

Report on the eel stock and fishery in France 2007

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FR.B. Introduction

FR.B.1 Presentation of the eel fisheries in France

The French eel fisheries occur mainly in inland waters (rivers, estuaries, ponds and lagoons) and 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 Manche region. The yellow eel fisheries occur in the same areas and also concern 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.

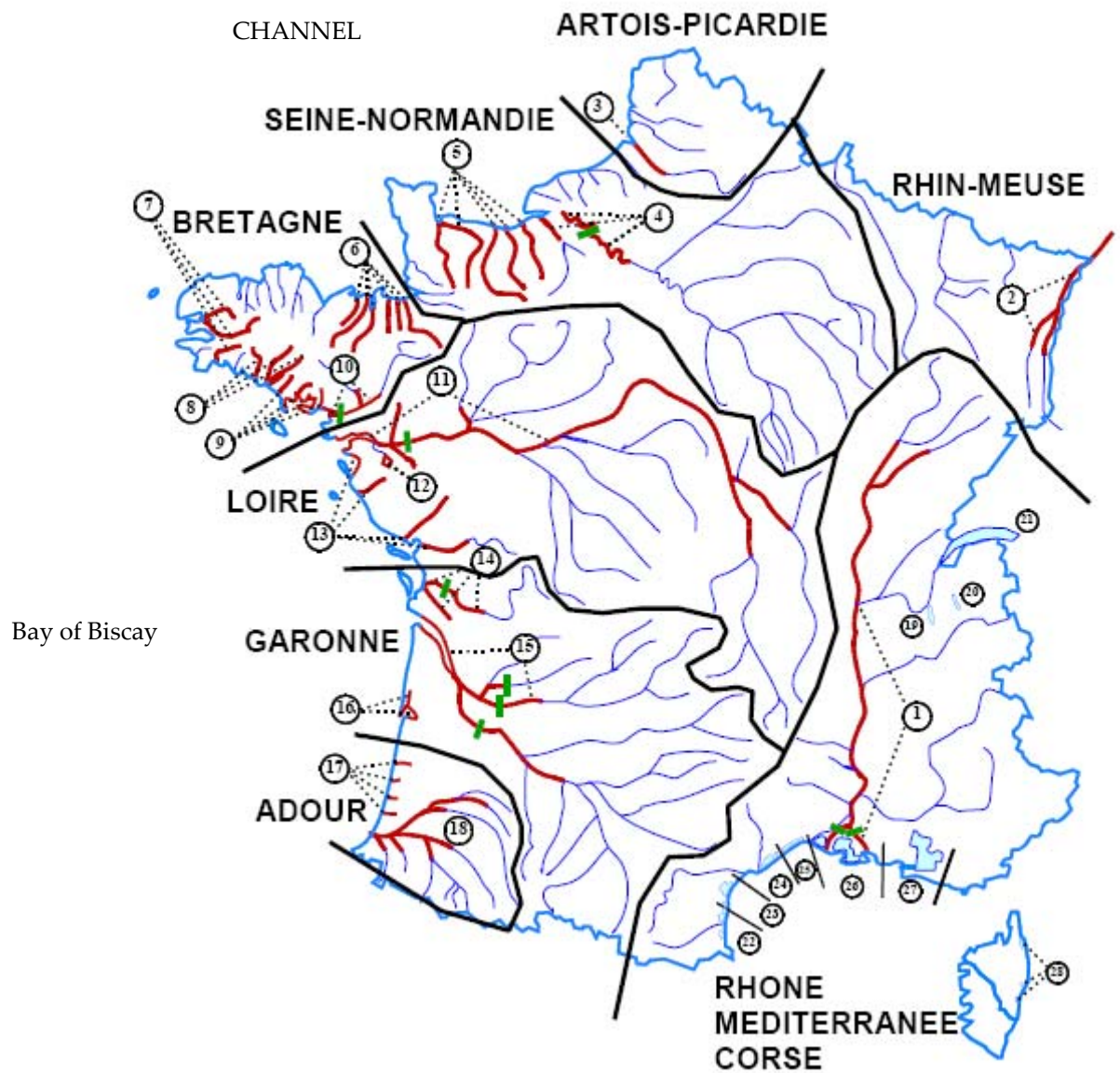


Figure FR. 1 Inland waters in France (eel fisheries in red; tidal limits in green). The numbers correspond to the list of fishing zones in Table FR.a. The management unit names and limits are in black (redrawn from Castelnaud, 2000).

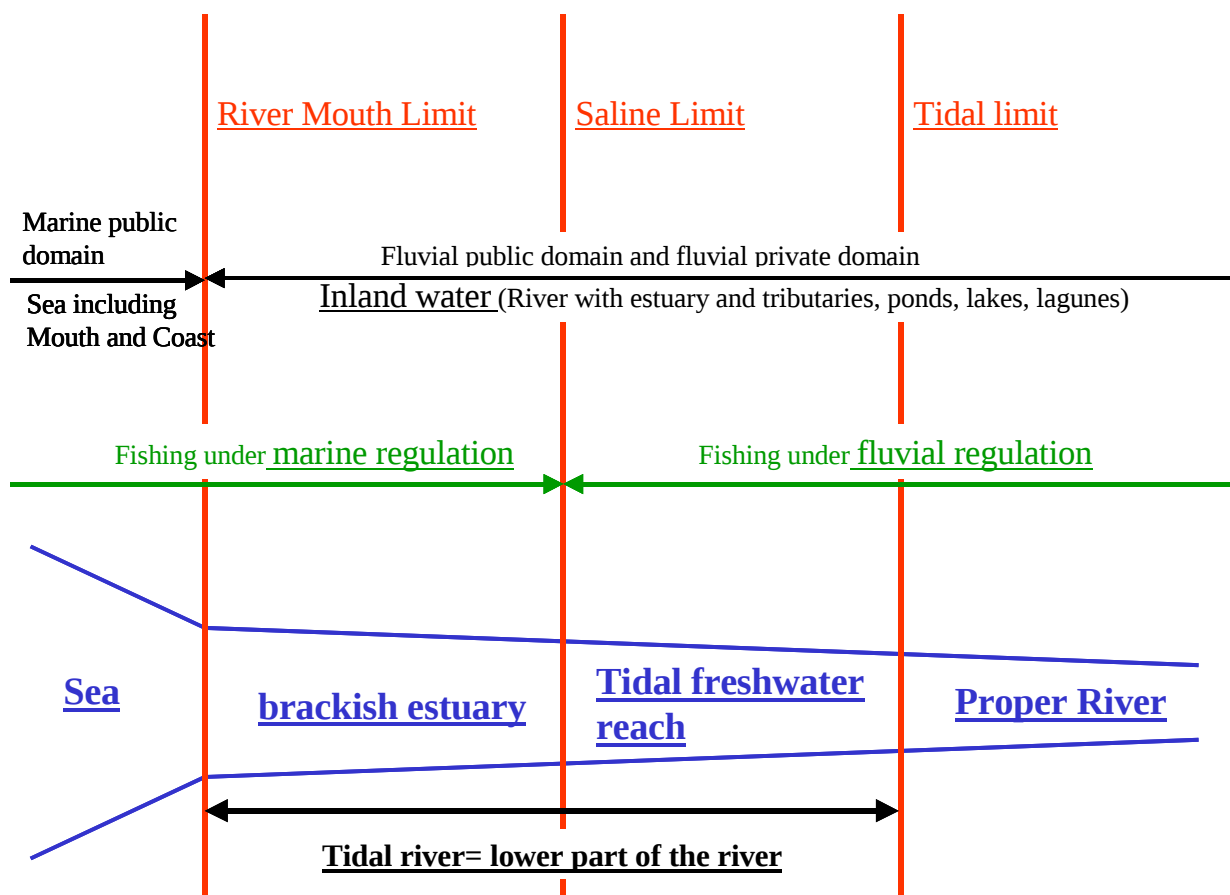
Table FR.a Fishing zones in French inland waters related to the 8 management units (COGE-POMI; modified from Castelnaud *et al.*, 2000, unpublished data).

