1978, Cemagref, evalution of productions by some DDAF Services
Non professionnal fishermen, amateurs and anglers	Local scientific monitoring of landings and effort since 1978, Cemagref, Ifremer, IAV, evalution of productions by some Affaires Maritimes Services	
No licence, no logbook		Non professionnal fishermen, amateurs and anglers
	Non professionnal fishermen, amateurs and anglers	since 1988)
	No licence, no logbook	Compulsory logbook (by day, by gear) 1999-2002 treated by ONEMA (ex-CSP)
	Marine Public domain: Mediterranean lagoons	
	Professionnal fishermen	Anglers
	No license but limitation of the number of fishermen by lagoon	Licenses per departement
	No logbook, some technical and scientific surveys	No logbook, ponctual estimates (ONEMA, ex- CSP)
		Private domain: others parts of rivers above estuaries, others parts of lakes
	Non professionnal fishermen, amateurs and anglers	
	No licence, no logbook	Professionnal fishermen
		No licence, no logbook, ponctual estimate of effort (ONEMA, ex-
		Non professionnal fishermen, amateurs and anglers
		Licenses per departement
		No logbook, ponctual estimate of effort (ONEMA, ex- CSP)

To manage the migratory species and their fisheries all along the watershed (under marine and fluvial regulation), special organizations, called "Comités de Gestion des Poissons Migrateurs" (COGEPOMI), have been created in 1994. There are eight COGEPOMI (management units, grouping basins), one for each important group of basin: Rhine-Meuse, Artois-Picardie, Seine-Normandie, Bretagne, Loire, Garonne, Adour and Rhone-Méditerranée-Corse (see Figure FR.1 and Table FR.a). They gather representatives of fishermen organizations, administrations and research centres. Each COGEPOMI propose a management plan and funding every five years and has to monitor them. The plan determines conservation and management actions, restocking operations, proposes fishing regulations for both recreational and professional fisheries.

Until now, these management plans did not aim at achieving a particular escapement rate for eel, and the results of management actions have not really been evaluated. While this system allows for a global approach, and tries to solve environmental problems such as migration barriers or turbine mortality, it does not give for the moment, a consistent management basis for eel at the national level by lack of central regulation and designing of practical management rules.

French eel management unit (EMU) as defined by the European eel regulation are more or less COGEPOMI. One should notice that Corse is a separate management unit and that EMU are extended to coastal waters (Figure FR.3).

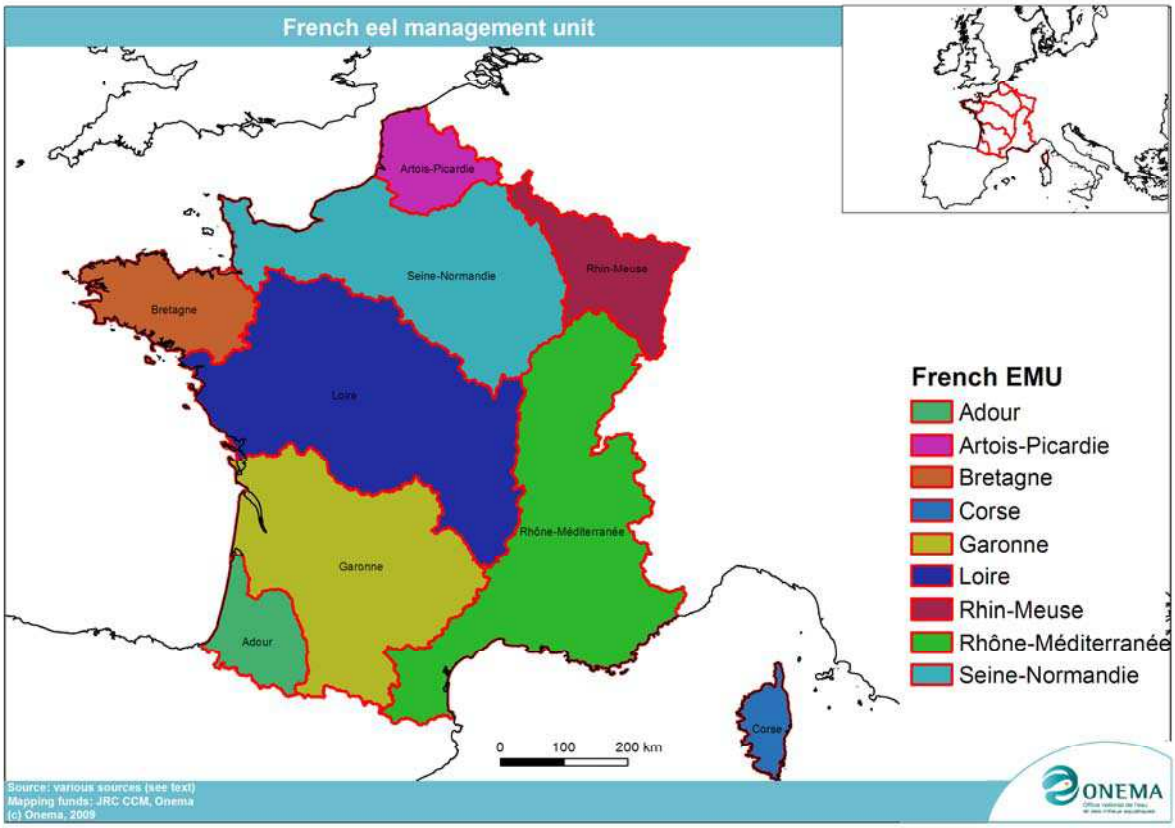


Figure FR.3. French eel management unit.

FR.3. Time-series data

FR.3.1. Recruitment series and associated effort

FR.3.1.1. Glass eel recruitment

Eight time-series are available in France for recruitment monitoring, corresponding to five locations. Seven recruitment series correspond to commercial catch data. Those will probably be disturbed in future after implementation of the European eel regulation.

In 2008, the WGEEL has analysed recruitment data and has categorized them for analysis. The French series were categorized as commercial catch or commercial cpue except for the Vilaine where the recruitment series includes an estimation of recruitment after the end of the fishing season. This year, the Gironde scientific survey of the stock has been added to the series (Table FR.c and Figure FR.4).

The Vilaine series corresponds to total catches of the fishery during the fishing season, to which is added estimation of late arrivals after the fishing season (Briand, 2009). It represents the full estuarine recruitment and therefore was labelled as "trapping all" during WGEEL analysis in 2008 (Briand, 2009). The Vilaine catch series is not continued before 1971, as at that date the construction of the Arzal has changed the fishing condition drastically. For 2009, the drop in recruitment parallels the drop in landings in France (see Section 6.1.3.).

The Loire series corresponds to an estimate of total landings of marine and river professional fishermen (t). Beware this series, often used in long-term analysis of the

trends in stock is considered as inaccurate as it has been collected by various administrations and authors across time (see Section 3.2.4.1).

The Sèvre Niortaise series has been computed by Gascuel, 1987, and corresponds to cpue calculated from logbooks. It has been stopped in 1984. A recent calculation of cpue in 2008 shows that it has dropped from 6 kilograms in 1983 to 1.93.

The Gironde comprises three series: landings of marine and river professional fishermen (catch, t), cpue of marine professional fishermen with large pushnet "pibalour" (kg/day^{-1} boat^{-1}) and scientific survey. The cpue series corresponds to a glm analysis of the Gironde catch series, see Beaulaton, 2008 for details. The scientific survey (glass eel/1000 m^3) is conducted by CEMAGREF (see Section 8.1.1) for details.

The Adour series comprise one series of catch of marine professional fishermen (t) and one series of commercial cpue of marine professional fishermen (kg.day^{-1}.boat^{-1}). Those are computed by IFREMER scientific institute from logbooks which in this estuary are considered of good quality.

Table FR.c. Recruitment series in France. 2009 means 2008–2009 migration season.

EMU	BRETAGNE	LOIRE		GARONNE-DORDOGNE-CHARENTE-SEUDRE-LEYRE			ADOUR – COURS D'EAU COTIERS	
Year	Vilaine Arzal trapping all	Loire Estuary com. catch	Sèvres Niortaise Estuary com. cpue	Gironde (catch) com. catch	Gironde pibalour (cpue) com. cpue	Gironde scient. Estim.	Adour Estuary (catch) com.1 catch	Adour Estuary (cpue) com. cpue
1923				46.0				
1924		65						
1925		70						
1926		90		18.7				
1927		65		34.1				
1928		102		22.4				5
1929				22.5				5.5
1930		1		28.2				6.7
1931				26.9				18.7
1932				31.1				
1933				13.5				
1934		90		13.4				
1935		150		19.7				
1936		30						
1937		7						
1938		15						
1939		17						
1940		27						
1941		21						
1944		10						
1945		66						

[1] Com. =commercial

EMU	BRETAGNE	LOIRE		GARONNE-DORDOGNE-CHARENTE-SEUDRE-LEYRE			ADOUR – COURS D'EAU COTIERS	
Year	Vilaine Arzal trapping all	Loire Estuary com. catch	Sèvres Niortaise Estuary com. cpue	Gironde (catch) com. catch	Gironde pibalour (cpue) com. cpue	Gironde scient. Estim.	Adour Estuary (catch) com.1 catch	Adour Estuary (cpue) com. cpue
1946		43						
1947		178						
1948		197						
1949		193						
1950		86						
1951		166						
1952		121						
1953		91						
1954		86						
1955		181						
1956		187						
1957		168						
1958		230						
1959		174						
1960		411						
1961		334		32.2	10.47			
1962		185	30	218	30.64			
1963		116	72	363	33.15			
1964		142						
1965		134	17	353	62.74			
1966		253	13	27.6	10.02			5.1
1967		258	8	163	25.46			6.4
1968		712	15	284	38.23			10.1
1969		225	14	36.6	18.52			5
1970		453	15	204	24.98			7.5
1971	44	330	12	47.1	9.12			4.6
1972	38	311	11	69.0	13.73			4.4
1973	78	292	8.5	20.0	29.19			4.5
1974	107	557	9	54.6	21.44			7.4
1975	44	497	8.5	44.1	12.5			5
1976	106	770	17	121	34			11
1977	52	677	15	122	25.38			
1978	106	526	18	64.7	23.17			
1979	209	642	17.5	73.2	18.74			10
1980	95	526	12	125	35.05			5
1981	57	303	9	84.9	32.41			
1982	98	274	8.5	61.0	14.55			
1983	69	260	6	66.7	14.33			
1984	36	183		45.0	13.87			
1985	41	154		27.0	7.39			2.4

EMU	BRETAGNE	LOIRE		GARONNE-DORDOGNE-CHARENTE-SEUDRE-LEYRE			ADOUR – COURS D'EAU COTIERS	
Year	Vilaine Arzal trapping all	Loire Estuary com. catch	Sèvres Niortaise Estuary com. cpue	Gironde (catch) com. catch	Gironde pibalour (cpue) com. cpue	Gironde scient. Estim.	Adour Estuary (catch) com.1 catch	Adour Estuary (cpue) com. cpue
1986	52.6	123		35.3	9.02		8	1.5
1987	41.2	145		44.6	9		9.5	3.3
1988	46.6	177		27.9	7.55		12	3.7
1989	36.7	87		45.9	8.9		9	4.1
1990	35.9	96		29.2	5.37		3.2	1.2
1991	15.35	36		38.4	6.78		1.5	0.7
1992	29.57	39		22.5	6.58	1.75	8	2.9
1993	31	91		42.4	8.92	2.83	5.5	2.4
1994	24	103		45.5	8.15	2.2	3	1.4
1995	29.7	133		43.5	8.49	2.92	7.5	2.6
1996	23.29	81		27.9	5.25	2.07	4.1	1.53
1997	22.85	71		49.3	9.24	3.14	4.6	1.6
1998	18.9	66		18.4	3.46		1.5	1.07
1999	16	87		43.1	7.41	3.49	4.3	1.82
2000	14.45	80		28.5	5.41	1	10	4.43
2001	8.46	33		8.2	1.85	0.36	2	0.49
2002	15.9	42		35.1	6.22	1.02	1.8	0.89
2003	9.37	53		9.6	2.52	0.28	0.6	0.31
2004	7.49	27		14.4	2.05	0.3	1.8	0.6
2005	7.36	17		17.2	2.56	0.53	3.2	1.13
2006	6.6	15		9.3	2.82	0.27	1.7	0.72
2007	7.7	21		8 .0	2.2	0.14	1.4	0.66
2008	5.1		1.93			0.28	1.7	1.05
2009	2.2							

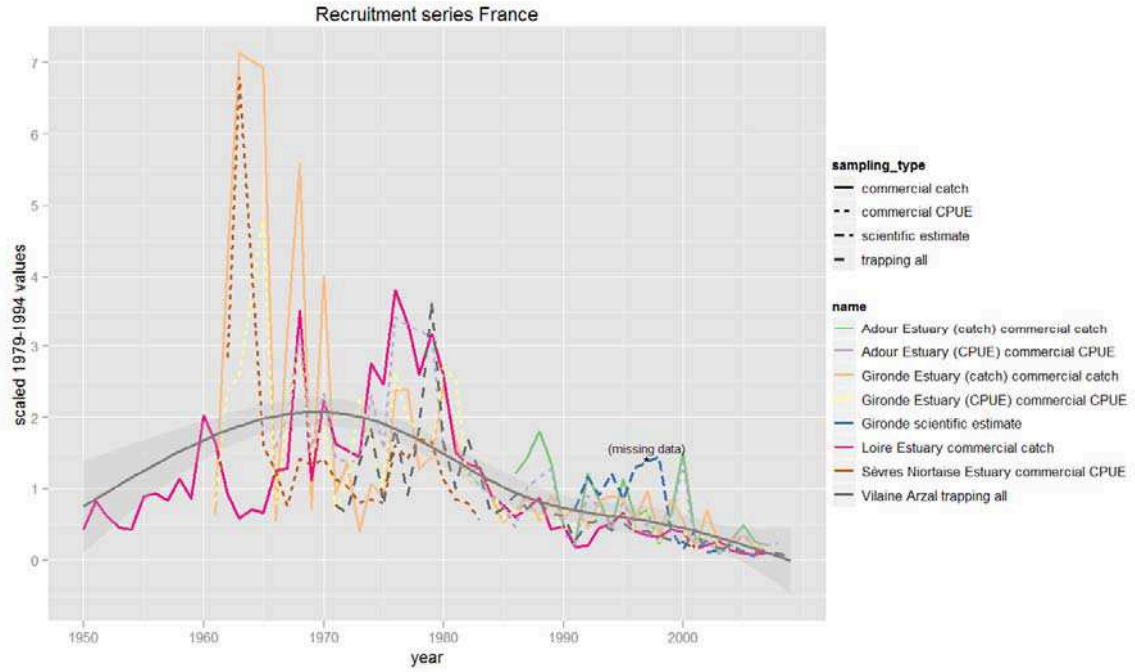


Figure FR.4. Recruitment series in France (scaled to mean1979–1994 value and after 1950). A smoother has been added to follow the trend. * missing data (considered as biased and retrieved from the dataset).

FR.3.1.2. Yellow eel recruitment

FR.3.1.2.1. Commercial

No available data.

FR.3.1.2.2. Recreational

No available data.

FR.3.1.2.3. Fishery independent

A database of migration at barriers is currently under construction, and will provide time-series for next year.

For the next years, in the framework of the French management plan, a network of index rivers (one for each EMU) will be set up in order to monitor ascending recruitment (glass eels or elvers) and migrating silver eels (Table FR.d). The preselected rivers are presented in the Table. The protocol details should be fixed.

Table FR.d. Pre-selected river for a river index network.

EMU	PRE-SELECTED RIVER
Adour	Gave de Pau (mountain fluvial basin <1000 km²) or La Nivelle (fluvial basin <1000 km²)
Gironde	Canal des étangs (estuary) or La Seudre (marshes)
Loire	Vendée (fluvial basin <1000 km²) / Sèvre Niortaise (marshes) or La Vie (fluvial basin <1000 km²)
Bretagne	Le Frémur (fluvial basin <1000 km²)
Seine-Normandie	La Bresle (fluvial basin <1000 km²)
Artois-Picardie	La Somme (fluvial basin >1000 km²) or L'Authie (fluvial basin >1000 km²)
Rhone Mediteranée Corse	A lagoon or Le Rhône (fluvial basin >1000 km²) A river in Corsica (fluvial basin <1000 km²)
Rhin meuse	Le Rhin (fluvial basin >1000 km²) or La Meuse (fluvial basin >1000 km²)

As an example on the Bresle River from the Seine Normandie EMU (close to the Artois-Picardie EMU), a small river of 70 km long with a mean flow of 7 m³/s, a trap (daily counting from April to December) on an eel ladder allows to follow the relative evolution of the upstream migration since 1994 (Figure FR.5). The proportion of eel that use the fish compared with other way of passage needs to be specified to obtain an absolute evaluation of upstream colonization. The increase observed in 2003 is probably caused by an improvement of the ladder accessibility and highlights the importance of the validation of such series.

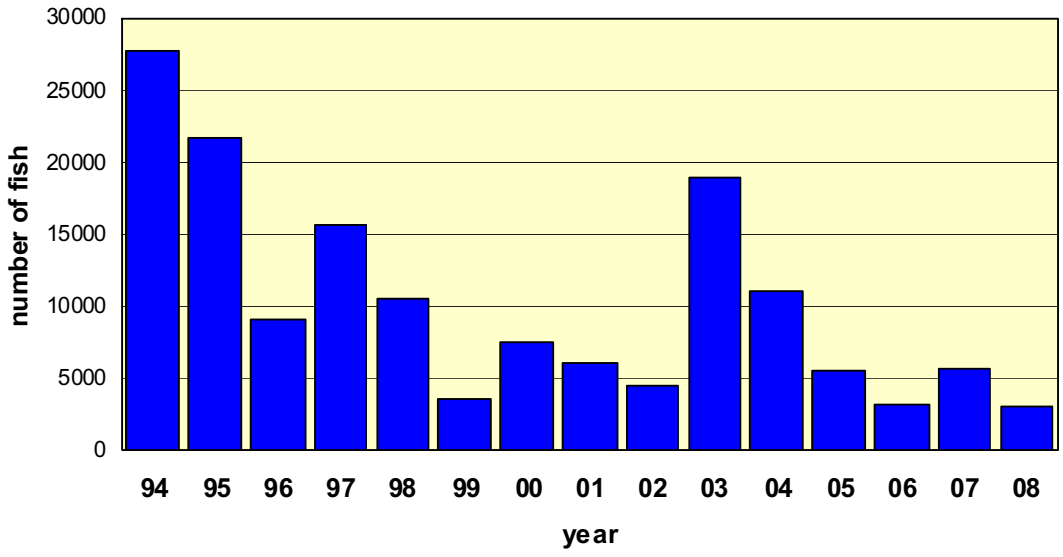


Figure FR.5. Annual evolution of fish number in the eel ladder trap on the Bresle River (data ONEMA).