(NUMBER FROM FIGURE FR. 1) 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, Scorff, Blavet	Bretagne
(9) Rivières d'Étel, d'Auray, de Penerf, Golfe du Morbihan	Bretagne
(10) Estuaire Vilaine aval	Bretagne
(10) Estuaire Vilaine amont, Fleuve Vilaine aval, Oust, Chère, 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 Campagnol - 115 ha	Rhône-Méditerranée Corse

(NUMBER FROM FIGURE FR. 1) FISHING ZONE – SURFACE FOR LAGOONS	COGEPOMI
(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
(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 – 12000 ha	Rhône-Méditerranée Corse
(27) Etang de Berre – 15500 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 fishers 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 fishers 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.



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 sometimes 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, fishers categories and fishing rights by zones (Castelnaud and Beaulaton, 2005, unpublished data).

FR.B.2 Management and monitoring system

The administrative saline limit separates two different fishery regulations (see Figure FR.2), marine and fluvial (fresh water). The marine fisheries are located in coastal water, brackish estuaries and in the Mediterranean lagoons. The fresh-water 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 fresh-water reach”, located between the saline limit and the tidal limit, where some marine professional fishers can fish along with river fishers although these are not allowed to go downstream the saline limit.

In brackish and coastal waters, amateur fishers do not need licenses to fish with authorized fishing gears. A system of licenses is set up for marine professional fishers, for river professional and amateur fishers in inland waters. The glass eel fishery is limited with a quota of glass eel stamps and the silver eel fishery is limited by per-

sonal authorizations. In the Mediterranean lagoons, **where glass eel fishing is forbidden**, there are also limitations in the number of marine professional fishers and fishing capacities but no system of licences exists.

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

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. No similar system exists for the marine professional fishers fishing eel in the Mediterranean lagoons.

The river professional and amateur fishers 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).

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
<u>Professional fishermen</u>	<u>Professional fishermen</u>	<u>Professional fishermen</u>
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, Ifremer, IAV, evaluation of productions by some Affaires Maritimes Services	Local scientific monitoring of landings and effort since 1978, Cemagref, evaluation of productions by some DDAF Services
<u>Non professional fishermen, amateurs and anglers</u>	<u>Non professional fishermen, amateurs and anglers</u>	<u>Non professional fishermen, amateurs and anglers</u>
No licence, no logbook	No licence, no logbook	since 1988)
	Marine Public domain: Mediterranean lagoons	Compulsory logbook (by day, by gear) 1999-2002 treated by ONEMA (ex-CSP)
	<u>Professional fishermen</u>	<u>Anglers</u>
	No license but limitation of the number of fishermen by lagoon	Licenses per département
	No logbook, some technical and scientific surveys	No logbook, punctual estimates (ONEMA, ex- CSP)
	<u>Non professional fishermen, amateurs and anglers</u>	Private domain: others parts of rivers above estuaries, others parts of lakes
	No licence, no logbook	<u>Professional fishermen</u>
		No licence, no logbook, punctual estimate of effort (ONEMA, ex-
		<u>Non professional fishermen, amateurs and anglers</u>
		Licenses per département
		No logbook, punctual 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 8 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 fishers' organizations, administrations and research centers. 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. Although 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. In 2006 and 2007, the ministers in charge of eel management have asked the scientific community to propose the basis of a national plan on eel management, suitable at the River Basin District level.

FR.C. Fishing capacity

FR.C.1 Glass eel

The professional glass eel fishing gear is variable from a river to another (Table FR. c).

Table FR.c. Size and dimensions of the nets allowed in the French inland waters to professional fishers. The numbers in bracket correspond to the COGEPOMI in Figure FR.1 (source Castelnaud, 2002).

TYPE	SHAPE	TOTAL FISHING SURFACE (2 NETS)	BASINS AND REGULATIONS, M=MARINE , F=FRESHWATER; COGEPOMI
Pushnet	Circular	2.262 m ²	Nord pas de Calais (m), ARTOIS-PICARDIE Picardie (m), ARTOIS-PICARDIE Normandie (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 m ²	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 m ²	Lay (m), LOIRE
Pushnet	Rectangular	4.32 m ²	Sèvre Niortaise (m), LOIRE
Pushnet	Rectangular	3.60 m ²	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 fishers (1 scoopnet of small size) or handled from a boat for professional fishers (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 fishers, 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).

The glass eel fisheries involve pure estuarine or river professional fishers, coastal professional fishers and some shellfish farmers (Champion and Perraudau, 2000).

A socio-economic study of the coastal fishery in the Bay of Biscay was carried out in 2000 in the frame of the Pecosude project (Leaute and Caill-Milly N., 2003). The survey concerned 248 commercial fishers representing 20% of the whole population. Seven classes of fishing boats were built. Nineteen surveys concerned the class of « pure glass eel boat » and 36 the class of “estuarine boat”.

The river and estuarine professional fishers have small boats, 18 years old, 6.5 m long, 2.5 TJB *de jauge*, 41 kW. They are handled by a mean number of 1.1 fishers. Others types of boat are used by coastal marine professional fishers for glass eel like “trawlers”, “dredgers”. Those are larger (8 m) and more powerful boats (72 kW) (Caill-Milly, 2001).

FR.C.2 Yellow and silver 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 fishers 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: deep-lines, lift nets, “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).

The special gear called “dideau” used to fish silver eel in the Loire basin was introduced in large rivers from 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.

FR. D. Fishing effort

FR.D.1 Glass eel

For marine professional fishers the quota of seasonal license for glass eel has been limited to 1137. Between 1999 and 2005, the total number of licenses delivered was 900 to 1000. There were 936 marine professional fishers fishing for glass eel in 1997 (Castelnaud, 2000) and around 1050 in 2001 (Table FR. d). The total number of marine professional fishers is higher than 1000 licences, probably because one licence permit with stamps to fish in several estuaries or because some fishers fish without licence).

For river professional fishers, from 1999 to 2005, the number of seasonal licenses has

decreased from 430 to 360 (from Briand *et al.*, 2005). In 2000, 432 licenses were distributed as following: 186 Adour, 147 Loire, 26 Charente, 77 Gironde). In fact there were 300 river professional fishers fishing for glass eel in 1997 (Castelnaud *et al.*, 2000) and 241 in the last evaluation (Table FR. d); the difference between number of licences and number of river fishers is the number of licences delivered to marine professional fishers who can fish in the tidal fresh-water reach under fluvial regulation; see Figure FR.2).

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

Finally a total mean number of about 1300 professional fishers has been evaluated during the period 1999–2001 and this figure has not changed much these last years (Table FR.d).

Table FR.d Mean number of glass eel professional fishers per basin from 1999 to 2001; except ^a year 1989 Castelnaud *et al.*, 1994; ^b year 1997, Castelnaud *et al.*, 2000; ^c year 2000, Cuende *et al.*, 2002. Source CSP, CRTS, Cemagref.

COGEPOMI	FISHING ZONE	MARINE PROFESSIONAL	FLUVIAL PROFESSIONAL	TOTAL
Artois-Picardie/Seine-Normandie	Manche - Seine-Normandie	10a		10
Bretagne	Bretagne (Vilaine excluded)	86a		86
Bretagne	Vilaine	131		131
Loire	Loire	278	50b	328
Loire	Vendée	209		209
Garonne	Charente-Seudre	163	24	187
Garonne	Gironde	75	75	150
Garonne	Arcachon	42		42
Adour	Adour + courants landais	57	92c	149
	Total France	1051	241	1292

Fishing effort is determined by the number of boats/fishers and the size of nets which varies with the fishers' categories and the fishing zone (Table FR.c) (Castelnaud, 2002). It depends also on the speed and power of the boat and the fishing duration.

FR.D.2 Yellow eel

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

FR.D.2.1 Inland fisheries

The inland fisheries are scattered and involve professional fishers, amateur fishers with gears and anglers with rods.

Whatever the category, the number of fishers has been decreasing since 1987 (Briand *et al.*, 2005). Only a part of the 450 professionals fishers 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 fishers (Table FR.e). The most

part of these marine professional fishers and two thirds of these fluvial fishers also target glass eel.

Table FR.e Mean number of yellow eel professional fishers per fishing zone from 1999–2001(Source CSP, CRTS, Cemagref; except ^a 1997, Castelnaud, 2000;^b 2000, Sauvaget, 2001).

COGEPOMI	FISHING ZONE	MARINE PROFESSIONAL	FLUVIAL PROFESSIONAL	TOTAL
Artois-Picardie/Seine-Normandie	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. D.2.2 Atlantic coastal fisheries

On the Atlantic coast, (Désaunay and Aubrun, 1988) described in the past an important fishery of yellow eel by trawling. This activity nowadays is unreported or has collapsed (Table FR.f). Recently, there might have been changes in eel exploitation in connection with the new use of fykenets.

Table FR.f. Number of boats fishing eels on the Atlantic and Channel coasts. Source 1 Désaunay and Aubrun, 1988; 2 Champion and Perraudeau, 2000; 3 Sauvaget *et al.*, 2001.

COGEPOMI	FISHING ZONE	1986 NB BOAT (1)	1997 NB BOAT (2)	2000 NB BOAT (3)
Artois-Picardie	Manche	9	?	
Seine-Normandie	Seine-Normandie	7	2 to 3	
Bretagne	Bretagne-Sud	5		9
Bretagne	Vilaine	3		
Loire	Loire	115		
Loire-Garonne	Vendée-Charente	80 to 90		
Garonne	Arcachon	2		

FR. D.2.3 Mediterranean fisheries

Since 1988, the number of 400 to 500 marine professional fishers targeting eel in the Mediterranean lagoons has been regularly announced. Nevertheless, a strong decrease of the population has been noticed (see details in Table FR. m): 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). The most reliable data are col-

lected by the Cépralmar in the Languedoc-Roussillon region which yield the main part of French Mediterranean eels and totalise 430 marine professional fishers targeting eel in 2002 (Loste and Dusserre, 1996; Dusserre and Loste, 1997; Cepralmar, 2003).

The most recent evaluation (Castelnaud *et al.*, 2000) estimates that 513 marine professional fishers were fishing yellow eel in 1997 in all the French Mediterranean lagoons (Table FR.e).

FR.D.3 Silver eel

If we do not consider the Mediterranean fisheries, where an unknown part of silver eel can be captured, the only significant fishery of silver eel is in the Loire basin, with 11 fishers using the special gear called “dideau”.

In 2002 the special five years authorizations for fishing silver eel in private waters were stopped by the local fishery administration (extinction in 2006; more than 200 authorizations existed yet in 2000 from Changeux, 2001).

FR.E. Catches and landings

FR.E.1 Historical series of catches and landings for glass eels and yellow eel

In 1999 the production of glass eels was estimated at 255 tons, with a turnover of 35.2 millions euros in the whole French basins (Table FR. g). The historical analysis of the series of captures concerning the main landing areas of the Atlantic coast highlights a fall of the glass eel productions starting in the eighties.

Table FR.g Estimation of the total glass eel production and of the number of fishers in France from 1970 to 2000. (MP: Marine professional fishers, PF: professional river fishers, River and Marine non-pro: river and marine amateur fishers and poachers); (1) unknown number of marine amateur fishers to be added; (2) marine non-professional fishers included; (3) comprising 110 t from marine amateur fishers; (4) number of licenses delivered.