It is also possible to analyse the fish characteristics. For example, eel length ranges between 55 mm and 305 mm with 88% of fish being between 75 mm and 115 mm among more than 28 000 eel measured. The mean eel length has slightly increased since 1994 (Figure FR.6).

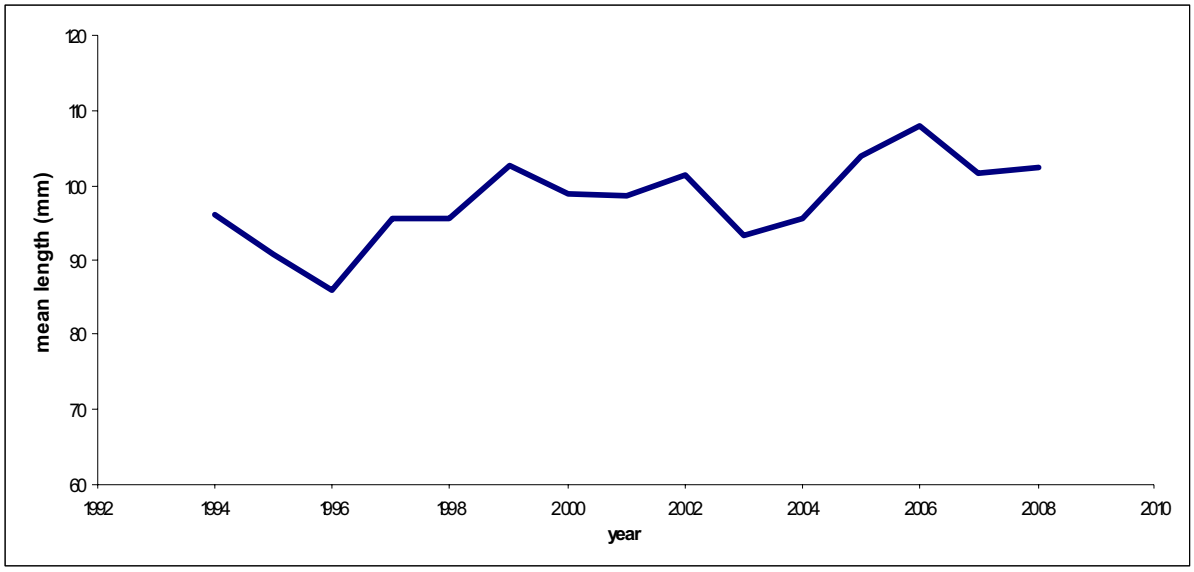


Figure FR.6. Annual evolution of mean length in the eel ladder trap on the Bresle River (data ONEMA).

FR.3.2. Glass eel landings time-series

There are eight EMU in France among which six are concerned with glass eel catches.

FR.3.2.1. Rhine-Meuse EMU

No glass eel there….

FR.3.2.2. Channel: Artois Picardie and Seine Normandie EMU

The channel region is covered by three EMU, Artois Picardie (A-P), Seine Normandie (S-N), and Brittany. In Brittany some catches occur in the north, in the Channel area but they are not very important when compared with western and southern Brittany. The following part covers glass eel catches in the channel apart from Brittany.

Data from the channel come from the Somme fishery (corresponding to a nominal effort of 13 fishermen on 15 licences in 2008) and other fisheries including the "Seine" (which sum up to 17 fishermen corresponding to 23 licences in 2008). In 2008, the reporting from fishermen can be considered as good in the Somme estuary, and of a lesser quality elsewhere due to aggregated catch report. The catch for the Somme estuary sums up to 314 kg in 2008. The catch for the remainder of the channel amounts to 807 kg. The fishing season starts in February and stops in May, and is the latest in France. The time-series, built mostly from data included in the French man-

agement plan, is made of landings report from fishermen. Data are missing for the Somme estuary in 1994 and 1995, and in 1988–1990 for the Seine and Norman coastal streams. 1986 and 1987 are made from inquiries from Desaunay, 1987. They represent the "possible" catch during the 1980 decade, so they are possibly a little bit overestimated.

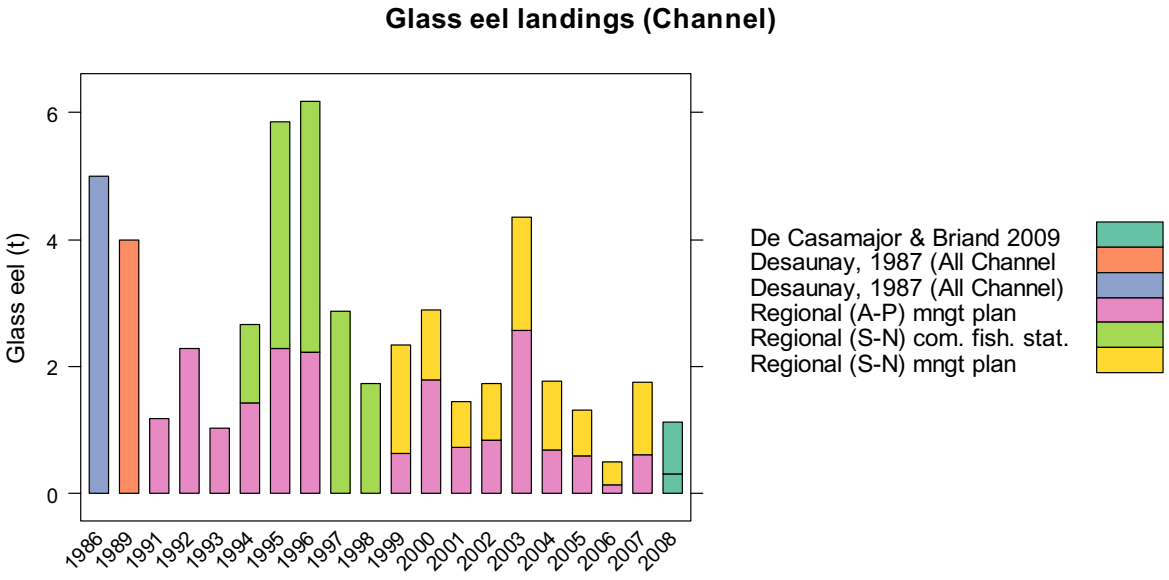


Figure FR.7. Glass eel landings in the channel according to the source of data.

The landings in 2008 are estimated at 1t100 (De Casamajor and Briand, 2009) and could possibly represent 1t 800 when assuming that all licenced fishermen are fishing.

FR.3.2.3. Brittany EMU

The main fishery for glass eel is the well known Vilaine glass eel fishery. Other glass eel fishery are scattered among the many coastal streams of Brittany.

FR.3.2.3.1. The Vilaine

The fishing conditions in the Vilaine do not depend on environment factors other than tide levels (Briand, 2009). The catch during the fishing season is equivalent to total recruitment. The only change brought in the time-series has been a reduction in the fishing season from 1996 but this is corrected in the current series by estimates of "late arrivals". Therefore, the following graph is labelled "glass eel recruitment se-

ries" though it amounts more or less to total catch, as escapement in the Vilaine is of little importance when compared with the landings.

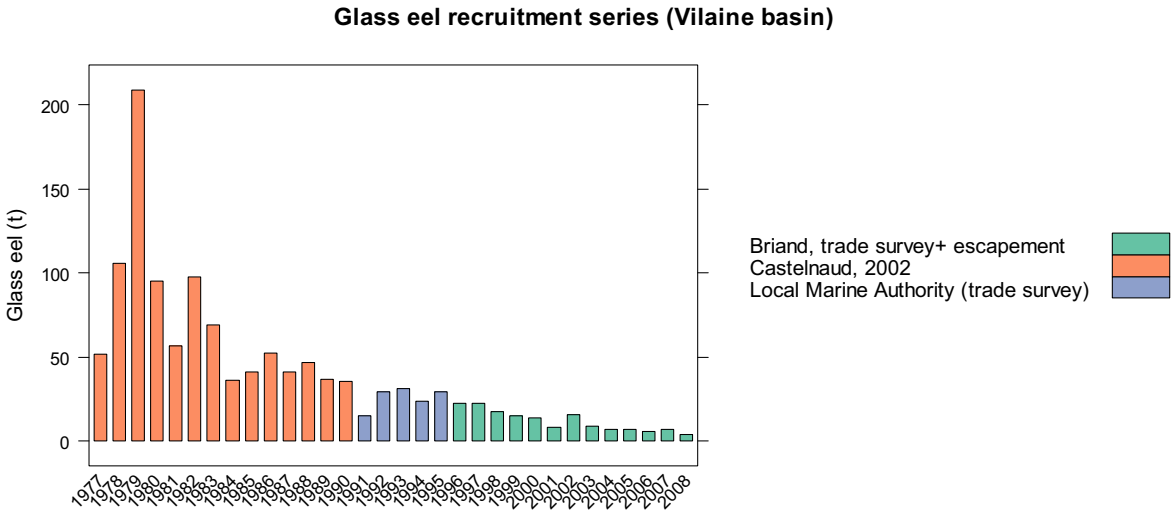


Figure FR.8. Historical series of glass eel landings in the Vilaine estuary according to the source of data.

FR.3.2.3.2. Brittany other than the Vilaine

Aubrun, 1986 includes non professional fishermen. Catches from 2002 are collected from fishermen logbooks.

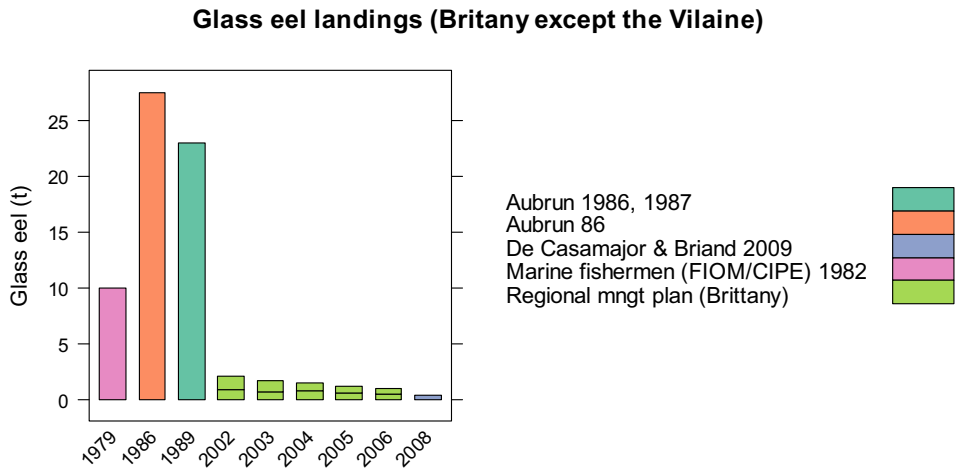


Figure FR.9. Glass eel landings in Brittany.

FR.3.2.4. Loire EMU

FR.3.2.4.1. The Loire estuary

For the Loire, as for other basins we have gathered data for as many sources as we could. As the Loire is probably one of the most complex cases, we chose to illustrate the process of data selection in Figure FR.10. The data from the Loire come from several areas and two categories of fishermen (fluvial and marine fishermen). Local rules for access to the fishing areas and licence are quite complex. Catches are made by fluvial fishermen upstream, marine fishermen downstream and there has historically been a well developed and integrated poaching practice along the banks of the estuary.

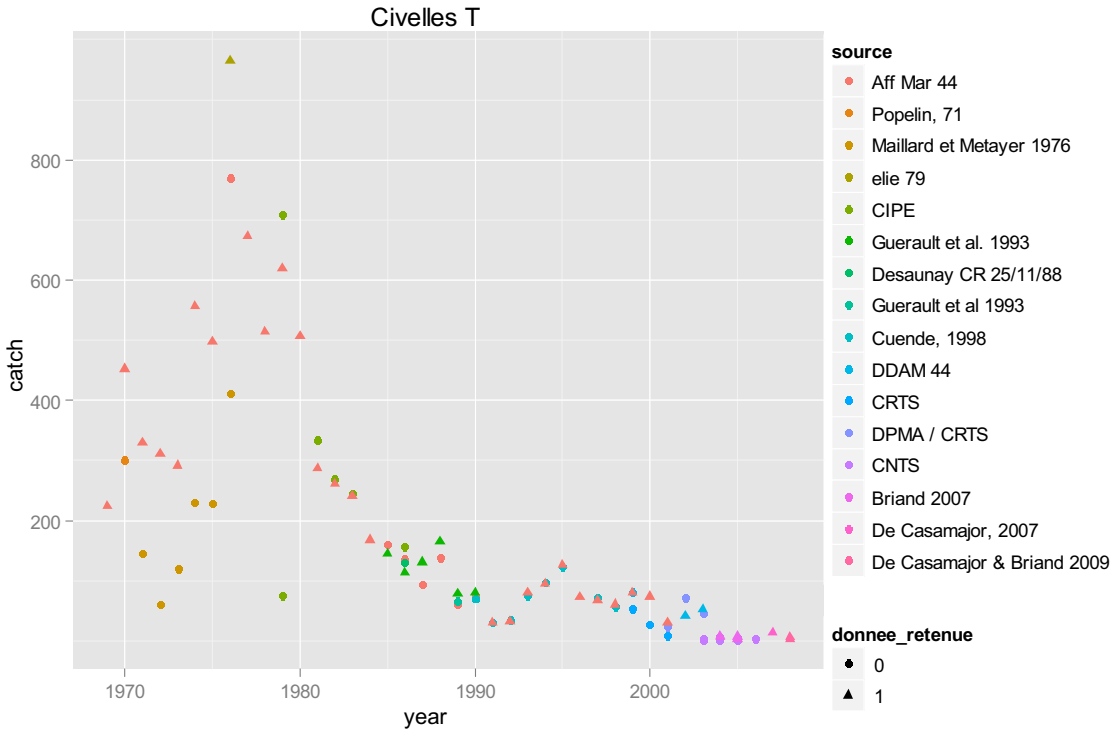


Figure FR.10. Selection of data for the historical series in the Loire estuary, several data can be selected (donnee_retenue=1) for one year provided they concern different categories of fishermen or different areas within the basin.

These various sources of data lead to the well known Loire series which should be considered with caution before drawing conclusions on recruitment trend, as it is a

series of total landings (hence subject to variations in effort) and built from many sources across time with various reliability.

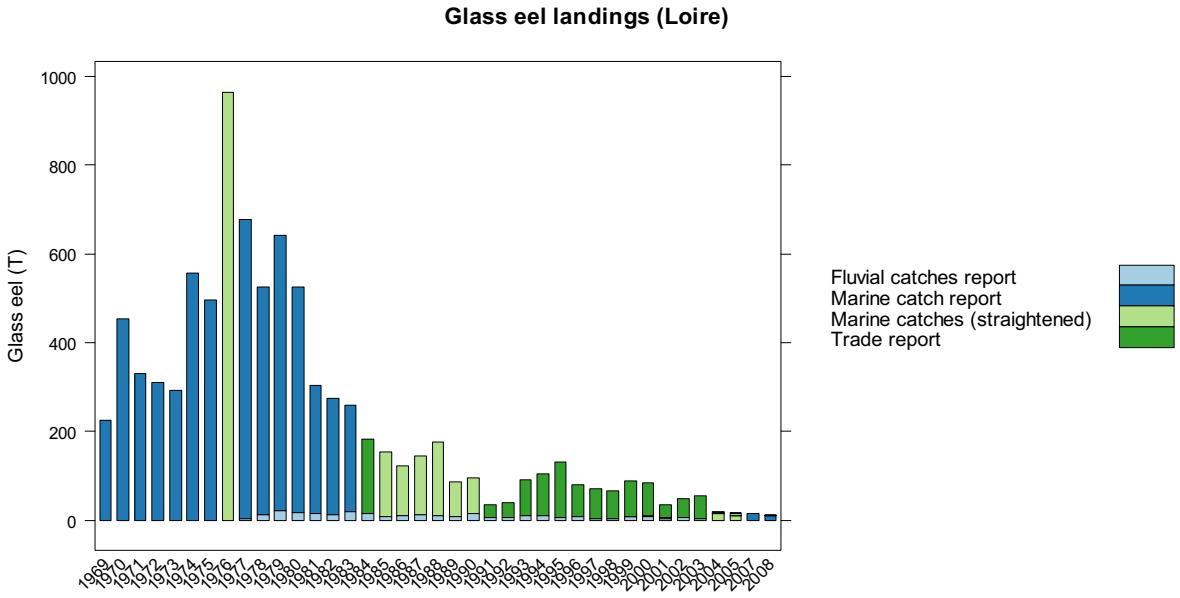


Figure FR.11. These various sources of data can be synthesized in the following graph, fluvial catches have not been included since 2003.

FR.3.2.4.2. The Vendée estuaries

The Vendée, located south from the Loire is mainly formed of small estuaries, the largest being the Sèvre Niortaise whose fishery was well described by Gascuel, 1987. With small streams and estuaries, but large landings, the Vendée is probably the place in France with the largest recruitment and unfortunately the worst series of data. Most data in the Vendée time-series are underestimated, except for data in 1976, 1986, 1989 (Respectively Elie, 1979; Aubrun, 1987; and Aubrun, 1986, 1987; Gascuel, 1987 and Désaunay, 1987). Those data also include in 1986 an estimation of catch from non professional fishermen in the Lay and Sèvre Niortaise. Some years (1993, 1997), data from the smaller estuaries (but large landings) of the Baie de Bourgneuf might be lacking and explain the low level of catch. 1999–2001 data come from the fishermen syndicate. In 2008 the level of landings was estimated as18 t (as shown on this graph) and extrapolated to 22.7 t (using nominal effort, see landings part). This dataseries should not be considered as reliable.

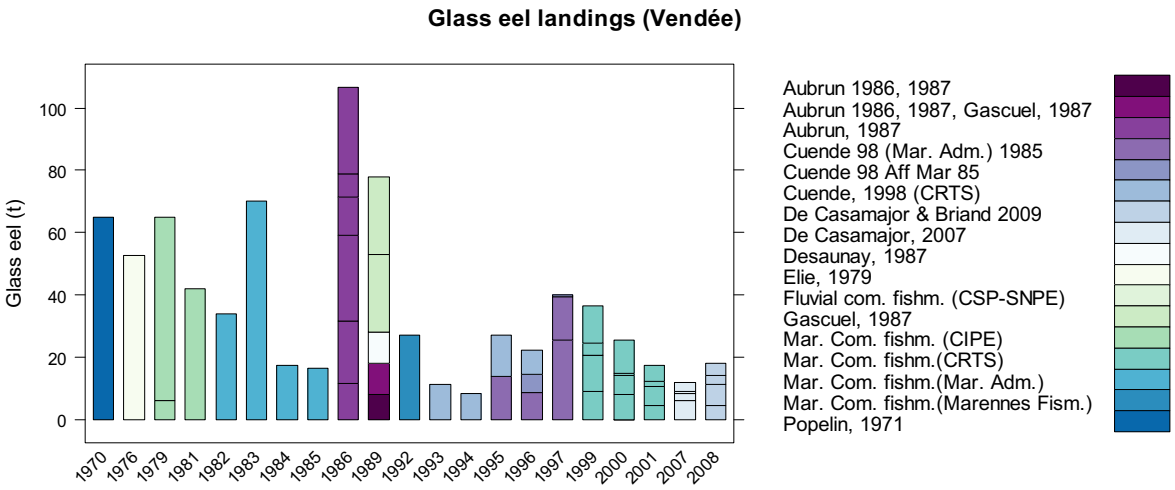


Figure FR.12. Glass eel landings in the Vendée region (Loire EMU), colour according to the source of data.

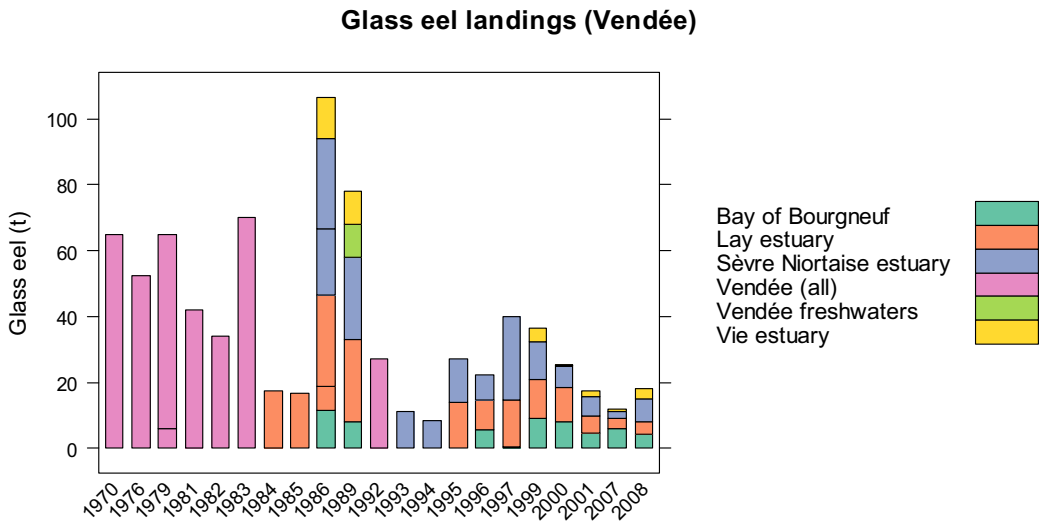


Figure FR.13. Glass eel landings in Vendée (Loire EMU), with colour according to the catch location.

FR.3.2.5. Garonne EMU

FR.3.2.5.1. The Charente and Seudre estuaries

The Charente and Seudre are two estuaries located north from the Gironde. The fishing areas comprise the Charente, the Seudre, the small Brouage canal (some boats) and catches made in the Oleron Island straight. As in the Gironde, the fishermen use large 14 m² pushnets with some boats remaining at anchor in the inner part of the Seudre estuary.

As was the case in the Vendée, the historical time-series shows variation with large underestimates some years (1993–1994) which are hardly credible. Fluvial fishermen catches are reported some years (1989, and 1999–2001), but they are of little importance when compared with marine fishermen catches. There is an estimation of recreational fishermen landings one year (1986) by Aubrun, 1987.

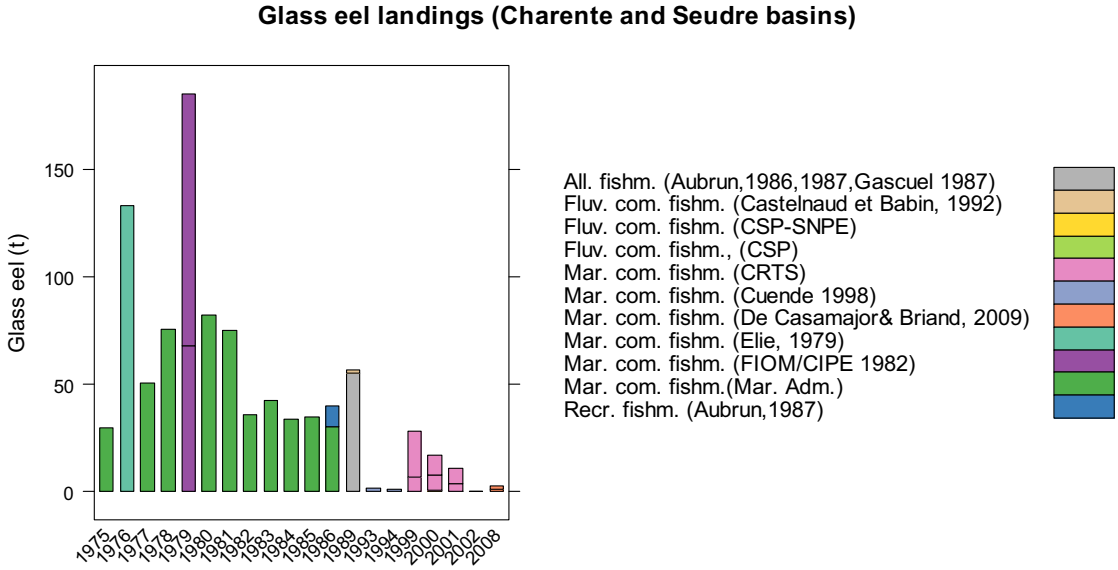


Figure FR.14. Glass eel landings in the Seudre and Charente basins (Loire EMU), with colour according to the source of data.

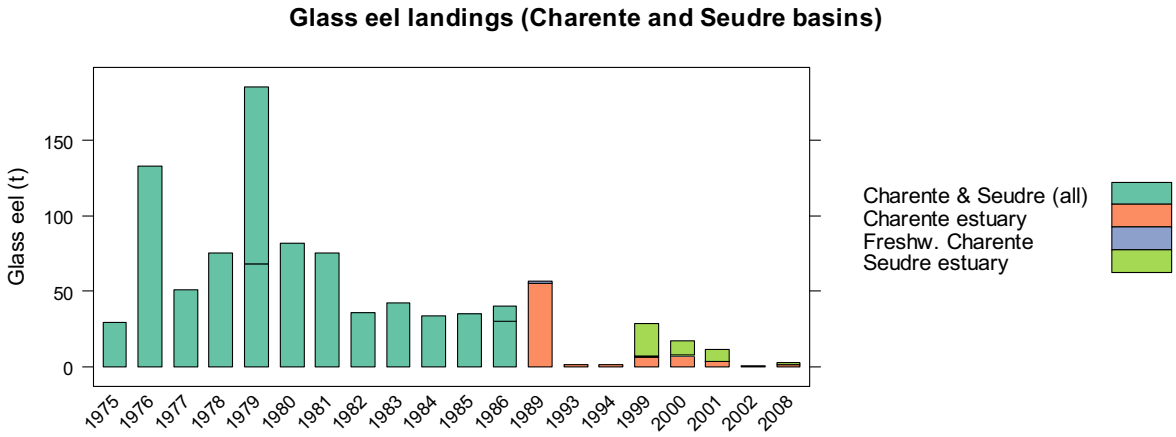


Figure FR.15. Glass eel landings in the Seudre and Charente basins (Loire EMU), with colour according to the location.

FR.3.2.5.2. The Garonne

The Gironde series has been collected by the CEMAGREF and extended by Beaulaton, 2008. The Gironde is one of the few estuaries where an estimation of recreational landings is available as a time-series. It was extrapolated from professional landings and number of river amateurs fishermen. The oldest catches (<1936) were extrapolated thanks to data that have been collected by Gandolfi in several papers, and that come from the railway statistics and San Sebastian market. In the 1980s, the catches from recreational fishermen were larger than those from commercial fishermen.

One should notice that landings were, until the beginning of the 1980s, dominated by the freshwater tidal reach catches ("Garonne Dordogne Isle rivers") but since then have been overtaken by brackish estuary catches ("Gironde estuary").

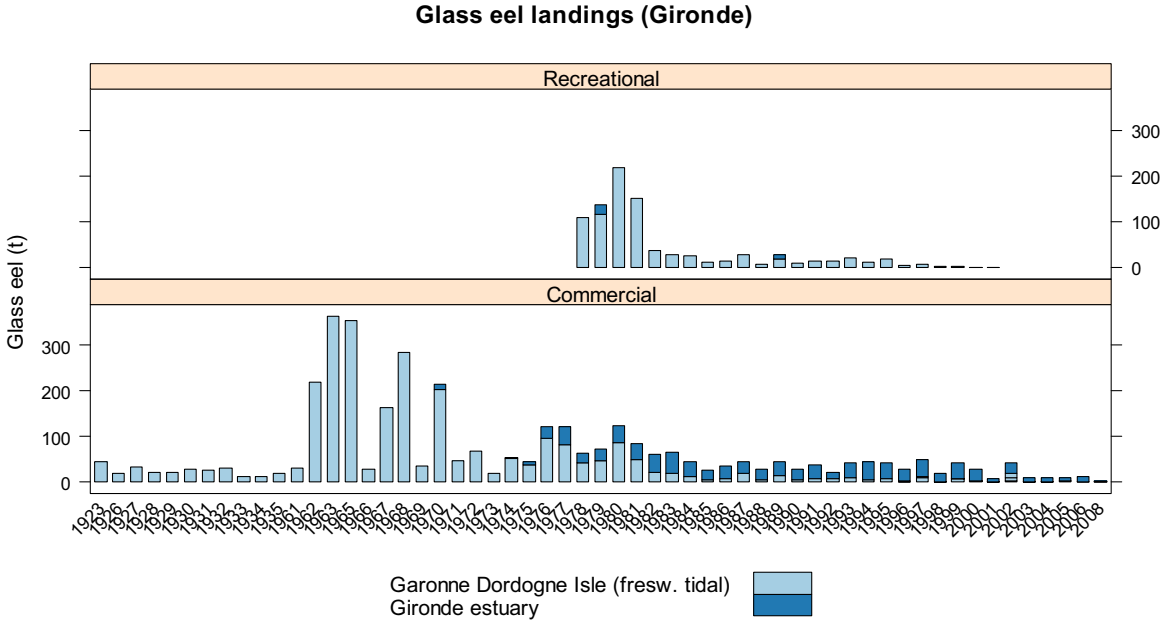


Figure FR.16. Glass eel landings in the Gironde (Garonne EMU), colour according to the catch location.

FR.3.2.5.3. The Arcachon Basin

A small fishery with handnets occurs in the Arcachon basin. It is mostly located in the canal des Etangs. We have only one historical data in 1989 (Aubrun, 1986, 1987) estimating the landings as 12 t. In 2008, the sum of catches was estimated around 1 t for 17 fishermen (de Casamajor and Briand, 2009).

FR.3.2.6. Adour and Courants Landais EMU-Adour

The most important fisheries within the EMU are located in the Adour but glass eel fishing also occurs at the coast (wave fishery) and in the small streams of the Landes region. Trying to rebuild a time-series for the Adour EMU is quite complex. Catches are done by commercial fishermen (mandatory report) for both marine and fluvial categories and Recreational fishermen whose catch was quite large when estimated in 1986 (Aubrun, 1987). The time-series provided to the ICES group for recruitment trend is located in the Adour estuary and only concerns marine fishermen. Historical catches were quite large in the 1970s as they were estimated at 280 tons by Popelin, 1971.

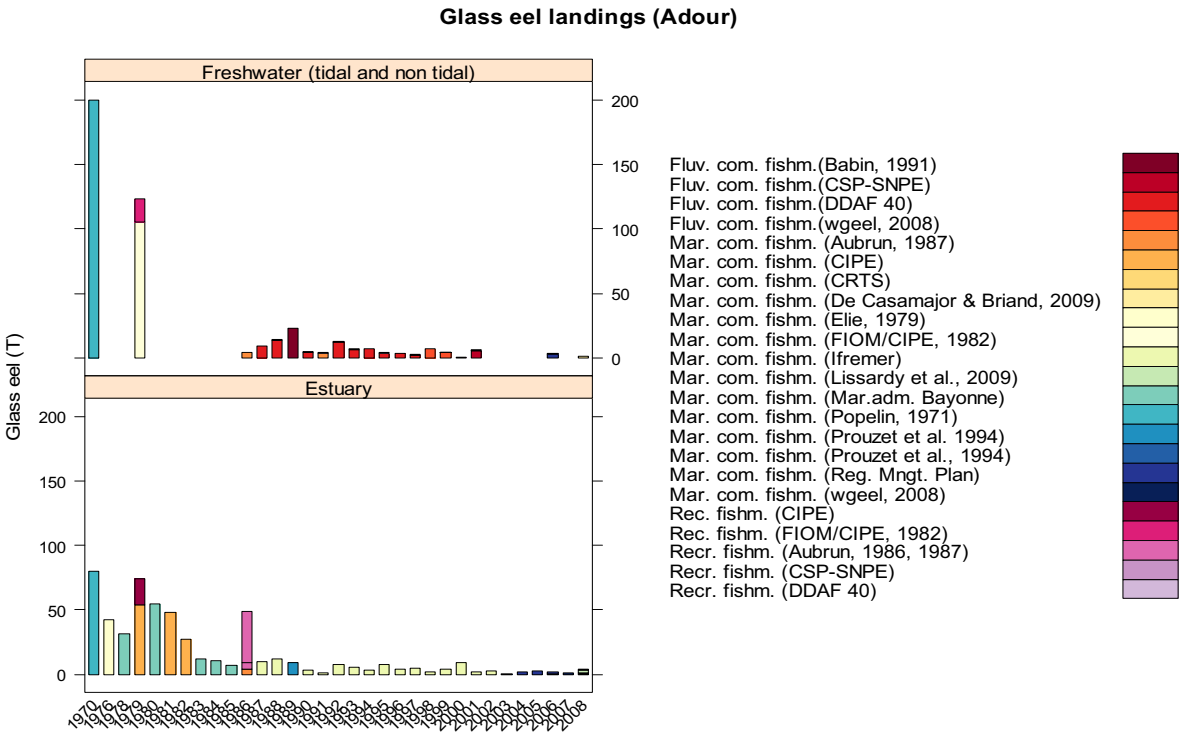
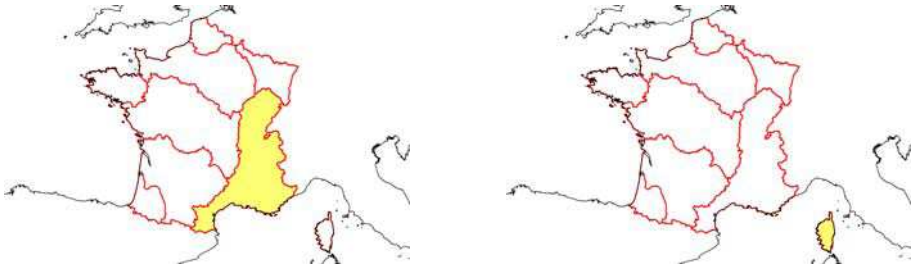


Figure FR.17. Glass eel landings in the Adour and Courants landais (Adour EMU), colour according to the source and fishermen (fishm.) type. The figure was split according to the location within the estuary.

FR.3.2.7. Rhône Mediterranean-EMU and Corsica EMU



Catch of glass eel is not authorized in the Mediterranean area.

FR.3.2.8. France overview

Table FR.e summarizes major French glass eel landings series from 1978 onwards. These series show clear decrease from more than 1000 t as overall before 1980 to less than 100 t as overall since 2004.

	PROFESSIONAL FISHERS CATCH (TONS)								NON PROFESSIONAL FISHERS CATCH (TONS)			
	Adour		Gironde		Loire		Vilaine	Total (1)	Adour	Gironde	Loire	Total (2)
Season	MP	FP	MP	FP	MP	FP	MP					
1978			22	43	514	12	106	**1393**		108		647
1979			26	47	620	22	209	1850		116		697
1980			38	87	508	18	95	**1491**		217		**1303**
1981			36	49	288	15	57	**890**		151		**904**
1982			39	22	261	13	98	**866**		36		**219**
1983			48	19	241	19	69	**791**		27		**161**
1984			32	13	168	15	36	**528**		26		**156**
1985			21	6	145	9	41	**444**		12		**71**
1986	8		27	9	113	10	53	**423**		14		**87**
1987	10		26	19	131	14	41	**461**		29		**172**
1988	12		22	6	165	12	47	**504**		7		**40**
1989	9		32	14	78	9	37	410		17		110
1990	3	4	23	6	81	16	36	**325**		9		**54**
1991	2	4	30	9	31	5	15	**179**		14		**87**
1992	8	12	15	8	32	7	30	**183**		13		**77**
1993	6	7	33	9	80	11	31	**329**		22		**130**
1994	3	7	40	5	95		24	**329**	18	12	0	**74**
1995	8	4	36	8	127	6	30	**413**	10	19	0	**113**
1996	4	3	25	3	73	8	22	**262**	12	4		**25**
1997	5		36	13	67	4	23	**287**	6	6		**39**
1998	2	7	16	2	61		18	**195**	7	1		**6**
1999	4	2	35	8	80	7	15	242	2	3	1	6
2000	10		25	3	74	6	14	206		0	1	2
2001	2		8	0	33	3	8	101		0	0	1
2002	2		25	10	42	8	16	**202**		6		**37**
2003	1		9	1	53	4	9	**151**		0		
2004	2	2	13	1	20	2	8	**89**	0	0	0	
2005	3	5	13	4	17	3	7	**89**	0	0	0	**2**
2006	2	3	8	1	15	2	7	**67**	0		0	
2007	1	2	7	1	21	2	8	**77**	0	0	0	
2008	3	2	6	2	19	3	5	71	0			
2009		0		0		1	2		0			

Table FR.e. Glass eel professional catches in the large French basins and total production in France for professional and non professional fishers. MP: marine professional fishers, PF: river professional fishers, Non professional: amateur fishers including poachers for Gironde; numbers in black= estimations by extrapolation; 0t = less than 1t.