YEAR	1970	1979	1986	1989	1999	2000
Production MP (t)	450	1175		300	225	180
Production PF and river non-pro f(t)	895	675		110	30	16,6
Total Production (t)	1345	1850	500	520 (3)	255	196,6
Mean price /kg (€)	2,75	5,65		61	138	120
Total value (M€)	2,74	10,44	12,5	30,5	35.2	
Number MP(1)	648	964	850	886	936	970 (4)
Number PF and River non-professionals	2424	2588	4000(2)	1512	761	671
Number Marine non-pro	(1)	(1)		2055	109	(1)
Origin of the data	Popelin, 1971	CIPE, 1982	Desaunay and Aubrun, 1988	Castelnaud <i>et al.</i> , 1989	Castelnaud, 2002 Castelnaud <i>et al.</i> , 2003 (5)	Castelnaud <i>et al.</i> , 2003

The estimation of inland waters captures for years 1999 and 2000 in Table FR. g, made by Cemagref, ONEMA (ex-CSP) and CNTS (ex-CRTS) for the FAO-FIDI has been revised with the estimation for year 2001 and the new figures are reported in Table FR.i. This table contain the result of an extrapolation from the scientific estimations

obtained in the main basins monitored (Adour, Gironde, Loire and Vilaine) with a relation obtained from the comparison with the punctual evaluation of total production for France available: years 1979 and 1989 in Table FR.g and years 1999, 2000 indicated just above, for professional fishers and the same years for non-professional fishers, apart 1979.

On the basis of this attempt, considering the FAO database, where gaps and under-evaluated figures were found, a more realistic temporal series has been built by biological stages (glass eel, yellow+ silver eel) and fishers' categories from 1978 to 2005. It was based on the annual results produced by the punctual scientific investigations (years available in Table FR.h) and the extrapolation of the results obtained in the main basins monitored (Adour, Gironde, Loire and Vilaine). After 2005, some data for these main basins are available but the extrapolation has not been made because this result of total productions become progressively uncertain and as to be furnished by the official statistical monitoring systems, according to the analysis and recommendations made on the French eel management plan.

Table FR.h. 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.

PROFESSIONAL FISHERS CATCH (TONS)								NON PROFESSIONAL FISHERS CATCH (TONS)				
Season	Adour		Gironde		Loire		Vilaine	Total (1)	Adour	Gironde	Loire	Total (2)
	MP	FP	MP	FP	MP	FP	MP					
1978			27	83	514	12	106	1484		108		647
1979			28	90	620	22	209	1850		116		697
1980			46	167	508	18	95	1667		217		1303
1981			45	78	288	15	57	967		151		904
1982			50	37	261	13	98	917		36		219
1983			49	26	241	19	69	808		27		161
1984			31	26	168	15	36	550		26		156
1985			16	12	145	9	41	446		12		71
1986	8		26	14	113	10	53	432		14		87
1987	10		32	25	131	14	41	486		29		172
1988	12		25	7	165	12	47	511		7		40
1989	9		38	16	78	9	37	410		17		110
1990	3	4	29	9	81	16	36	338		9		54
1991	2	4	36	10	31	5	15	193		14		87
1992	8	12	17	8	32	7	30	188		13		77
1993	6	7	30	12	80	11	31	325		22		130
1994	3	7	35	7	95		24	340	18	12	0	74
1995	8	4	47	10	127	6	30	439	10	19	0	113
1996	4	3	21	4	73	8	22	257	12	4		25
1997	5		33	11	67	4	23	276	6	6		39
1998	2	7	14	2	61		18	189	7	1		6
1999	4	2	41	8	80	7	15	242	2	3	1	6
2000	10		21	4	74	6	14	206		0	1	2
2001	2		9	0	33	3	8	101		0	0	1
2002	1,8		28	9	42	8	16	206		6		37
2003	0,6		10	1	53	4	9	151		0		
2004	1.8		13	1	20		8	76		0		

PROFESSIONAL FISHERS CATCH (TONS)								NON PROFESSIONAL FISHERS CATCH (TONS)	
2005	3,2	13	4	17	3	7	88	0	2
2006	1,7	8	1					0	
2007	1,4	7	1					0	

This work leads to the following data (total for professional and non-professional fishers, anglers excluded) in Table FR.i:

- glass eel landings in inland waters from 1978 to 2001,
- yellow and silver eel landings in inland waters from 1986 to 2001 and in the Mediterranean lagoons from 1983 to 2001;
- eel production in France compared to uncorrected data registered by FAO-FIDI.

Table FR.i Estimate of capture of glass eels and yellow eels (few silver eel fisheries) in France and comparison with FAO database (Fishstat).

stage	glass eel	yellow eel (+silver)	yellow eel (+silver)	yellow eel (+silver)	all stages	all stages
area	inland water	inland water	mediterranean lagoons	France	France	France - FAO
1978	2 131					
1979	2 547					
1980	2 970					
1981	1 871					
1982	1 135					
1983	969		1 700			
1984	706		1 810			
1985	516		1 501			
1986	518	720	1 224	1 944	2 462	2 687
1987	658	700	1 362	2 062	2 720	1 978
1988	551	700	1 565	2 265	2 816	2 109
1989	520	440	1 306	1 746	2 266	1 672
1990	392	380	1 398	1 778	2 170	1 674
1991	280	380	1 265	1 645	1 925	1 450
1992	264	380	941	1 321	1 585	1 164
1993	456	380	900	1 280	1 736	864
1994	414	380	900	1 280	1 694	607
1995	552	380	900	1 280	1 832	320
1996	282	380	900	1 280	1 562	403
1997	314	323	900	1 223	1 537	1 782
1998	195	250	900	1 150	1 345	449
1999	248	105	900	1 005	1 253	289
2000	214	86	900	986	1 200	399
2001	101	102	900	1 002	1 103	415

FR.E.2 Catches and landings by fishing sector for glass eels and yellow eel

The mean production of glass eel is given for the recent period 1999–2001 by fishing sectors in Table FR.j.

Table FR.j. Mean landings in tons of Glass eel per sectors of the period 1999–2001 (Sources: CSP-SNPE, CRTS, Cemagref, Affaires maritimes except for *, period 1994–1998). Number of fishers corresponding in Table section C.

COGEPOMI	FISHING SECTORS	MARINE AND RIVER PROFESSIONALS	RIVER AMATEURS
Artois-Picardie/Seine-Normandie	Manchel - Seine-Normandie	2.7*	
Bretagne	Bretagne (Vilaine excluded)	?	
Bretagne	Vilaine	12.5	
Loire	Loire	70.3	0.6
Loire	Vendée	26.4	
Garonne	Charente-Seudre	18.9	
Garonne	Gironde	27.6	1.0
Garonne	Arcachon	?	
Adour	Adour + courants landais	15.5	0.4
	Total	173.9	2

The mean production of yellow eel is also given per fishing sectors globally for the same period (Table FR.k).

Table FR.k. Mean landings in tons of Yellow eel per sectors for the period 1999–2001 (Source CSP, CRTS, Cemagref; except for ^a 2000–2002, Changeux, 2003a, ^b 1997, Robion and Adam 1997 (unpublished), ^c 1997, (Castelnaud, 2000), ^d 1996, CRTS com pers. Number of fishers corresponding in Table Section C.