FR.3.3. Yellow eel landings time-series

FR.3.3.1. Commercial

FR.3.3.1.1. Loire EMU

Grand Lieu Lake, connected to the lower Loire River is one of the most important fisheries from that basin. Figure FR.18 shows landings series from this lake from 1959 to 2008. Adam, 1997 describes historical data, as well as change in exploitation between 1960s 1970s and 1990s and particularly the replacement of traditional eel pots by modern fykenet and the extension of fishing season. Yellow eels and silver eels are only separated since 2002. For those years silver eels represent a mean proportion of 17%.

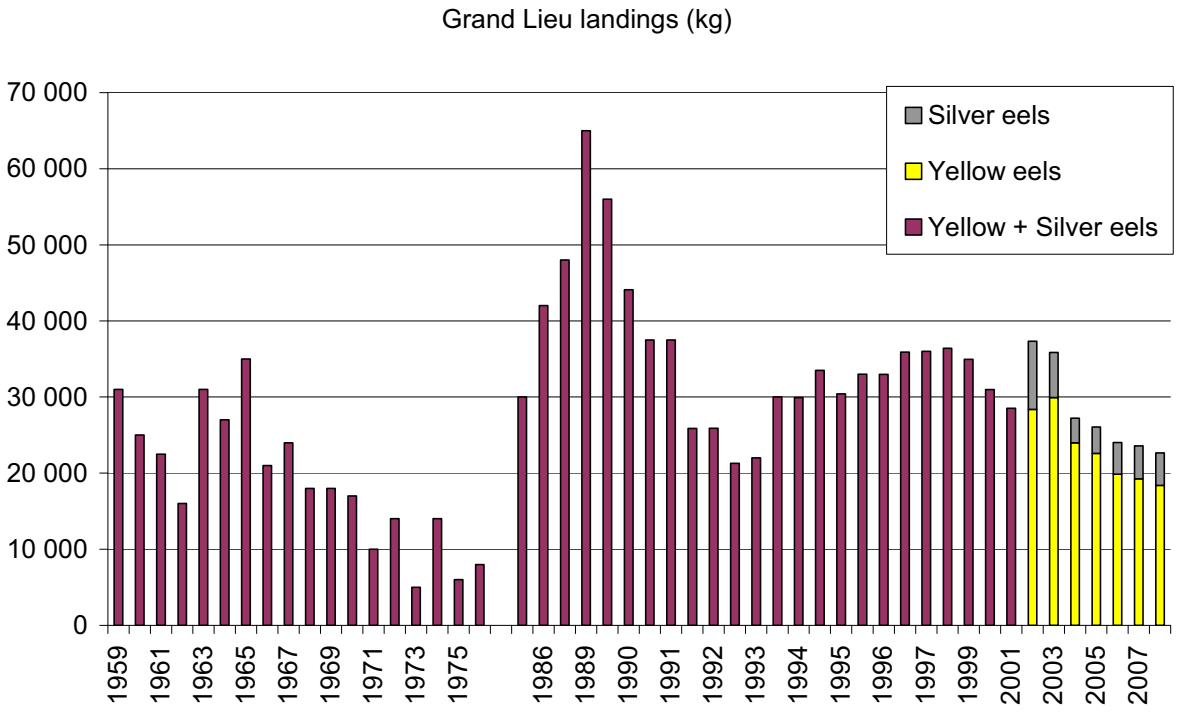


Figure FR.18. Grand Lieu lake (Loire EMU) landings from 1959 to 2008 (Adam, 1997; tableau de bord anguille Loire, Boisneau, pers. comm.).

FR.3.3.1.2. Garonne EMU

The Gironde series has been collected by the CEMAGREF and concerns landings from professional fishermen in the lower part of the Garonne basin (comprising the brackish estuary and the tidal freshwater reach of the Garonne and Dordogne rivers). This series has been extended by Beaulaton, 2008. One should notice that 1946–1977 data are based on small number of fishermen that may explain high variability from these years (Figure FR.19). The fisheries also shift from eel pot made of wood to plastic eel pots. Yellow eel landings clearly decrease over the last twenty years from 158 t in average between 1978–1986, to less than 9 t since 2005.

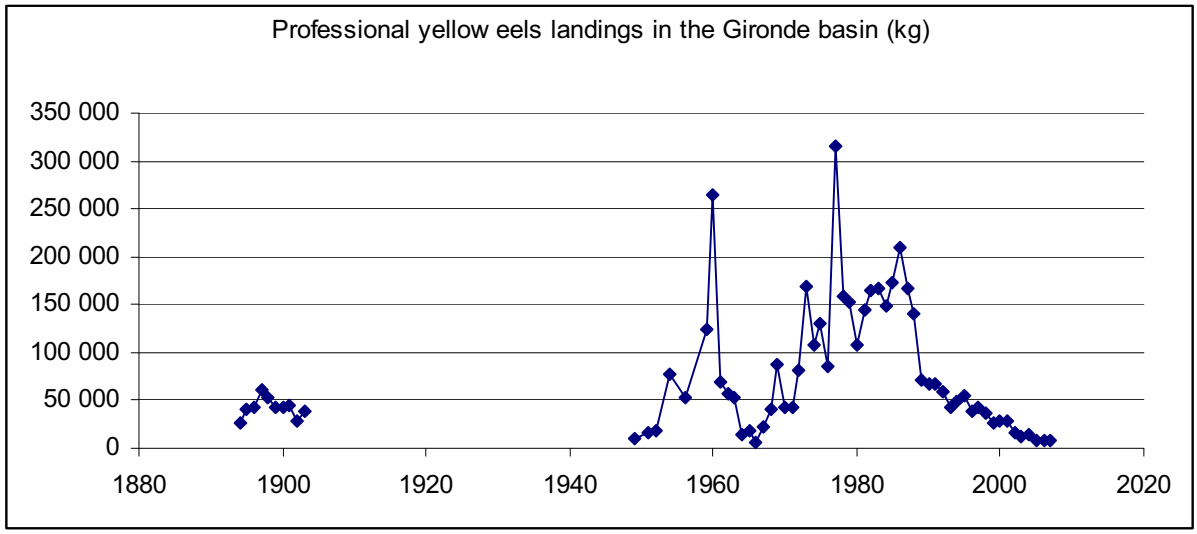


Figure FR.19. Marine and river professional yellow eel landings in the Gironde basin (brackish and freshwater estuary).

FR.3.3.1.3. Adour EMU

The Adour series has been collected by Ifremer since 1986 and concerns professional marine fishermen (Morandeau *et al.*, 2009). This series was extended from 1978 using local fisheries administration data. On this estuary the landings decrease from the last thirty years from 15 t in 1978 to 1 t and even less in 2002 and 2008 (Figure FR.20).

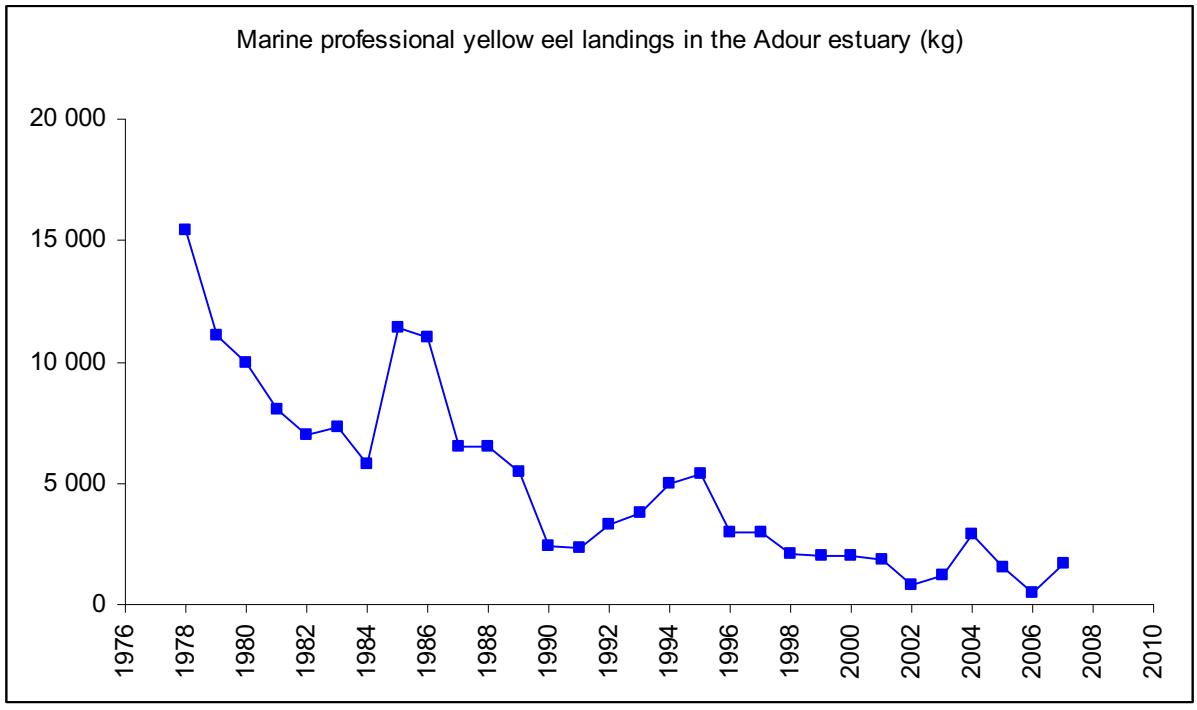


Figure FR.20. Subadult eel landings and associated effort for the Adour estuary from 1978 to 2007.

FR.3.3.2. Recreational

No data available.

FR.3.4. Silver eel landings

FR.3.4.1. Commercial

FR.3.4.1.1. Loire EMU

A short series of silver eel landings from the Loire basin, the only one where this stage is specifically targeted, is now available (Figure FR.21).

On the Loire river reach, above the Grand-Lieu lake, the landings from 7 to 9 river professionals are similar in 2004 and 2008, after increasing in the between, nearly of double in 2007.

On the Grand-Lieu lake (connected to the Loire river), landings from 7 river professionals decrease from 2002 to 2008.

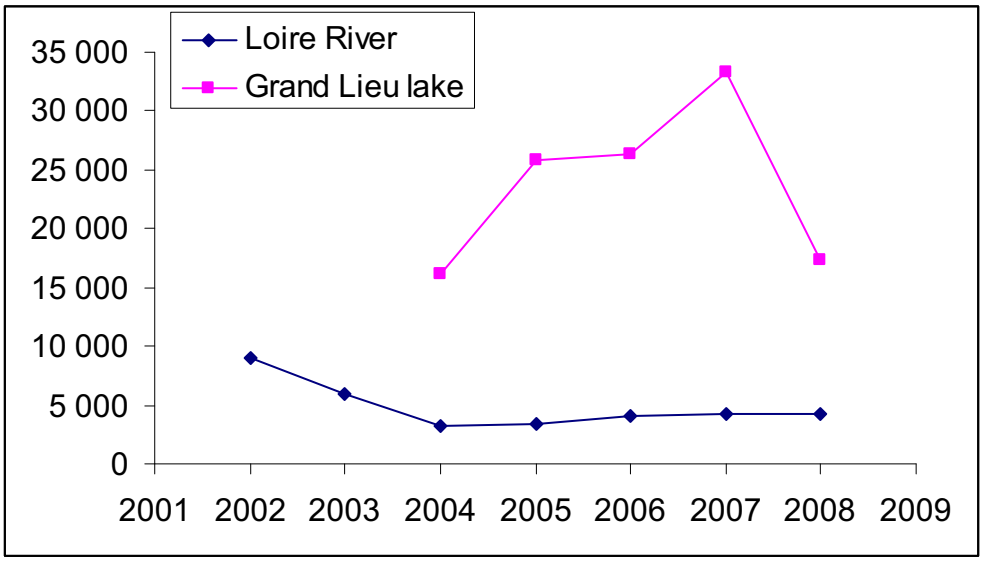


Figure FR.21. Silver eel catches in the Loire EMU (Boisneau P., pers. comm.)

FR.3.4.2. Recreational

No data available.

FR.3.5. Aquaculture production

No data available.

FR.3.6. Stocking

No restocking recorded at the central level.

FR.4. Fishing capacity

There is not a full and up-to-date register of fishing capacity in France. Until now the annual number of fishing licence for eel is produced each year by the marine fishermen organization but nothing similar exists for river fishermen. The type of gears used is known but apart the glass eel scoopnet for which the size is the same everywhere in France, the size of the glass eel pushnets vary with the location and the fishermen. The number of pots for yellow and silver eel varies in the same manner. Even the size of the net of the special gear for silver eel in the Loire River can be different from one fisherman to another.

FR.4.1. Glass eel

FR.4.1.1. For commercial fishermen

FR.4.1.1.1. Licenses

For marine commercial fishermen the quota of seasonal licence for glass eel has been limited historically to 1137. In 2001 the number of licence delivered was 1050; it has reduced to 843 in 2008 and will decrease to around 700 licences and "glass eel stamp" in 2009. Data on river professional licences is only available for 2007. In that year, there were 238 fluvial licences, making with marine professional fishermen a total of 1119 professional fishermen potentially targeting glass eel.

Table FR.f. Total number by COGEPOMI of the couple of ship(s)/fishermen authorized to fish glass eel in 2006, 2007 and 2008 (source DPMA/Conapped). For 2006 and 2008, marine professional fishermen only, 2007 river professional fishermen is added.

EMU	BASIN STAMPS	2006	2007	2008
Adour	Adour	69	68 + 119	62
Gironde	Arcachon, Gironde et/ou Charente	260	254+86	239
Loire	Loire et/ou Vendée	370	353+33	344
Bretagne	Nord, Sud Bretagne et/ou Vilaine	163	159	154
Seine-Normandie	Normandie	29	29	29
Artois-Picardie	Nord-Pas de Calais-Picardie	19	18	15
TOTAL		910	881 +238	843

FR.4.1.1.2. Fishing fleet

Table FR.g shows characteristics of marine fishermen boats in 2008. Note that 40% of them are concentrated within the Loire EMU.

Table FR.g. Technical characteristics of the glass eel marine fishing fleet in 2007 (ships registered in the fishing fleet file-source: SIH-IFREMER).

LENGTH CLASS	NUMBER OF SHIPS	LENGTH	PUISSANCE MOYENNE (KW)	MEAN AGE (YEAR)	MEAN NUMBER (MEN)
< à 7 m	174	6	45	18	1.1
7 à 9 m	236	8	73	24	1.1
9 à12 m	227	10.2	89	26	1.5
12 à16 m	1	12.2	87	38	1

FR.4.1.2. For Recreational fishermen

For legal river amateur fishermen, the number of licenses was stable from 1993 to 1999 with an average of 617. Since 1999, the number of legal river amateur fishermen has decreased to 285 in 2005 and 193 in 2006. The amateur glass eel fishery has been banned in 2006 in the Loire River.

FR.4.2. Yellow Eel

FR.4.2.1.1. Channel and Atlantic fisheries (both marine and freshwater)

Yellow eel fisheries are not under specific quotas of stamps like glass eel fisheries. Fishermen often target yellow and silver eels indistinctly.

The inland fisheries for yellow eels are scattered and involve professional fishermen, amateur fishermen with gears and anglers with rods.

Whatever the category, the number of fishermen has been decreasing since 1987 (Briand *et al.*, 2005).In 2001 only a part of the 450 professionals fishermen fishing diadromous species in inland waters target eel at yellow and silver stages (Castelnaud, 2000), their number is evaluated at 128 marine and 107 river professional fishermen (see Table FR.h). The most part of these marine professional fishermen and two third of these river fishermen also target glass eel.

FR.4.2.1.2. Mediterranean lagoon fisheries

Since 1988, the number of 400 to 500 marine professional fishermen targeting eel in the Mediterranean lagoons was regularly announced. Nevertheless, a strong decrease of the population was noticed: 63% between 1969 and 1994 on the Palavasiens lagoons (fishing zone 25, see Table FR.a) (Ruiz, 1994) and 33% between 1986 and 1996 on the Gruissan and Bages-Sigean lagoons (Loste and Dusserre, 1996; Dusserre and Loste, 1997).

For the Rhône-Méditerranée EMU, the most reliable data were collected by the Cépralmar in the Languedoc-Roussillon region which landed the main part of French Mediterranean eels and totalised 430 marine professional fishermen targeting eel in 2002, 208 in 2003 and 2004 and 244 in 2005 (Loste and Dusserre, 1996; Dusserre and Loste, 1997; Cepralmar, 2003, 2004, 2005, 2006). More recently, the Pôle relais lagunes méditerranéennes (2009) has estimated in all 41 fishermen in the PACA region in 2008 (the other region concerned by eel Rhone EMU).

For the Corse EMU, French eel management plan census 21 fishermen in Corse Mediterranean lagoons.

The previous evaluation (Castelnaud *et al.*, 2000) estimated that 513 marine professional fishermen were fishing yellow eel in 1997 in all the French Mediterranean lagoons. With the most recent data, a rough estimation of the number of fishermen in Mediterranean is 280 fishermen.

FR.4.2.2. National overview

Table FR.h. Mean number of yellow eel professional fishermen per fishing zone from 1999 to 2001, the most recent period with complete data (Source CSP, CRTS, Cemagref; except [a] 1997, Castelnaud, 2000;[b] 2000, Sauvaget, 2001).

EMU	Fishing zone	Marine professional	Fluvial professional	Total
Artois-Picardie & Seine-Normadie	Manche - Seine-Normandy	5(a)	1	6
Bretagne	Bretagne (Vilaine excluded)	13(b)		13
Bretagne	Vilaine	2	1	3
Loire	Loire	16	28	44
Loire	Grand Lieu		8	8
Loire	Vendée	5		5
Garonne	Charente-Seudre	1		1
Garonne	Gironde	30	42	72
Garonne	Arcachon	42		42
Adour	Adour + courants landais	14	10	24
Rhône-Méditerranée & Corse	Rhone		4	4
Rhin-Meuse	Rhin		8	8
Rhône-Méditerranée & Corse	Méditerranée	513	5	518
	Total	641	107	748

FR.4.3. Silver eel

FR.4.3.1.1. Channel and Atlantic fisheries (both marine and freshwater)

The only significant fishery targeted specially silver eel is in the Loire basin (Loire EMU), with 7 to 9 fishermen using the special gear called "dideau". Apart from this fishery, some fishermen fish during period and use gears those allow catching silver eels such as fykenets. The number of such fishermen is unknown, but at least the 7 fishermen from Grand Lieu Lake (Loire EMU) enter in that category. Some marine fishermen might also catch silver eel.

In 2002 the special five years authorizations for fishing silver eel in private waters by amateurs fishermen were stopped by the local fishery administration (more than 200 authorizations existed yet in 2000 from Changeux, 2001).

The silver eel fishery is no longer practised in the Vilaine where it was historically present.

FR.4.3.1.2. Mediterranean lagoon fisheries

A large part of the 280 fishermen catching yellow eels (see Section 4.2.1.2) also catch silver eels. The exact number is unknown.

FR.5. Fishing effort

FR.5.1. Glass eel (2008)

FR.5.1.1. Professional fishermen

Fishing effort for the glass eel fisheries should ideally be measured by the volume filtered by the fishery. When compared with the volume of the fishing area, it provides an estimate of the fishing efficiency (Beaulaton and Briand, 2007). In the following paragraphs, we describe the surface of the nets and the number of fishing days per fishing areas. Data about the fishing duration and the fishing speed are also necessary to compile an estimate of the true filtration and are not reported there as they are lacking in some places and require a thorough analysis.

FR.5.1.1.1. Gears

Table FR.i. Size and dimensions of the nets allowed in the French inland waters to professional fishermen. The numbers in bracket correspond to the EMU in Figure FR.3 (source Castelnaud, 2002).

TYPE	SHAPE	TOTAL FISHING SURFACE (2 NETS)	BASINS AND REGULATIONS, M=MARINE , F=FRESHWATER; EMU
Pushnet	Circular	2.262 m²	Nord pas de Calais (m), ARTOIS-PICARDIE Picardie (m), ARTOIS-PICARDIE Normadie (m), SEINE-NORMANDIE Bretagne (m), BRETAGNE Loire (m + f), LOIRE Baie de Bourneuf (m), LOIRE Garonne, Dordogne, Isle (f), GARONNE Adour (f), ADOUR
Large pushnet (Pibalour)	Rectangular	8 to 14 m²	Gironde (m), GARONNE Charente (m), GARONNE Seudre (m), GARONNE
Handed scoopnet	Oval	Close to 2.262 m	Arcachon (m), GARONNE Garonne, Dordogne, Isle (f), GARONNE Courants Landais, Adour (m), ADOUR
Pushnet	Square	2.88 m²	Lay (m), LOIRE
Pushnet	Rectangular	4.32 m²	Sèvre Niortaise (m), LOIRE
Pushnet	Rectangular	3.60 m²	Vie(m), LOIRE

The classical and basic gear used to fish glass eel is the scoopnet of different sizes and shapes. Scoopnets are handled from the river bank for amateur fishermen (1 scoopnet of small size) or handled from a boat for professional fishermen (1 scoopnet of large size and oval) or pushed by a boat (2 scoopnet of large size and circular). They are called "pibalour" when they are rectangular, wider and pushed by a boat.

For amateur fishermen, the scoopnet dimension is 0.19 m² in all basins.

The poachers with or without boat can use the different gears and techniques described but also special poaching devices like very large nets called "chaussette" or passive traps called "caisse à civelles" (see Luneau *et al.*, 2003 for more details).

FR.5.1.1.2. Fishing effort in number of trips per day

The glass eel fishing effort has been analysed from marine fishermen reports only (river fishermen not yet available). Boats larger than 10 m report in logbooks, and those data were not available at the time of the Report. In each fishing area, the fishing effort has been extracted through a selection process. Several screenings were applied with the objective to extract "daily" data from the database, and to discard aggregated data. In this screening process, some catches, that were effectively daily catches, might have been discarded. Daily mean catch where calculated for each location, sometimes grouping several small estuaries, and the seasonal trends are often consistent for the whole fishery. Note that the sum for the number of fishermen with daily catch (given in the legend) is done per graph, and thus a fisherman fishing two places will be counted twice so the sums might differ from those reported in Table FR.f.

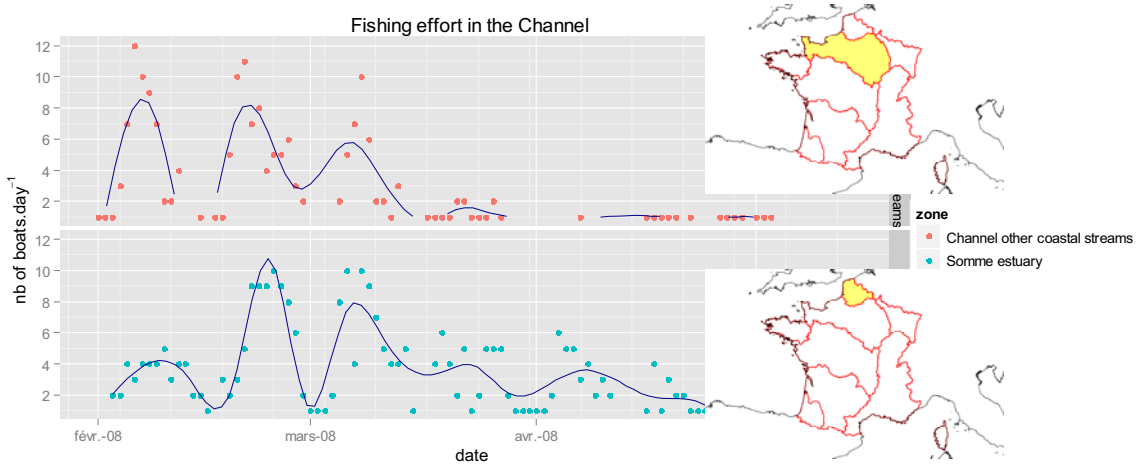


Figure FR.22. Trend in daily mean fishing effort of marine commercial glass eel fishermen in the Channel in 2008, based on 28 boats with daily catch report on 44 licences.

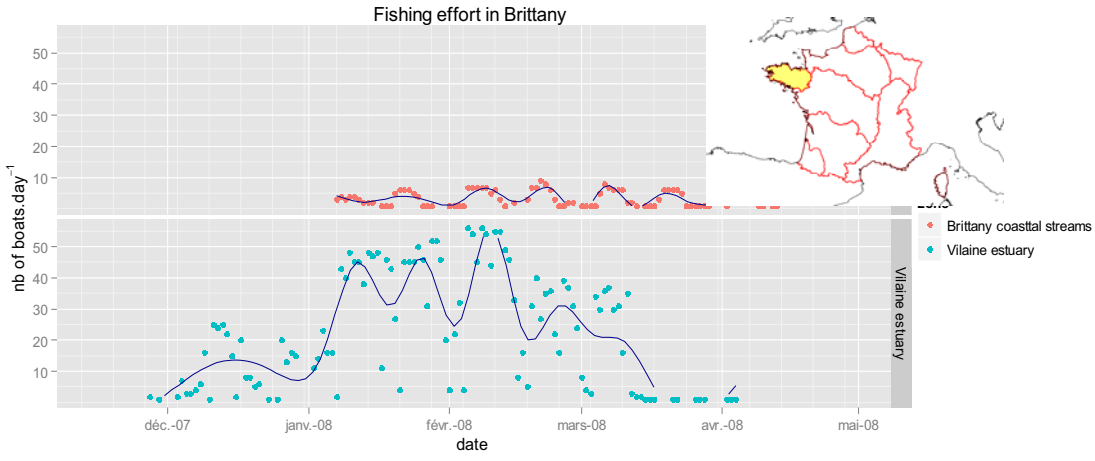


Figure FR.23. Trend in daily mean fishing effort of marine commercial glass eel fishermen in Brittany in 2008, based on 74 boats with daily catch report on 154 licences.

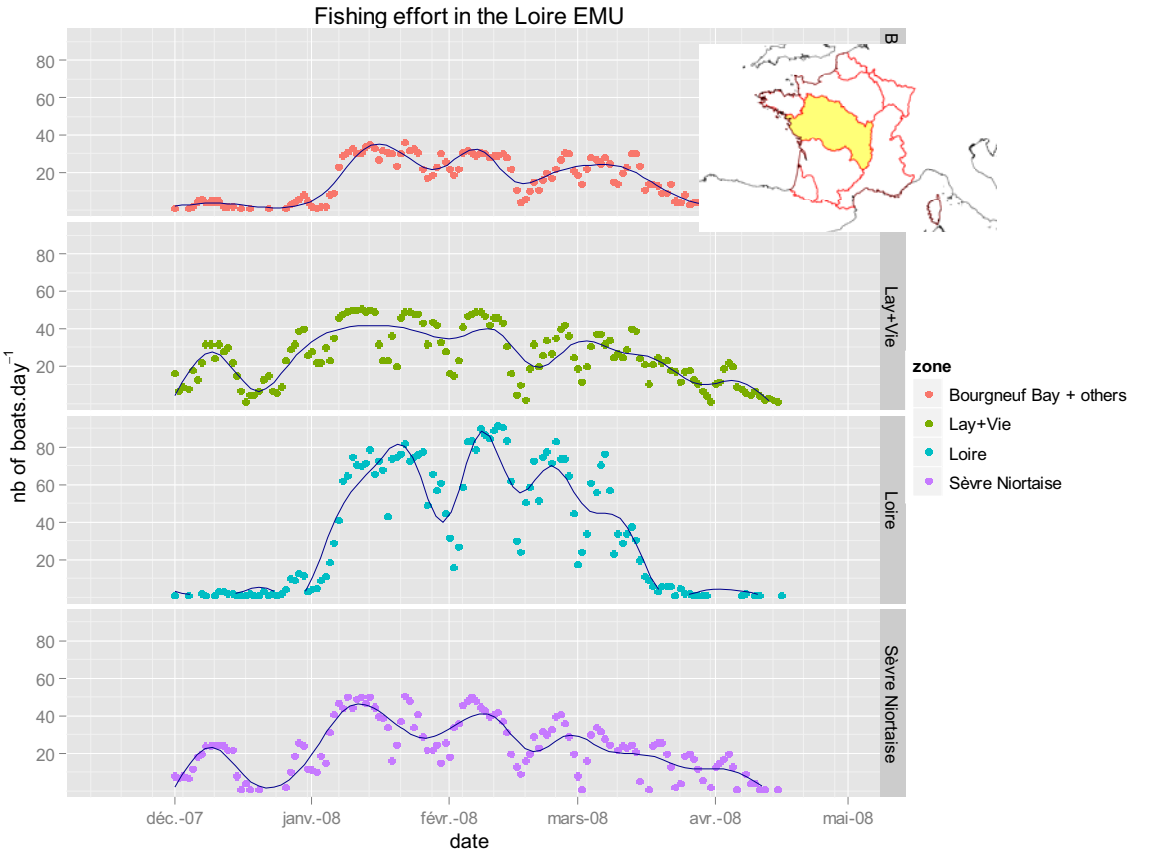


Figure FR.24. Trend in daily mean fishing effort of marine commercial glass eel fishermen in the Loire Eel Management Unit in 2008, based on 255 boats with daily catch report out of 344 licences.

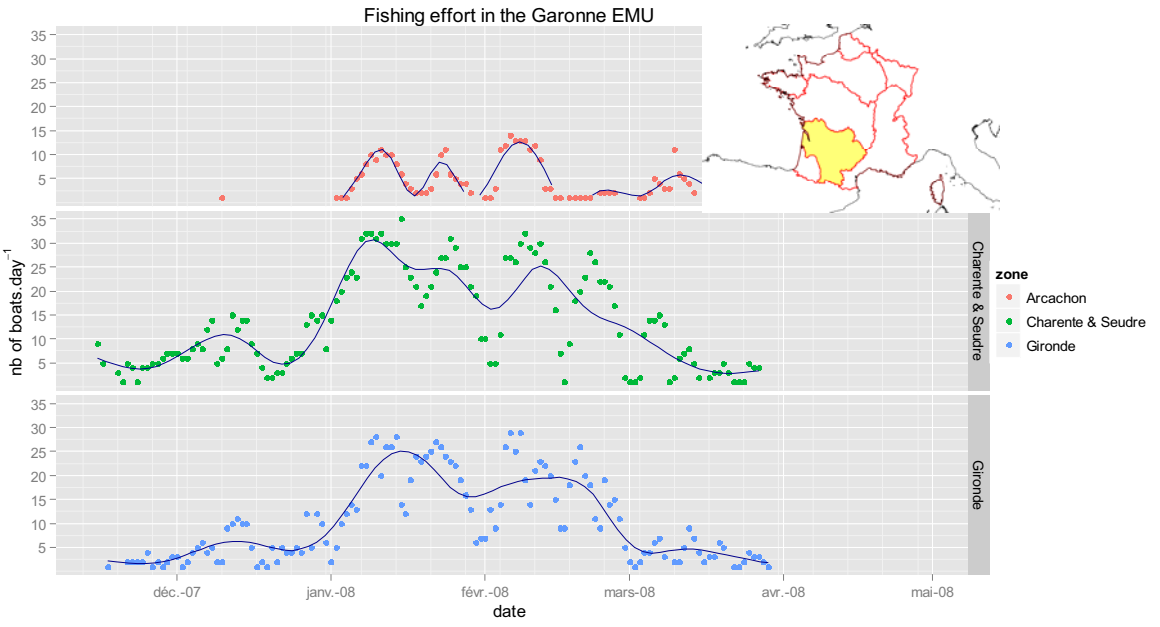


Figure FR.25. Trend in daily mean fishing effort of marine commercial glass eel fishermen in the Garonne Eel Management Unit in 2008, based on 85 boats with daily catch report out of 239 licences.

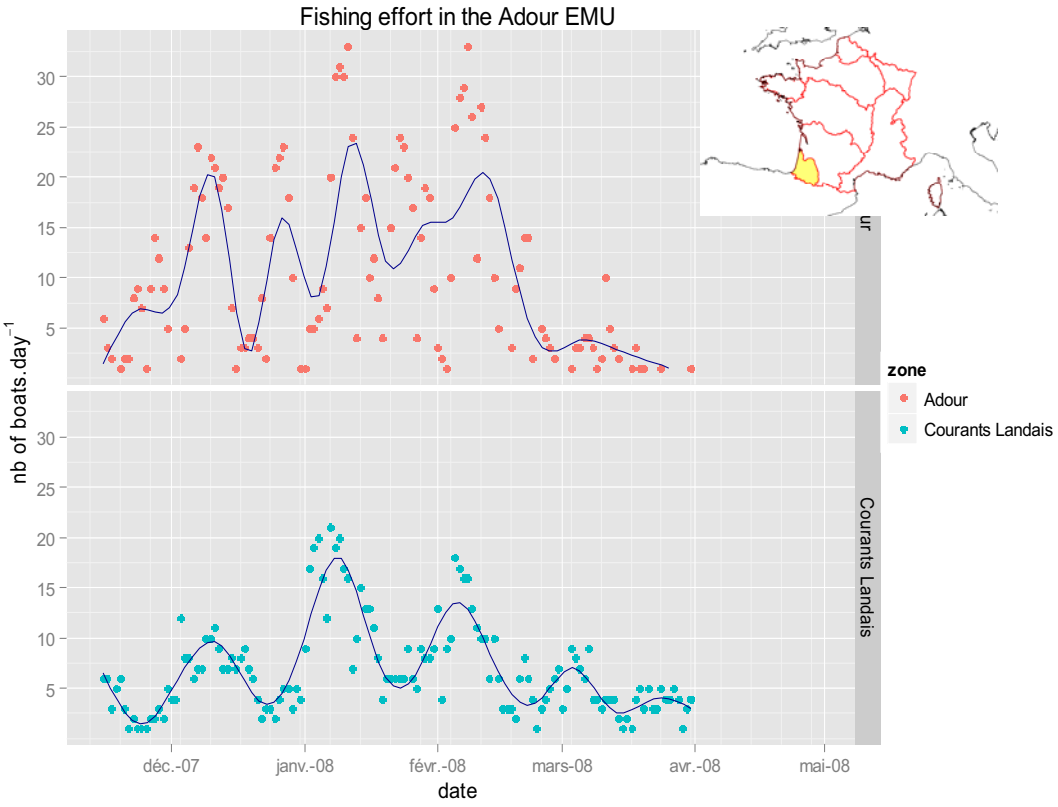


Figure FR.26. Trend in daily mean fishing effort of marine commercial glass eel fishermen in the Adour Eel Management Unit in 2008, based on 92 boats with daily catch report out of 62 licenses[2].

To synthesize at the national level, the effort was extrapolated to the whole fishery using the number of stamps (fishing authorizations in an estuary). It must be emphasized again that statistical reports of logbooks boats were not available at the time of the Report, and that catches were screened to obtain daily values, so the difference between daily report selection and extrapolated value does not mean underreport.

[2] It might seem surprising that in the case of the Adour, the number of boats is larger than the number of licences. But indeed, some fisheries in the Adour take place at the coast and in that location the «CIPE» licence was not mandatory.