COGEPOMI	FISHING SECTORS	MARINE AND RIVER PROFESSIONALS	RIVER AMATEURS	ANGLERS
Artois-Picardie/Seine-Normandie	Manche- Seine-Normandie	? + 0.5		
Bretagne	Bretagne (Vilaine excluded)			
Bretagne	Vilaine	0.8	2.7	
Loire	Loire	49.6	30.2	49 (a)
Loire	Grand Lieu	36 (b)		
Loire	Vendée	15 (c)	2.4 (c)	
Garonne	Charente-Seudre	3.3	2.1	
Garonne	Gironde-Garonne-Dordogne	27.1	7.3	
Garonne	Arcachon	21 (d)		
Adour	Adour + courants landais	3.3	1.1	
Rhône-Méditerranée-Corse	Rhone	18.8	0.6	
Rhône-Méditerranée-Corse	Méditerranée (lagoons)	900	?	
Rhin-Meuse	Rhin	2.7	0.3	
	Total	>1078	46.7	>39

Some historical data on yellow eel landings by coastal marine professional fishers are available for 1986 (Table FR.l).

Table FR.l Historical yellow eel landings of the coastal eel fishery, Atlantic and Manche régions (Désaunay and Aubrun, 1988).

COGEPOMI	FISHING ZONE	1986
Artois-Picardie	Manche	25
Seine-Normandie	Seine-Normandie	40 to 60
Bretagne	Bretagne-Sud	10
Bretagne	Vilaine	10
Loire	Loire	?
Loire-Garonne	Vendée-Charente	60
Garonne	Gironde	
Garonne	Arcachon	2
Adour	Adour et Courants landais (d)	

Concerning 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) and now seem to be stable. The Table FR.m gathers the data available on numbers of marine professional fishers and productions of eel (yellow and silver) in the different lagoons. The total of captures registered was around 730 t, which is less than the total announced by VERGNE *et al.*, 1999 because these authors referred to commercial data.

Table FR.m. Total production from Mediterranean lagoon fisheries from various authors. (Ximenes *et al.*, 1990; Ruiz, 1994; Loste and Dusserre, 1996; Dusserre and Loste, 1997).

Secteurs	Zones de pêche	Effectif de pêcheurs	captures anguilles	Captures poissons	Sources
Etangs du Roussillon	(22) Etang de Canet	10	?	?	Prud'homie
	(22) Etang de Salses Leucate	40	?	150 t total	Prud'homie
Etangs du Narbonnais	(23) Etang de Lapalme	2	?	?	Loste et Dusserre (1996), Prud'homie
	(23) Etang de Bages-Sigean	28	120	+100 t other fishes	
	(23) Etang de Campagnol	22	50	+30 t other fishes	Dusserre et Loste (1997)
	(23) Etang de l'Ayrolle				
	(23) Etang de Gruissan				
Etang de Thau	(24) Etang de Thau	290	120	?	Vergnes et al. (1999), Mazouni et al (1999)
Etangs Palavasiens	(25) Etang d'Ingril	38	47	+ 13 t other fishes	Ruiz (1994)
	(25) Etang de Vic				
	(25) Etang de Pierre- Blanche				
	(25) Etang du Prévost				
	(25) Etang de l'Arnel				
	(25) Etang du Grec				
Etangs Camarguais	(25) Etang Latte-Méjean	8	?	?	Prud'homie
	(25) Etang de l'Or				
	(26) Etang du Ponant				
Etang de Berre	(26) Petite Camargue gardoise	15	?	?	Prud'homie
	(26) Etang du Vacares et des Impériaux	20	40	?	Vergnes et al. (1999)
Etangs de Corse	(27) Etang de Berre	30	150	?	Vergnes et al. (1999)
	(28) Etang de Palo	10	87	?	Ximenes et al. (1990), Ximenes (com. pers.)
	(28) Etang d'Urbino				
	(28) Etang de Diana				

FR.E.3 Restocking

No restocking recorded at the central level.

FR.E.4 Aquaculture

No data.

FR.E.5 Catch of recreational fisheries

Several local attempts to evaluate the fishing pressure of anglers on eel have been set up in France: on the river Loire (Chancerel 1991; Ricou 2003; Changeux *et al.*, 2003; Baisez, 2006), in the Cotentin marshes (Changeux and Michelot, 2006), in the northern part of France near Calais (Fasquelle and Ledouble, 2006), in the Adour basin (Samuel Marty, Migradour, com.pers.) and in the Rhine river (Vauclin and Storck, 2002). On this basis and different hypothesis, we have tried to make an estimate of catches or fishing effort on eel for French anglers.

One can consider that there are now about 2 millions of fresh-water anglers in France (Changeux, in press). In 2005 only 1.25 millions of them were paying their fishing tax (Source ONEMA). The others 0.75 millions are occasional anglers or don't practise in large public rivers or marshes where eel is still abundant. Finally, the number of tax is widely used as a low hypothesis to assess the population of anglers. This information is known per department and has been updated every year by the CSP-ONEMA since 1942. We can hope this situation will stand with the recent changes in the organization of fishing administration. Considering this population, the annual activity of an angler is approximately for eel of 17 fishing session per year (Changeux, in press).

We have retained four types of department following the distribution map of Chancerel (1994): 1-department with high to mean density of eels, 2-department with mean to low density, 3-department where eel presence is marginal, and 4-department not accessible to eel. The proportion of anglers fishing for eels at least once a year varies between 30%, in the department where the species is abundant, to 1% in the department where it is absent (Table FR. n). This last figure is not nil because there are some anglers searching for eel who pay their tax in these departments and travel to fish in other department where eel is more abundant. The estimation of the number of eel anglers give around 147 300 in France (Table FR. o). The capture per unit of effort vary (cpue) in the same way from 3 to 0,003 eels per fishing session. This last value considers the smaller number of days the anglers from distant department, may spend on eel.

Table FR.n. Hypothetic per cent of anglers seeking for eel and associate capture per unit of effort (cpue in nb eels per fishing session) for the four types of departments.

Departement type	Percent of eel anglers	CPUE (eel per session)
High to medium density	30%	3
Medium to low density	15%	0,3
Marginal presence	5%	0,03
Not accessible to eel	1%	0,003

The application to entire France (Table FR. o), using a mean annual activity estimate of 17 fishing session per angler, and a mean weight of 127.61 g per eel, gives a total amount of 508.6 t/year. This seems to be a high value if we consider that we count 17 fishing session for anglers who have fished for eel at least once a year. But it's a way to offset the small number of anglers given by the tax.

Looking to this simulation in detail, we find for the Loire basin a weight of captures which is very close to the previous figure of Chancerel, 1991: 136 t/year related to 100 to 150 t/year. For Loire-Atlantique our estimate is 14% lower than the result of the 2000 study (42 t of eels against 49 given by Changeux *et al.*, 2003, see Table FR.k). However this first assessment will be useful to draw up a protocol for a regular national survey (Changeux, 2007).

Table FR.o. Assessment of the number of anglers seeking for eels at least once a year, the associate number of fishing session, number and weight of eels based on the number of tax sold in 2005.

Bassin	Eel density class	Departement	Nb of anglers for		Nb of sessions	Nb of eels	Weight of eels (kg)
			Nb of tax	eels			
Adour	Densité forte à moyenne	Pyrénées-Atlantiques	16 327	4 898	83 268	249 803	31 877
Adour	Densité moyenne à faible	Landes	16 049	2 407	40 925	12 277	1 567
Adour	Présence marginale	Hautes-Pyrénées	12 159	608	10 335	310	40
Total Adour			44 535	7 913	134 528	262 390	33 484
Artois-Picardie	Densité forte à moyenne	Pas-de-Calais	26 246	7 874	133 855	401 564	51 244
Artois-Picardie	Densité forte à moyenne	Somme	16 654	4 996	84 935	254 806	32 516
Artois-Picardie	Densité moyenne à faible	Nord	38 334	5 750	97 752	29 326	3 742
Total Artois-Picardie			81 234	18 620	316 542	685 696	87 502
Bretagne	Densité forte à moyenne	Finistère	6 436	1 931	32 824	98 471	12 566
Bretagne	Densité forte à moyenne	Morbihan	10 999	3 300	56 095	168 285	21 475
Bretagne	Densité moyenne à faible	Côtes-d'Armor	9 819	1 473	25 038	7 512	959
Bretagne	Densité moyenne à faible	Ille-et-Vilaine	18 548	2 782	47 297	14 189	1 811
Total Bretagne			45 802	9 486	161 254	288 457	36 811
Corse	Densité moyenne à faible	Corse	5 266	790	13 428	4 028	514
Total Corse			5 266	790	13 428	4 028	514
Garonne	Densité forte à moyenne	Charente-Maritime	18 407	5 522	93 876	281 627	35 938
Garonne	Densité forte à moyenne	Gironde	26 682	8 005	136 078	408 235	52 095
Garonne	Densité moyenne à faible	Charente	14 653	2 198	37 365	11 210	1 430
Garonne	Densité moyenne à faible	Dordogne	18 563	2 784	47 336	14 201	1 812
Garonne	Densité moyenne à faible	Lot-et-Garonne	12 223	1 833	31 169	9 351	1 193
Garonne	Présence marginale	Corrèze	11 612	581	9 870	296	38
Garonne	Présence marginale	Haute-Garonne	25 644	1 282	21 797	654	83
Garonne	Présence marginale	Gers	8 026	401	6 822	205	26
Garonne	Présence marginale	Lot	9 264	463	7 874	236	30
Garonne	Présence marginale	Tarn-et-Garonne	10 499	525	9 924	268	34
Garonne	Inaccessible	Ariège	9 647	96	1 640	5	1
Garonne	Inaccessible	Aveyron	17 291	173	2 938	9	1
Garonne	Inaccessible	Cantal	10 116	101	1 720	5	1
Garonne	Inaccessible	Lozère	6 866	69	1 167	4	0
Garonne	Inaccessible	Tarn	14 517	145	2 468	7	1
Total Garonne			214 000	24 178	411 044	726 313	92 683
Loire	Densité forte à moyenne	Loire-Atlantique	21 459	6 438	109 441	328 323	41 897
Loire	Densité forte à moyenne	Maine-et-Loire	28 084	8 425	143 228	429 685	54 832
Loire	Densité forte à moyenne	Vendée	17 771	5 331	90 632	271 896	34 697
Loire	Densité moyenne à faible	Indre-et-Loire	19 109	2 866	48 728	14 618	1 865
Loire	Densité moyenne à faible	Loir-et-Cher	11 764	1 765	29 998	8 999	1 148
Loire	Densité moyenne à faible	Deux-Sevres	15 172	2 276	38 689	11 607	1 481
Loire	Présence marginale	Allier	12 326	616	10 477	314	40
Loire	Présence marginale	Cher	12 787	639	10 869	326	42
Loire	Présence marginale	Indre	10 063	503	8 554	257	33
Loire	Présence marginale	Loiret	14 326	716	12 177	365	47
Loire	Présence marginale	Mayenne	12 056	603	10 248	307	39
Loire	Présence marginale	Nièvre	13 768	688	11 703	351	45
Loire	Présence marginale	Puy-de-Dôme	17 722	886	15 064	452	58
Loire	Présence marginale	Sarthe	19 970	999	16 975	509	65
Loire	Présence marginale	Vienne	13 802	690	11 732	352	45
Loire	Présence marginale	Yonne	12 655	633	10 757	323	41
Loire	Inaccessible	Creuse	8 066	81	1 371	4	1
Loire	Inaccessible	Loire	15 778	158	2 682	8	1
Loire	Inaccessible	Haute-Loire	12 223	122	2 078	6	1
Loire	Inaccessible	Haute-Vienne	15 204	152	2 585	8	1
Total Loire			304 105	34 587	587 988	1 068 710	136 379
Meuse	Présence marginale	Ardennes	12 469	623	10 599	318	41
Meuse	Présence marginale	Meuse	10 795	540	9 176	275	35
Total Meuse			23 264	1 163	19 775	593	76
Rhin	Densité moyenne à faible	Bas-Rhin	26 611	3 992	67 858	20 357	2 598
Rhin	Densité moyenne à faible	Haut-Rhin	14 820	2 223	37 791	11 337	1 447
Rhin	Présence marginale	Meurthe-et-Moselle	16 826	841	14 302	429	55
Rhin	Présence marginale	Moselle	16 772	839	14 256	428	55
Rhin	Présence marginale	Vosges	13 051	653	11 093	333	42
Total Rhin			88 080	8 548	145 300	32 884	4 197
Rhône-Méditerranée	Densité forte à moyenne	Bouches-du-Rhône	8 075	2 423	41 183	123 548	15 766
Rhône-Méditerranée	Densité forte à moyenne	Hérault	12 831	3 849	65 438	196 314	25 052
Rhône-Méditerranée	Densité moyenne à faible	Alpes-Maritimes	6 428	964	16 391	4 917	628
Rhône-Méditerranée	Densité moyenne à faible	Gard	12 373	1 856	31 551	9 465	1 208
Rhône-Méditerranée	Densité moyenne à faible	Pyrénées-Orientales	9 514	1 427	24 261	7 278	929
Rhône-Méditerranée	Densité moyenne à faible	Var	8 839	1 326	22 539	6 762	863
Rhône-Méditerranée	Densité moyenne à faible	Vaucluse	11 599	1 740	29 577	8 873	1 132
Rhône-Méditerranée	Présence marginale	Ain	19 540	977	16 609	498	64
Rhône-Méditerranée	Présence marginale	Alpes-de-Haute-Provence	7 635	382	6 490	195	25
Rhône-Méditerranée	Présence marginale	Ardèche	13 662	683	11 613	348	44
Rhône-Méditerranée	Présence marginale	Aude	10 237	512	8 701	261	33
Rhône-Méditerranée	Présence marginale	Côte-d'Or	16 599	830	14 109	423	54
Rhône-Méditerranée	Présence marginale	Doubs	15 592	780	13 253	398	51
Rhône-Méditerranée	Présence marginale	Drôme	11 538	577	9 807	294	38
Rhône-Méditerranée	Présence marginale	Isère	22 531	1 127	19 151	575	73
Rhône-Méditerranée	Présence marginale	Rhône	14 938	747	12 697	381	49
Rhône-Méditerranée	Présence marginale	Haute-Saône	11 974	599	10 178	305	39
Rhône-Méditerranée	Présence marginale	Saône-et-Loire	30 764	1 538	26 149	784	100
Rhône-Méditerranée	Présence marginale	Territoire-de-Belfort	2 193	110	1 864	56	7
Rhône-Méditerranée	Inaccessible	Hautes-Alpes	7 819	78	1 329	4	1
Rhône-Méditerranée	Inaccessible	Jura	12 725	127	2 163	6	1
Rhône-Méditerranée	Inaccessible	Savoie	12 749	127	2 167	7	1
Rhône-Méditerranée	Inaccessible	Haute-Savoie	13 569	136	2 307	7	1
Total Rhône-Méditerranée			293 724	22 815	389 527	361 699	46 159
Seine-Normandie	Densité forte à moyenne	Calvados	7 865	2 360	40 112	120 335	15 366
Seine-Normandie	Densité forte à moyenne	Eure	8 994	2 698	45 869	137 608	17 560
Seine-Normandie	Densité forte à moyenne	Manche	10 659	3 190	54 361	163 083	20 811
Seine-Normandie	Densité forte à moyenne	Seine-Maritime	7 168	2 150	36 557	109 670	13 995
Seine-Normandie	Densité moyenne à faible	Oise	10 221	1 533	26 064	7 819	998
Seine-Normandie	Densité moyenne à faible	Orne	8 526	1 279	21 741	6 522	832
Seine-Normandie	Densité moyenne à faible	Paris et couronne	6 460	969	16 473	4 942	631
Seine-Normandie	Densité moyenne à faible	Val-d'Oise	3 937	591	10 039	3 012	384
Seine-Normandie	Présence marginale	Aisne	15 768	788	13 403	402	51
Seine-Normandie	Présence marginale	Aube	9 686	484	8 233	247	32
Seine-Normandie	Présence marginale	Eure-et-Loir	8 650	433	7 353	221	28
Seine-Normandie	Présence marginale	Marne	12 913	646	10 976	329	42
Seine-Normandie	Présence marginale	Haute-Marne	9 572	479	8 136	244	31
Seine-Normandie	Présence marginale	Seine-et-Marne	17 024	851	14 470	434	55
Seine-Normandie	Présence marginale	Yvelines	4 585	229	3 897	117	15
Seine-Normandie	Présence marginale	Essonne	8 875	444	7 544	226	29
Total Seine-Normandie			150 903	19 132	325 228	555 211	70 850
Total			1 250 913	147 332	2 504 614	3 985 981	508 655