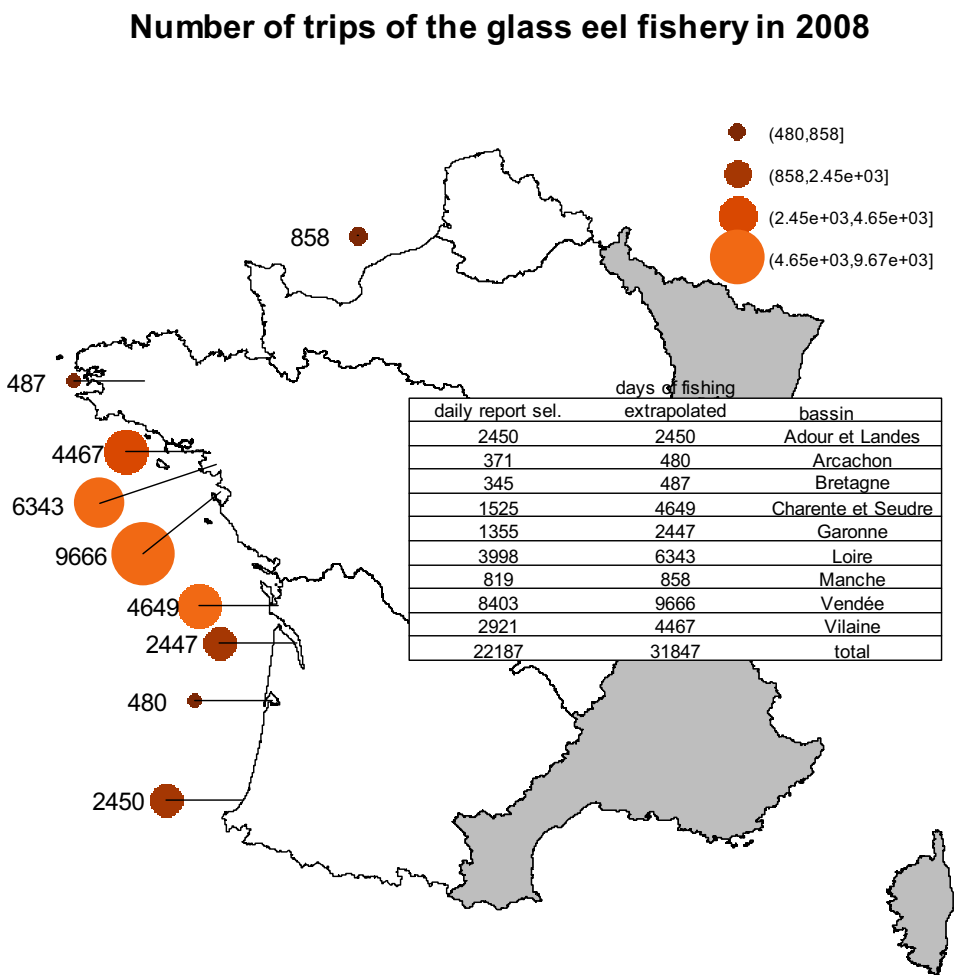


Figure FR.27. Total number of fishing days for marine commercial glass eel fishermen in 2008. The value has been extrapolated to the whole fishery (see text this paragraph and in landings for discussion on the method used).

FR.5.2. Yellow eel

In inland waters, the eel pot (10 mm mesh size minimum, last entrance larger than 40 mm) is the common fishing gear used by all categories of fishermen to fish yellow eel. The shapes are much diversified according to the basin and also the fishing zone; the eel pots are not always baited. The fykenet is also used by the professionals only, with a 10 mm mesh size minimum. A barrier can be associated. Others gears exist: deeplines, liftnets, "vermée" for anglers.

The main fishing gear used in Mediterranean lagoons is a fykenet (mesh size 10 mm) transformed with wings ("ganguis") and with three chambers ("capéchade"). In some places, fixed fisheries are made of batteries of fykenets. These fixed fisheries have to let a passage for the migration from the lagoons to the sea of euryhalines species which are mostly captured (sea breams in particular).

FR.5.3. Silver eel

The special gear called "dideau" used to fish silver eel in the Loire basin was introduced from large rivers in the Netherlands in the early 20th century. It is a sort of trawl used from a fixed boat. The net measures 25 m of length with a mouth of 10 m width and 5 m height. The mesh size starts at 16 cm at the mouth and ends at 10 mm.

Silver eel are also catch with gears cited above for yellow eels, particularly fykenets, "ganguis" and "capéchade".

FR.5.4. Marine fishery

Data not available.

FR.6. Catches and landings

FR.6.1. Glass eel

FR.6.1.1. Professional fishermen (2008)

The landings were processed from the small boats without logbooks (boat <10 m) for marine fishermen, as the data from logbooks reports were not available at the time of the Report. As some data were lacking we have chosen to straighten the total landings using the number of licences. For river fishermen compulsory declaration to SNPE are taken.

We think that this method might have been accurate for the two following reasons:

- An extrapolation from these data ends up with catches of 5 t 3 for the Vilaine while a sum of 5 t 1 was collected from fish dealer survey;
- The extrapolation to France gives total of 71 t which is within the estimation of total traded (68–72 t; Table FR.j).

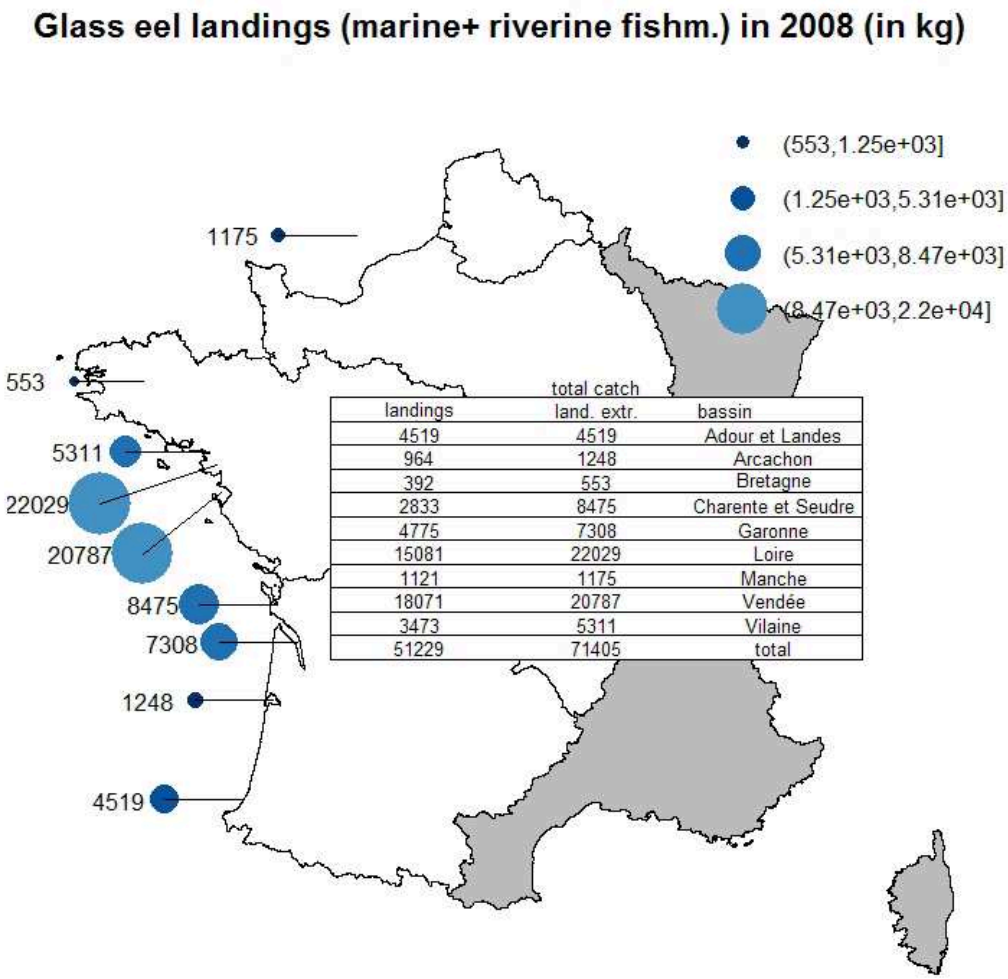


Figure FR.28. Total landings estimated for marine and riverine commercial glass eel fishermen in 2008. The value has been extrapolated to the whole fishery (see text this paragraph and in effort for discussion on the method used).

FR.6.1.2. Recreational fishermen

No data available.

FR.6.1.3. National overview (glass eel 2008 and 2009)

Three sources of data can be used: landings, trader statistics (unofficial) and EU trade statistics. Landings data are not yet available for 2009. However landings for 2009 are available in the Vilaine and are a fair estimate of recruitment, especially in 2009 when the fishery has been extended to the end of March. All figures are consistent with a decrease of around 60% of landings between 2008 and 2009. Trade to Asia has been specially disrupted, and the increase in trade to Spain is interpreted as mixing of yellow eel in winter reports.

Table FR.j. Comparison of different sources of glass eel landings for seasons 2007–2008 and 2008–2009.

	Export from France Hong Kong Taiwan China (t)	Export from France Spain (t)	Export from France sum (t)	Professional fishermen landings this report) (t)	Glass eel traders (CNPMEM/ CONAPPED estimate) (t) 3	Vilaine estuary (landings t)
2007–2008	39	12.7	51.7	71.4	68–72	5.1
2008–2009	6.9	18.6	25.5	Not available	31–32	2.2
(2009–2008) /2008	-82%	+46%	-51%		-55%	-57%

FR.6.2. Yellow eel

FR.6.2.1. Professional fisheries

FR.6.2.1.1. Rhin-Meuse EMU

Professional fisheries is only authorized in the Rhine River and its tributary the Ill River. Landings are estimated at 724 kg in 2007 by the French eel management plan.

FR.6.2.1.2. Artois-Picardie EMU

The main freshwater fisheries take place in the Somme River. Landings were estimated to 20 t until PCB pollution restricts this fishery in 2006 (French EMP).

Yellow eel fisheries are also caught in the Channel. Data for 2000 to 2006 are given in the French EMP. The mean of that value is 1.7 t.

[3] (including fluvial fishermen).

FR.6.2.1.3. Seine-Normandie EMU

River professional fishermen fish in the Seine River and declare 862 kg in 2007.

Yellow eel fisheries are also caught in the Channel. Declared landings are 13.0 t in 2007 and 450 kg in 2008 (Ifremer). This large variation is due to PCB restriction.

FR.6.2.1.4. Bretagne EMU

River professional fishermen caught some eel in the Vilaine River. This fishery seems to disappear. Marine fishermen catch 11 t of eel in 2007 and 1.8 t in 2008 in South Brittany (Ifremer). This large variation is unexplained. They also catch eel in the Vilaine estuary: 1.8 t in 2007 (Ifremer).

FR.6.2.1.5. Loire EMU

River fishermen in the Loire river and its tributaries have declared 24 t in 2007 and 30 t in 2008 (Onema-SNPE). Marine fishermen in the estuary have declared 12 t in 2007 and 7 t in 2008 (Ifremer). The local administration (Affaire maritime 44) estimates for those fishermen a landing of 21 t for 2007.

Marine fishermen also catch eel in Vendée. The declared landing for 2008 is 4 t (Ifremer).

FR.6.2.1.6. Garonne EMU

River fishermen for eel in the Charente River for less than 1 t. Marine fishermen fish along the Coast facing Charente estuary (Pertuis Charentais) for a mean amount of 2 t (EPTB Charente; 2003–2006 average).

Marine and river fishermen from the Gironde fish 9 t in 2007 (Cemagref) and 21 t in 2008 (Ifremer and Onema). River fishermen from Dordogne and Garonne Rivers have declared 2 t in 2007 (Onema).

Finally, marine fishermen declared 18 t of eel in 2007 and 16 t in 2008 (Ifremer).

FR.6.2.1.7. Adour EMU

Marine fishermen from Adour and Courants landais have declared 1.4 t in 2007 and 0.7 t in 2008 (Ifremer).

River fishermen from Adour and its tributaries have declared 0.7 t of eels in 2007 and 0.5 t in 2008 (Onema).

FR.6.2.1.8. Rhône EMU

Some fisheries restrictions have been taken in the Rhône River for river fishermen due to PCB. They have declared in 2007 0.5 t of eels (Onema).

In the Mediterranean lagoons the eel catches have reached 2000 t/year during the 1980s. They have decreased progressively to 900 tons in 1998 with 200 t for the Camargue and Corsica and 700 t for the Languedoc-Roussillon (VERGNE *et al.*, 1999).

The mean average landing from 2003 to 2005 is estimated at 512 t for Languedoc-Rousillon lagoons (Cepralmar 2003, 2004, 2005). In 2007, catches in PACA lagoons are estimated at 111 t (Pôle relais lagunes méditerranéennes, 2009).

For 2008, Demenache *et al.*, 2009 have estimated that the production of yellow eels in continental French Mediterranean coast has dropped further to about 294 t (precision between 211/395 t).

FR.6.2.1.9. Corse EMU

For Corsica lagoons, the production is about 31 t for 2007 (Demenache *et al.*, 2009).

FR.6.2.1.10. National overview

Table FR.k. National overview of yellow eel fishing in France in 2007 and 2008.

EMU	2007	2008
Rhin-Meuse	0.7	NA
Artois-Picardie	<2 t	<2 t
Seine-Normandie	13.9	<1 t
Bretagne	13.0	1.8
Loire	48.9	46.3
Garonne	31.4	41.5
Adour	2.1	1.3
Rhône	294.5	294.5
Corse	31.0	31.0
Total	437.2	418.7

FR.6.2.2. Recreational fisheries

FR.6.2.2.1. National overview

The catch of recreational fisheries is estimated at 500 t with no new data available (see 2008 report for details).

FR.6.3. Silver Eel

FR.6.3.1. Loire EMU

Silver eel landing from the Loire River are 33 t in 2007 and 17 t in 2008 (P. Boisneau, pers. comm.) and from Grand lieu lake 4.3 t in 2007 and 2008.

FR.6.3.2. Rhone EMU

Silver eel fishing take place in many different lagoons for an average (2003–2005) amount of 241 t (Cepralmar 2003, 2004, 2005).

FR.6.3.3. National overview

Apart from fisheries listed above, some fishermen fish during period and use gears those allow catching silver eels such as fykenets. The catches from these fishermen are counted with yellow eels.

Table FR.l. Silver eel catches in France in 2007 and 2008.

EMU	2007	2008
Loire	38	22
Rhône	241	241
total	279	263

FR.6.4. Marine fishery

See professional fisheries (Section FR.6.2.1).

FR.7. Catch per unit of effort

FR.7.1. Glass eel

FR.7.1.1. Marine commercial glass eel fisheries

An overview of the trends in cpue can be provided for 2008. These cpue are consistent with licences and landings to indicate that the area of main recruitment is the Loire-Vendée. The lower cpue in the Vilaine is consistent with the concentrated effort at that place. An indication of the trends in cpue for the Adour, Sèvre Niortaise and Gironde basins is provided in Recruitment Series and associated effort (Section 3.1). However this analysis should be moderated as gears used can be different from one estuary to the other (Section 5.1.1.1).

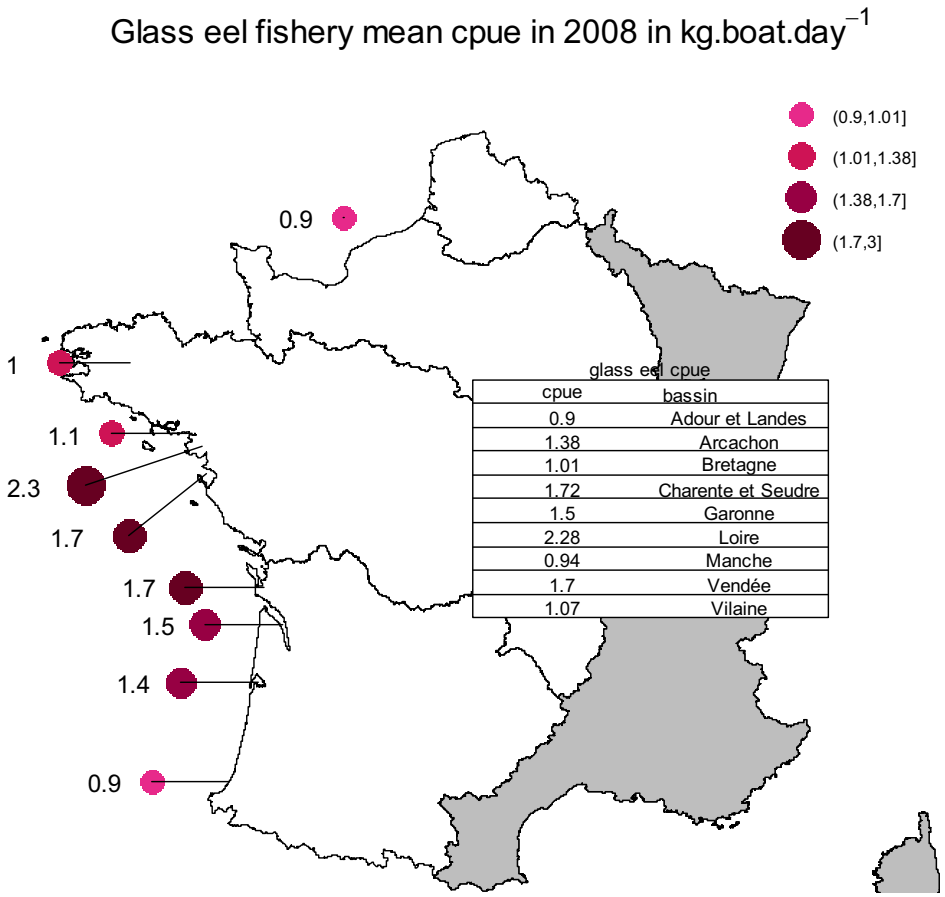


Figure FR.29. Glass eel marine fisheries cpue in 2008 (Ifremer).

FR.7.1.2. Glass eel cpue in the Garonne EMU

The Gironde basin is the tidal part (Figure FR.1 and Figure FR.2) of the Garonne Basin, comprising the brackish estuary and the tidal freshwater reach of the Garonne River, Dordogne River and of its tributary, the Isle River. The results are providing by the Cemagref statistical monitoring system and have been studied recently by Beaulaton, 2008.

One of the notable features of the glass eel fishery in the Gironde during the 1978–2003 period is the major shift from scoop net catches in favour of large pushnet catches (Figure FR.30 and Table FR.m). The fishery is currently very largely a large

pushnet fishery in the estuary, whereas formerly it was a scoopnet fishery in freshwater estuary.

After a strong decrease of the glass eel abundance in the Gironde basin between 1981 and 1985, the situation at present seems stationary, at a very low level (Figure FR.30 and Table FR.m). The 2003 season is close to the worst historical level (2001).

Table FR.m. Catches of glass eel for professional large pushnet (LPN), small pushnet (SPN) and scoopnet (SN) and non professional scoopnet fishermen, cpue on the Gironde basin for 1961–2007 (Source: Cemagref). "-" : gears not used that year ; "?" unevaluated.