FR.F Catch per unit of effort

FR.F.1 Glass eel cpue in the Gironde basin

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 fresh-water reach of the Garonne River, Dordogne River and of its tributary, the Isle River. The results are providing by the Cemagref statistical monitoring system.

One of the notable features of the glass eel fishery in the Gironde during the 1978–2003 period is the major shift from scoopnet catches in favor of large pushnet catches. (Figure FR.3 and Table FR.p). The fishery is currently very largely a large pushnet fishery in the estuary, whereas formerly it was a mixed-gear fishery in both the brackish and fresh 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.3 and Table FR.p). The 2003 season is close to the worst historical level (2001).

Table FR.p. Catches of glass eel for professional large pushnet (LPN), small pushnet (SPN) and scoopnet (SN) and non professional scoopnet fishers, cpue on the Gironde basin for 1978–2007 (Source: Cemagref).

YEAR	TOTAL CATCH (T)			CPUE (KG/DAY)	
	PRO. LPN	PRO. SN	PRO. SPN	NONPRO. SN	PRO. LPN
1977–1978	26.7	83.3		107.8	12.8
1978–1979	28.0	89.7		116.2	14.0
1979–1980	45.8	167.3		217.1	25.4
1980–1981	45.5	78.3		150.6	14.9
1981–1982	49.6	36.6		36.5	10.9
1982–1983	49.5	25.8		26.9	12.7
1983–1984	30.5	26.0		26.0	17.6
1984–1985	16.3	11.7		11.8	8.1
1985–1986	26.3	13.6		14.4	8.8
1986–1987	31.9	25.0		28.6	13.5
1987–1988	25.4	6.7		6.7	9.3
1988–1989	37.5	15.6		17.3	7.1
1989–1990	28.6	8.6		9.0	5.6
1990–1991	36.0	9.6		14.5	8.5
1991–1992	17.0	8.0		12.8	4.5
1992–1993	29.6	11.6		21.7	8.9
1993–1994	34.6	6.5		12.4	9.2
1994–1995	47.5	9.6		18.9	7.9
1995–1996	21.4	1.5	2.2	4.2	4.7
1996–1997	33.0	3.6	7.9	6.4	6.3
1997–1998	14.1	0.4	1.7	1.0	3.8
1998–1999	40.6	0.8	7.5	2.7	8.9
1999–2000	21.2	0.1	3.4	0.3	6.6
2000–2001	8.8	0.0	0.2	0.1	1.9
2001–2002	28.3	3.8	4.7	6.2	4.9
2002–2003	9.5	0.1	0.8	0.1	2.7

YEAR	TOTAL CATCH (t)				CPUE (kg/DAY)
	PRO. LPN	PRO. SN	PRO. SPN	NONPRO. SN	PRO. LPN
2003–2004	13.3	0.1	1.0	0.1	2.5
2004–2005	12.9	0.8	3.5	0.5	2.7
2005–2006	8.1	0.0	1.2	0.0	2.4
2006–2007	7.1	0.1	0.8	0.1	2.2