	Total Catch (t)				CPUE (kg/day)
Year	Pro. LPN	Pro. SN	Pro. SPN	NonPro. SN	Pro. LPN
1960–1961	-	32.2	-	?	
1961–1962	-	217.8	-	?	
1962–1963	-	363.0	-	?	
1963–1964	-	?	-	?	
1964–1965	-	352.5	-	?	
1965–1966	-	27.6	-	?	
1966–1967	-	162.8	-	?	
1967–1968	-	284.2	-	?	
1968–1969	-	36.6	-	?	
1969–1970	-	203.8	-	?	
1970–1971	-	47.1	-	?	
1971–1972	-	69.0	-	?	
1972–1973	-	20.0	-	?	
1973–1974	1.9	52.7	-	?	7.8
1974–1975	6.6	37.5	-	?	6.7
1975–1976	25.2	95.7	-	?	13.2
1976–1977	39.0	82.6	-	?	11.7
1977–1978	22.1	42.6	-	107.8	15.6
1978–1979	25.9	47.3	-	116.2	12.1
1979–1980	38.1	86.6	-	217.1	22.9
1980–1981	36.1	48.8	-	150.6	15.4
1981–1982	39.4	21.6	-	36.5	10.9
1982–1983	48.1	18.6	-	26.9	10.2
1983–1984	31.6	13.4	-	26	10.7
1984–1985	21.0	6.0	-	11.8	6.6
1985–1986	26.6	8.7	-	14.4	6.6
1986–1987	25.9	18.7	-	28.6	6.8
1987–1988	21.5	6.4	-	6.7	6.1
1988–1989	31.8	14.1	-	17.3	5.4
1989–1990	23.0	6.2	-	9	4.2
1990–1991	29.9	8.5	-	14.5	6.3
1991–1992	14.8	7.7	-	12.8	3.3
1992–1993	33.0	9.4	-	21.7	6.1
1993–1994	40.2	5.3	-	12.4	6.6
1994–1995	35.5	8.0	-	18.9	6.2

	Total Catch (t)				CPUE (kg/day)
Year	Pro. LPN	Pro. SN	Pro. SPN	NonPro. SN	Pro. LPN
1995–1996	24.7	1.5	1.7	4.2	3.9
1996–1997	36.0	3.3	10.1	6.4	5.9
1997–1998	16.5	0.3	1.6	1	3.2
1998–1999	35.4	0.9	6.7	2.7	6.2
1999–2000	25.3	0.1	3.1	0.3	6.5
2000–2001	8.0	0.0	0.2	0.1	1.7
2001–2002	24.7	6.4	4.0	6.2	4.4
2002–2003	9.0	0.1	0.6	0.1	2.1
2003–2004	13.3	0.1	1.0	0.1	1.8
2004–2005	12.9	0.8	3.6	0.5	1.9
2005–2006	8.1	0.0	1.2	0	2.5
2006–2007	7.1	0.1	0.8	0.1	2.2

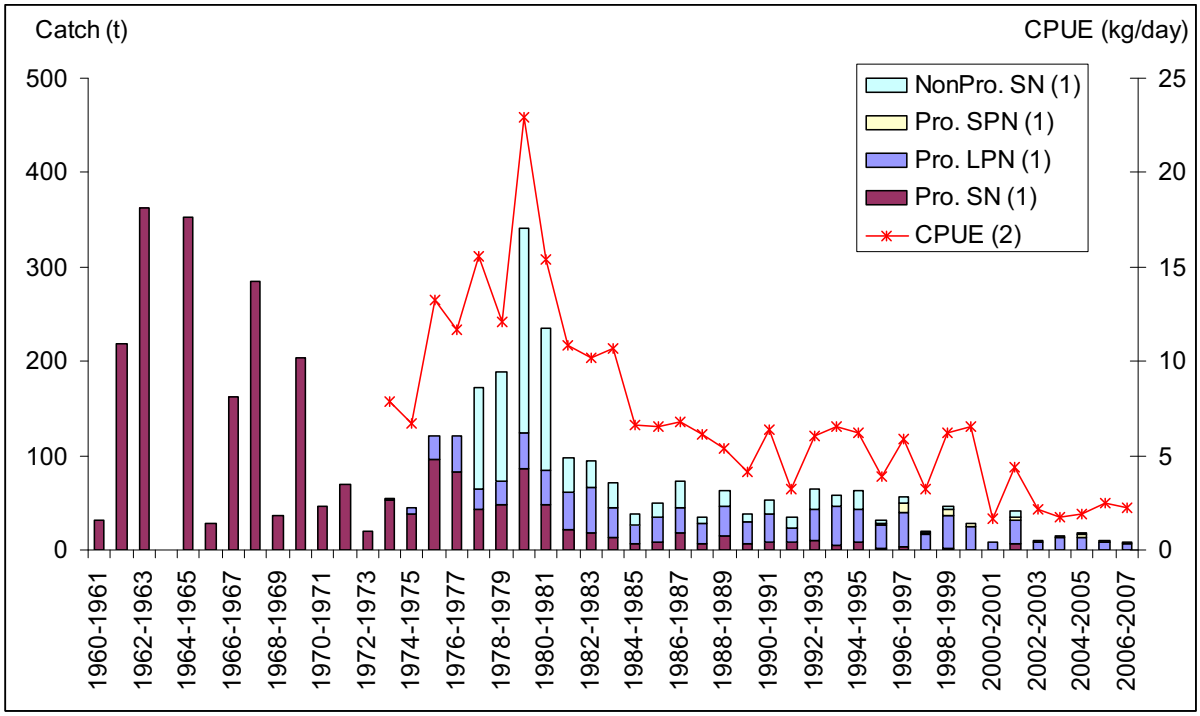


Figure FR.30. Cumulated capture of glass eel for professional fishermen for 1961–2007 and non professional fishermen for 1978–2007, cpue on the Gironde basin for 1978-2007 (Source: Cemagref).

FR.7.1.3. Glass eel cpue in the Adour EMU

The results are provided by Ifremer in connection with CNTS (Table FR.r).

Table FR.a. Mean, maximum minimum annual cpue (kg/trip) for the glass eel fishery (handnets) in the Adour estuary (source : Ifremer/CNTS).

Year	CPUE mean	CPUE Min	CPUE Max	Year	CPUE mean	CPUE Min	CPUE Max
1927/1928	5	4.7	5.3	1984/1985	2.4	1.5	3.3
1928/1929	5.5	4.4	7	1985/1986	1.5	0.6	2.1
1929/1930	6.7	4.3	9.9	1986/1987	3.3	0.3	5.3
1930-1931	18.7	10.1	35.2	1987/1988	3.7	1.4	5.6
				1988/1989	4.1	0.9	6.2
1965/1966	5.1	1.3	8.8	1989/1990	1.2	0.2	2.1
1966/1967	6.4	4.1	9.7	1990/1991	0.7	0.15	1.1
1967/1968	10.1	3	23.3	1991/1992	2.9	0.4	4.4
1968/1969	5	0.9	7.8	1992/1993	2.4	1.3	2.3
1969/1970	7.5	3.6	11.2	1993/1994	1.4	0.8	1.9
1970/1971	4.6	2.9	5.6	1994/1995	2.6	0.85	3.9
1971/1972	4.4	1.5	7.8	1995/1996	1.53	0.75	1.8
1972/1973	4.5	3.5	6.8	1996/1997	1.6	1.13	1.97
1973/1974	7.4	4.3	12.3	1997/1998	1.07	0.49	1.31
1974/1975	5	2.2	7.9	1998/1999	1.82	1.05	2.21
1975/1976	11	3.3	16	1999/2000	4.43	2.77	4.34
				2000/2001	0.49	0.53	1.05
1978/1979	10			2001/2002	0.89	0.48	1.23
1979/1980	5			2002/2003	0.31	0.09	0.45
				2003/2004	0.6	0.2	0.9
				2004/2005	1.13	0.42	2.17
				2005/2006	0,72	0,46	0,96
				2006/2007	0,66	0,15	0,91
				2007/2008	0,76	0,04	1,13

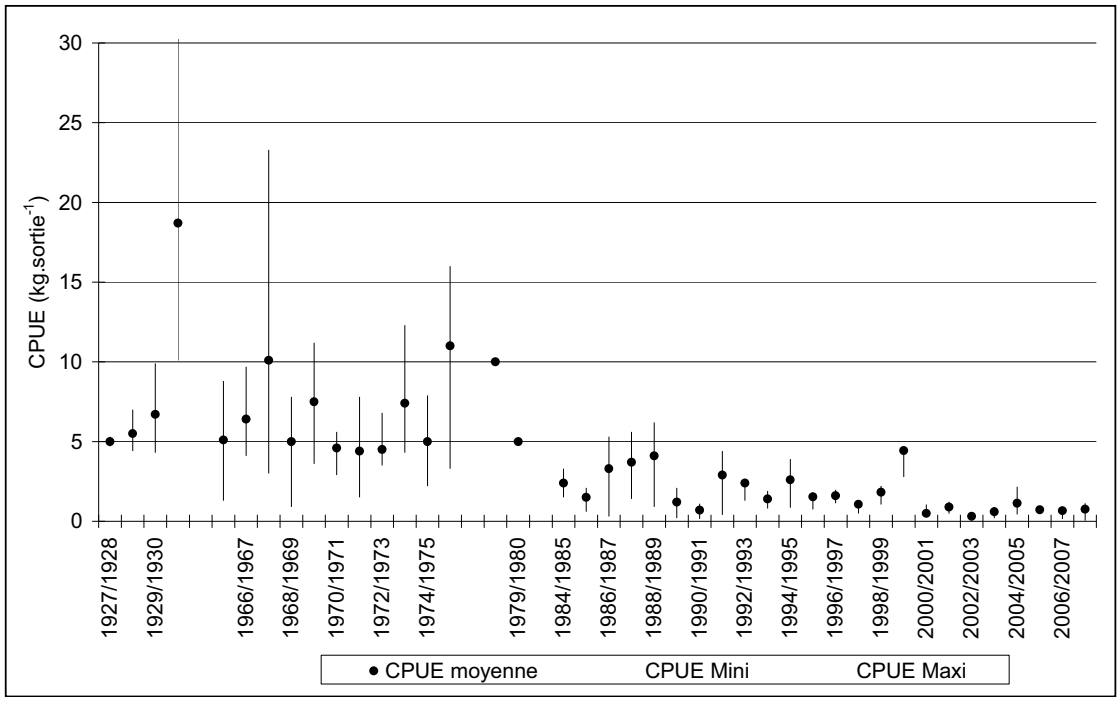


Figure FR.31. Long-term trend of glass eels abundance from fishing with scoop net by marine fishermen on the Adour estuary with mean values of cpue and minimal and maximal values between 1927 and 2007/2008.

The tendencies since the beginning of 1930s are studied from cpue with scoopnet in the Adour estuary by marine fishermen. They allow to compare the fishing season 2007/2008 in the previous years, since 1927.

The cpue is the same order of height since the beginning of 2000s, is for a level lower than those observed at the beginning of the series in the 1930s.

Recent period

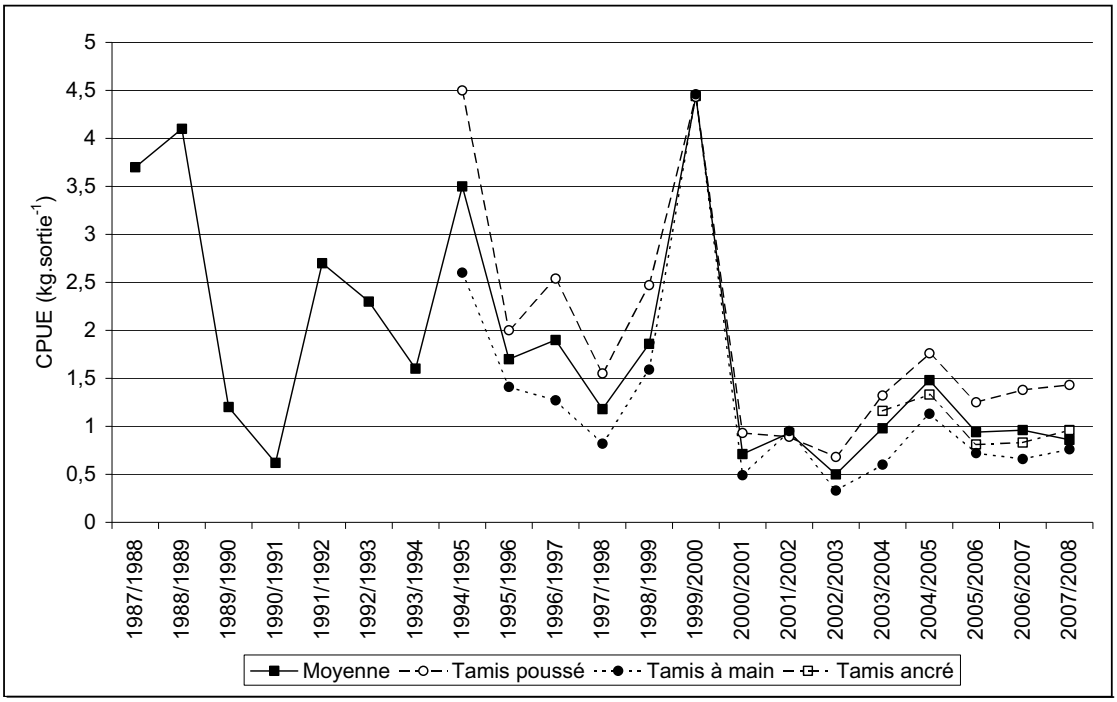


Figure FR.32. Recent Variations of glass eels cpue per type of fishing gears in the Adour estuary. Moyenne = mean, tamis poussé = small pushnet, tamis à main = scoopnet, tamis ancré = fixed scoopnet (Period: 1987/1988 to 2007/2008).

The cpue curves realized from data of the Adour estuary "scoopnet" and "small pushnet" follow appreciably the same fluctuations since 1994/1995, date of appearance of the small pushnet in maritime zone. Since 2001/2002, a new practice of "fixed scoopnet" appeared in fluvial zone (statements are available since the season 2003/2004). In 2007/2008, this practice was widely used. Whatever is the used technique, cpue stays at a low level since the beginning of 2000s.

FR.7.1. Yellow eel

FR.7.1.1. Yellow eel cpue in the Garonne EMU

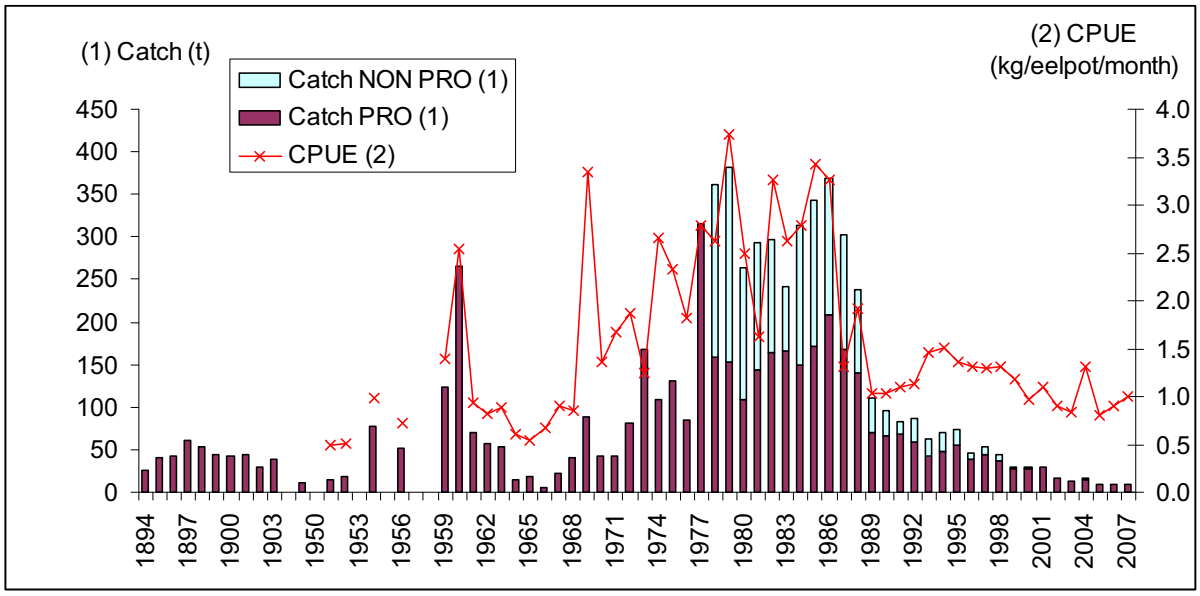
Yellow eel cpue for the Gironde basin have been extended by Beaulaton, 2008. The eel pot cpue increase in the 1970s, mainly because of change of eel pot (from wooden to plastic). Then the eel pot cpue for yellow eel has fallen since the middle of the 1980s, slightly increased until 1998 before decreasing again until 2007 (Table FR.n; Figure FR.33). The total catches have decreased while the number of fishermen has also decreased. But changes in the fishing power and in the tactics have increased the real effort and our effort unit does not reflect these changes. Consequently, this cpue is not fully representative of the real current tendency of the abundance which presents certainly a more marked decrease.

We will also apply GLM methods on eel pot cpue, to precise and verify the tendency of yellow eel abundance.

Table FR.n. Catches of yellow eel for professional and non professional (from 1978 onwards only) yellow eel fishermen, cpue on the Gironde basin for 1894–2007 (Source: Cemagref).

	Total Catch (t)		CPUE (kg/eelpot/month)
Year	Pro.	Non Pro.	Pro.
1894	26.2		
1895	40.5		
1896	42.1		
1897	61.6		
1898	53.7		
1899	43.5		
1900	41.8		
1901	43.9		
1902	29.1		
1903	38.1		
1949	10.7		
1950			
1951	15.4		0.5
1952	17.6		0.5
1953			
1954	77.5		1.0
1955			
1956	51.9		0.7
1957			
1958			
1959	123.8		1.4
1960	265.3		2.5
1961	69.4		0.9
1962	56.8		0.8
1963	53.1		0.9
1964	14.5		0.6
1965	18.4		0.5
1966	6.3		0.7
1967	21.5		0.9
1968	40.8		0.8
1969	87.8		3.3
1970	42.4		1.4
1971	43.1		1.7
1972	80.6		1.9
1973	168.6		1.2
1974	108.2		2.7
1975	130.8		2.3
1976	84.8		1.8
1977	314.8		2.8
1978	157.9	204.1	2.6
1979	152.5	229.5	3.7

Year	Total Catch (t)		CPUE (kg/eelpot/month)
	Pro.	Non Pro.	Pro.
1980	108.4	155.7	2.5
1981	143.5	148.8	1.6
1982	164.3	133.1	3.3
1983	166.0	76.2	2.6
1984	148.8	164.1	2.8
1985	172.4	170.3	3.4
1986	208.8	160.5	3.3
1987	167.7	134.3	1.3
1988	140.0	97.7	1.9
1989	70.4	40.2	1.0
1990	67.0	28.3	1.0
1991	67.5	15.8	1.1
1992	58.5	27.7	1.1
1993	42.2	21.4	1.5
1994	48.7	21.1	1.5
1995	55.8	18.4	1.4
1996	38.8	7.7	1.3
1997	43.7	9.7	1.3
1998	36.1	7.3	1.3
1999	27.3	1.5	1.2
2000	27.9	1.4	1.0
2001	29.4	0.6	1.1
2002	15.8	1.1	0.9
2003	12.8	0.5	0.8
2004	14.4	1.3	1.3
2005	8.6	0.6	0.8
2006	8.4	1.3	0.9
2007	8.8	1.3	1.0



Figure_FR.33. Cumulated catch of yellow eel for professional and non professional (from 1978 onwards only) fishermen, cpue on the Gironde basin for 1894–2007 (Source: Cemagref).

FR.7.2.2. Yellow eel cpue in the Adour EMU

The number of fishermen remained constant with however fluctuations. The production by fishermen decreased since the beginning of the records (Figure FR.34).

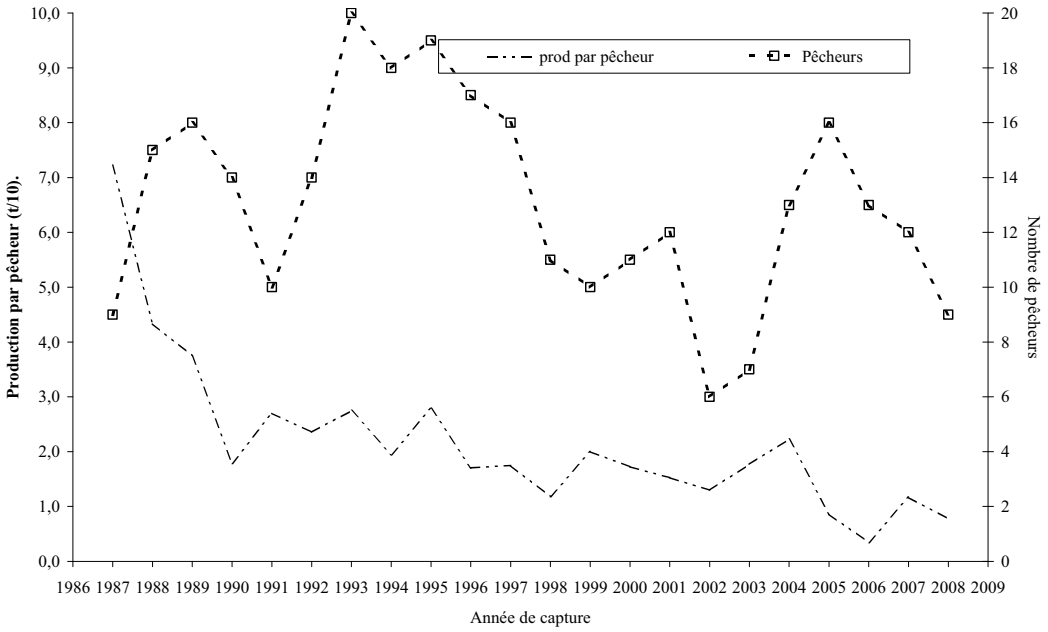


Figure FR.34. Associated effort of subadult eel landing for the Adour estuary. Period: 1986–2008, ***Prod par pêcheur= production per fisherman, pêcheurs=nb of fishermen.***

FR.7.3. Silver eel

FR.7.3.1. Silver eel cpue in the Loire EMU

The cpue (log cpue +1) of silver eel professional fishermen from the Loire River seems to be stable from 1987 to 2002 with high variability. From 2003 onwards the cpue seems to decrease but with the last value in 2007 of the abundance index, no clear trend appears.

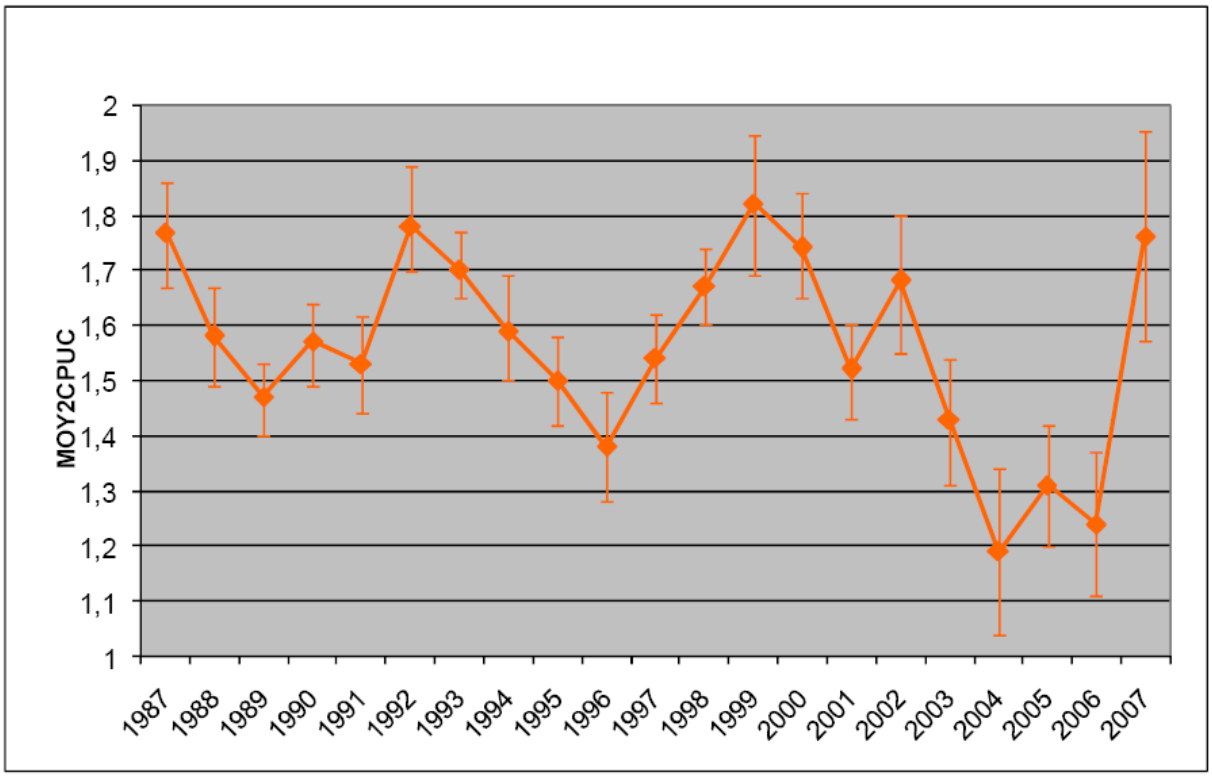


Figure FR.35. Abundance index (log cpue+1) of silver eel for the Loire river silver eel fishermen (Bodin *et al.*, 2008).

FR.8. Scientific surveys of the stock

FR.8.1. Recruitment surveys, glass eel

FR.8.1.1. Recruitment survey, the Gironde

The Gironde survey consists in a monthly sampling of 24 stations (surface + deep) distributed along four transects. This monitoring uses an estuarine research vessel (Figure FR.36) and aims at evaluating the abundance variations of the juveniles of fish and crustacean and the adults of small species.

Figure FR.36. "L'Estuarial" boat used for scientific survey in the Gironde (Source: Cemagref).

The results (annual average from September to August) for glass eels highlight a sharp decrease for season 1999–2000 and a steady low decrease afterwards. In the main, this analysis confirms results coming from fishery data (Figure FR.30 and Figure FR.37) even if some little differences remain to analyse.

Table FR.o. Time-series for the Gironde glass eel recruitment data by migratory season= year (n-1)- (n).

SEASON (N-1, N)	1990	2000
0		1.00
1		0.36
2	1.75	1.02
3	2.83	0.28
4	2.20	0.30
5	2.92	0.53
6	2.07	0.27
7	3.14	0.14
8	???	0.28
9	3.49	

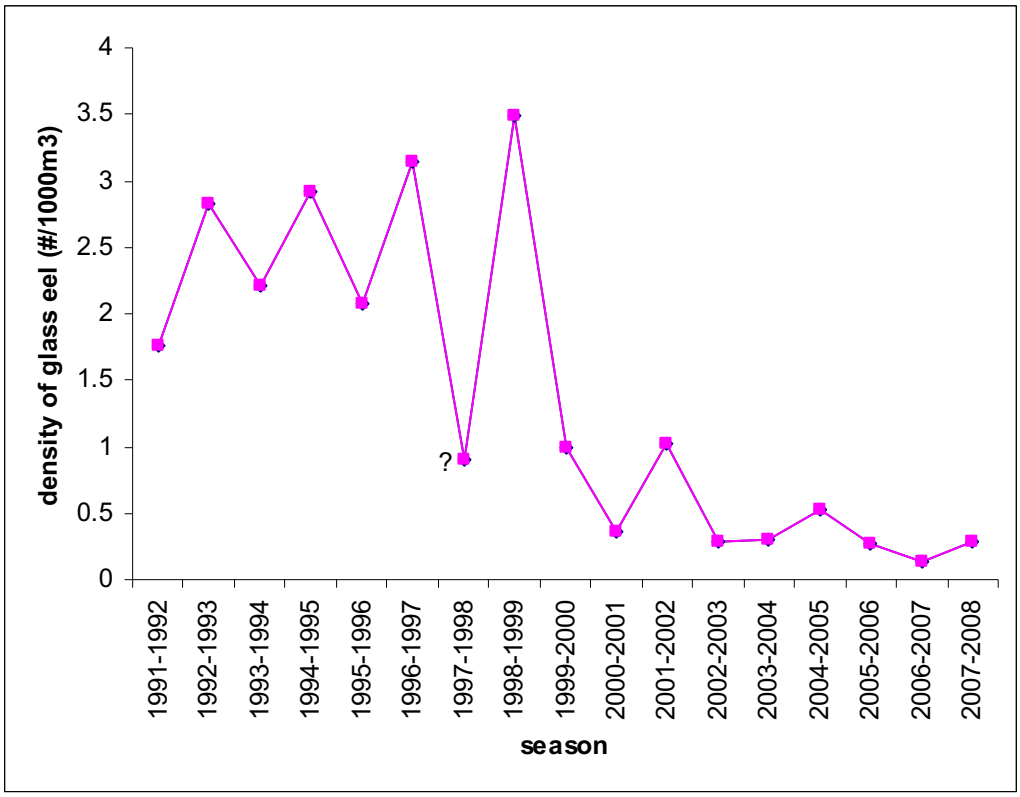


Figure FR.37. Results of the glass eel recruitment survey in the Gironde (? Indicates a suspect data from missing sampling in January).

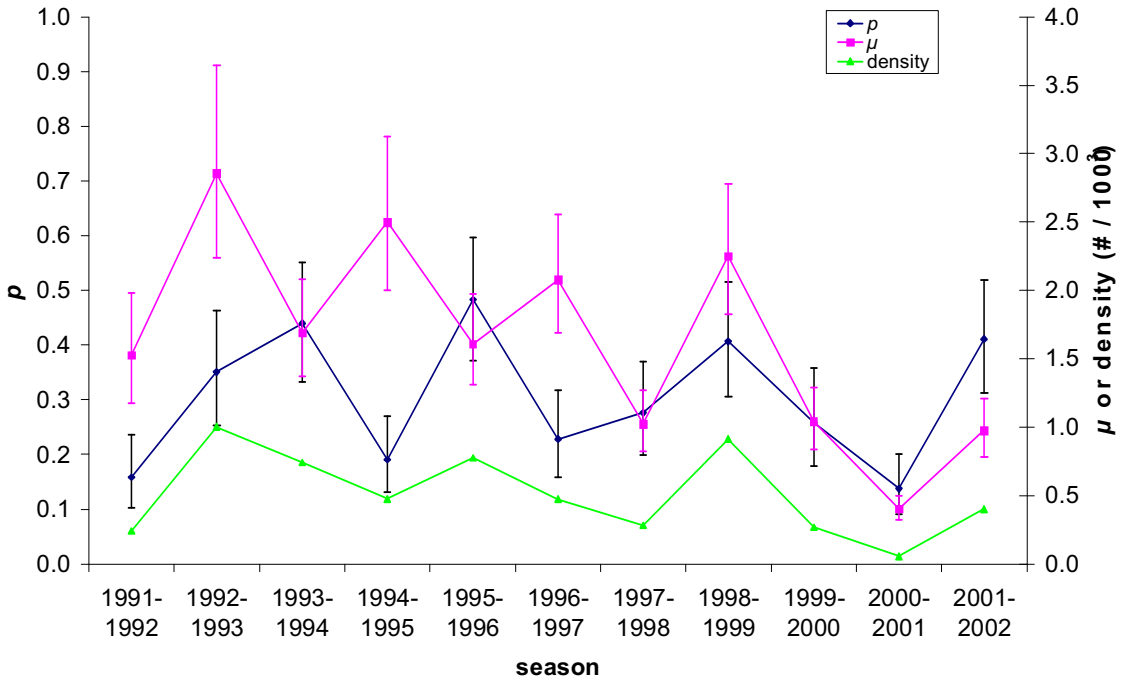


Figure FR.38. Results for glass eel of a delta-gamma analysis for season effect (p=probability of positive capture, μ=mean capture for only positive capture, density=p*μ) (extracted from Lambert, 2005).

These data were from seasons 1991–1992 to 2001–2002 were analysed by Lambert, 2005 using a delta-gamma approach (Stefánsson, 1996). This method allows separate analyses of the presence probability (p) and positive capture (μ) and joint analyse through overall density. The delta and gamma approaches were performed thanks to generalized linear models (GLM; (McCullagh and Nelder, 1989) with both spatial and temporal effects. Results on season effect (Figure FR.38) show some peculiar seasons like 2000–2001 for which glass eels were rarely caught (low p) and when caught, in small number (low μ), resulting in a very low density.

FR.8.2. Stock surveys, yellow eel

Specific stock surveys were performed in small basin (Frémur, Oir). General fish monitoring is also made by Onema (Reseau hydrobiologique et piscicole – RHP). The results are in previous ICES reports.

FR.8.3. Silver eel

Silver eel fluxes to the sea were assessed using the sequential fishery in the Loire Basin following a mark-recapture protocol (Boury and Feunteun, unpublished).

No other information is available on silver eel stock.

FR.9. Catch composition by age and length

There is no routine programme measuring the catch composition by age and length in France.

FR.10. Other biological sampling

FR.10.1. Length and weight and growth (DCR)

A survey will set up by ONEMA in 2010. 500 eels are supposed to be analysed. Field sampling of fishermen catches will be organized by ONEMA and age reading will be performed by Cemagref.

FR.10.2. Parasites and pathogens

A review was done by Elie and Girard, 2009.

FR.10.3. Contaminants

See the review of Elie and Girard, 2009.

A campaign of PCB analysis in eel (among five other fish) was set up by the French Ministry of Agriculture in order to prioritize sectors of intervention to reduce risk for human food. Results of the first set of analyses are waited.

FR.10 4. Predators

No data on eel predators are currently summarized.

FR.11. Other sampling

no data available.

FR.12. Stock assessment

FR.12.1. Local stock assessment

Local stocks in each EMU are not evaluated. Only yellow eel density and corresponding silver eel escapement at national level are computed (see French management plan and Section 12.2.2). This has been break down by EMU here.

Table FR.p. Silver eel estimate by EMU in 2006–2007, from yellow eel density.

Rhin-Meuse	26 000
Artois-Picardie	234 000
Seine-Normandie	1 341 000
Bretagne	1 259 000
Loire	1 231 000
Garonne	6 706 000
Adour	1 352 000
Rhône-Méditerranée	2 149 000
Corse	544 000
Total	14 842 000

FR.12.2. International stock assessment

FR.12.2.1. Habitat

Table FR.q. Wetted Area (in km²) of different type of eel habitat by EMU.

EEL HABITAT	LACUSTRINE	RIVERINE	TRANSITIONAL & LAGOON	COASTAL
Rhin	63	14	0	0
Meuse	4	33	0	0
Artois Picardie	198	47	151	?
Seine Normandie	390	490	260	1940
Bretagne	83	81	215	?
Loire	132	812	296	32 500
Garonne Dordogne Charente Seudre Leyre	126	417	601	600
Adour	136	136	4	?
Rhône-Méditerranéee	?	?	?	?
Corse	?	?	?	?

FR.12.2.2. Silver eel escapement and production

In France silver eel escapement was estimated at national level not at the EMU scale. The method is firstly based on an estimation of yellow eel density on river of the drainage basin. This estimation is calculated using the EDA model calibrated on 11 787 electro-fishing operations (6007 stations). Secondly an arbitrary proportion of yellow eel that silver every year (5%) allows to calculate the escapement before silver eel fisheries and mortally in turbines. It should be considered as. This escapement per year is equal to 29 millions of silver eels during the period 1997–1999 and 15 million during the period 2006–2007. Considering the glass eel recruitment decrease, the

maximum potential escapement is estimated between 10 and 30% of the present situation, or between 50 and 150 millions of silver eel escapement.

FR.12.2.2.1. Impacts

No data available.

FR.12.2.2.2. Stocking requirement eels <20 cm

The objective is to use 5 to 10% of glass eel caught in French estuary for stock in French rivers. In several EMU, surface to be stock and requirement in glass eel are noticed.

	SURF TO BE STOCKED (KM^2)		QUANTITY (TONNE/YEAR)
	Lacustrine	riverine	
Rhin	0.00	15.14	?
Meuse	0.00	0.00	?
Artois Picardie	?	?	?
Seine Normandie	9.62	8.45	?
Bretagne	?	?	?
Loire	?	?	?
Garonne Dordogne Charente Seudre Leyre	0.00	0.19	2.14
Adour	0.00	0.15	1.68
Rhône-Méditerranéee	0.00	0.00	0.00
Corse	0.00	0.00	0.00

FR.12.2.2.3. Data quality issues

No information on this topic.

FR.13. Sampling intensity and precision

No data available.

FR.14. Standardisation and harmonization of methodology

No data available.

FR.14.1. Survey techniques

FR.14.2. Sampling commercial catches

FR.14.3. Sampling

FR.14.4. Age analysis

FR.14.5. Life stages

FR.14.6. Sex determinations

FR.15. Overview, conclusions and recommendations

FR.16. Literature references

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