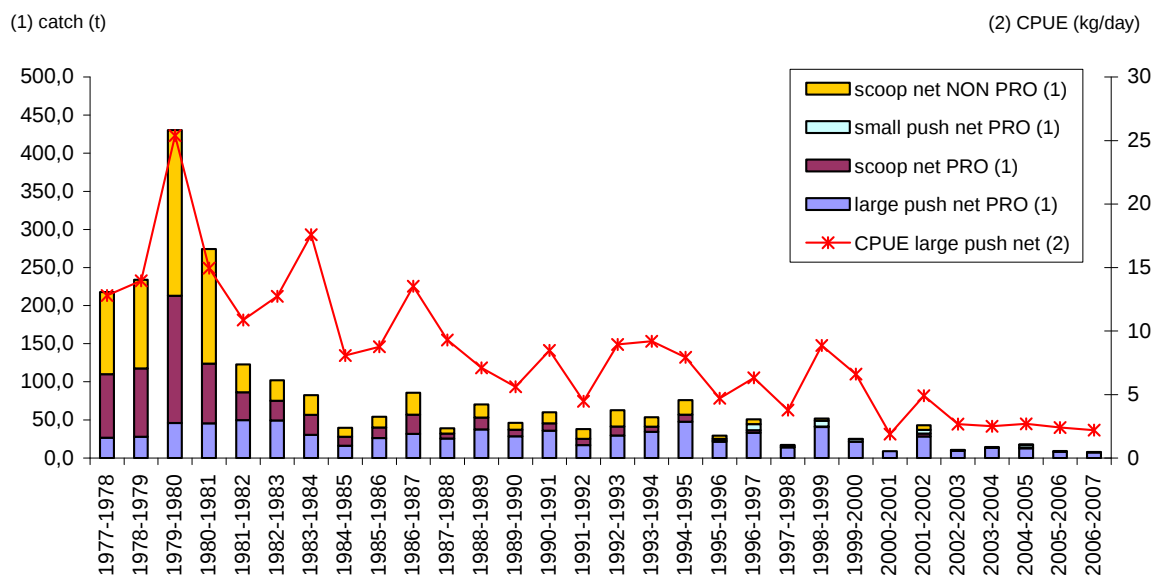


Figure FR.3. Cumulated capture of glass eel for professional and non professional fishers, cpue on the Gironde basin for 1978–2007 (Source: Cemagref).

The use of GLM model with these fishery data has permitted to correct the variation of catches and effort between fishers. The glass eel cpue in the Gironde is a valid abundance index, the same trend is obtained for two métiers (large pushnet and scoopnet) and two zones (brackish and fresh estuary) (Beaulauton and Castelnaud, in press). This result confirms the decreasing trend of glass eel in the Gironde basin.

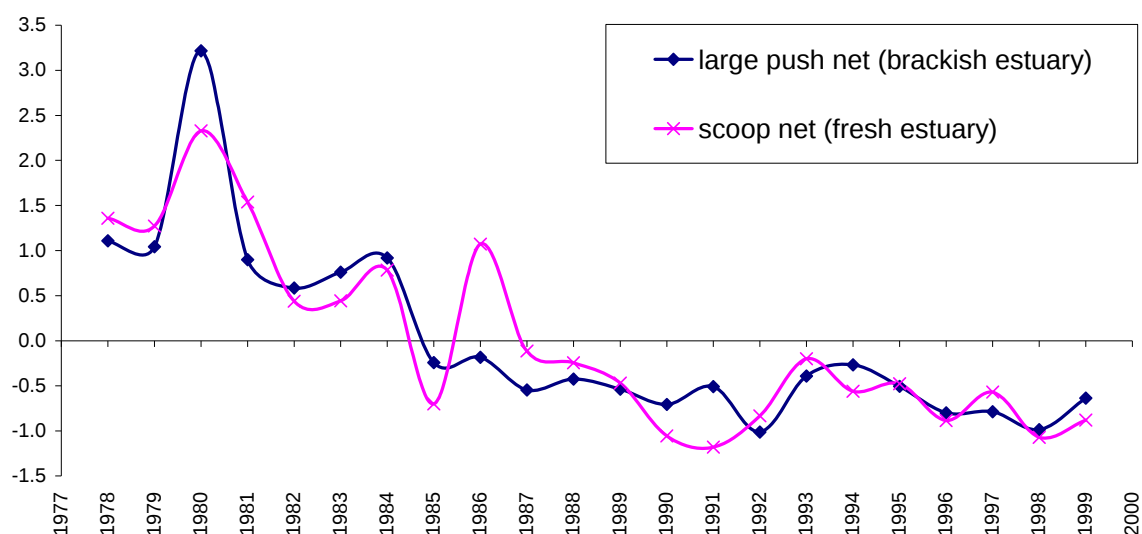


Figure FR.4. Standardized cpue (from GLM) for the large pushnet (*Pibalour*) and the scoopnet (*Tamis*) métiers for the period 1978–1999 (Beaulaton and Castelnau, in press).

FR.F.2 Yellow eel cpue in the Gironde basin

The eel pot cpue for yellow eel has fallen down between 1988 and 1989, slightly increased until 1998 before decreasing again until 2004. The total catches have decreased although the number of fishers 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.

To analyse this situation, a biological sampling through the professional fishery has been made in 2004 and 2005. This sampling will permit to precise the effort parameters, the stock structure and the fishing impact on the stock. If this study is maintained during several years, it will be possible to evaluate the magnitude of the yellow eel stock with VPA methods (Sparre, 1979; Ardizzone and Corsi, 1985; Gasquel and Fontenelle, 1994; Dekker, 2000).

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

Table FR.q. Catches of yellow eel for professional and non professional eel pot fishers, cpue on the Gironde basin for 1978–2007 (Source: Cemagref).

YEAR	TOTAL CATCH (T)		CPUE (KG/EELPOT/MONTH)
	Pro.	Non Pro.	Pro.
1978	195.5	204.1	
1979	241.3	229.5	
1980	181.4	155.7	
1981	187.8	148.8	
1982	157.9	133.1	
1983	71.8	76.2	
1984	103.8	164.1	
1985	106.0	170.3	
1986	124.5	160.5	
1987	94.8	134.3	1.9
1988	102.3	97.7	1.9
1989	67.1	40.2	0.9
1990	47.1	28.3	0.8
1991	26.3	15.8	1.2
1992	46.1	27.7	1.1
1993	35.7	21.4	0.9
1994	35.2	21.1	1.0
1995	36.9	18.4	1.3
1996	25.7	7.7	1.1
1997	32.2	9.7	1.5
1998	24.4	7.3	1.5
1999	21.8	1.5	1.1
2000	20.0	1.4	1.1
2001	18.0	0.6	1.2
2002	13.1	1.1	1.0
2003	10.4	0.5	0.9
2004	14.4	1.3	1.4
2005	8.6	0.6	0.8
2006	8.4	1.3	0.9
2007	8.8	1.3	1.0

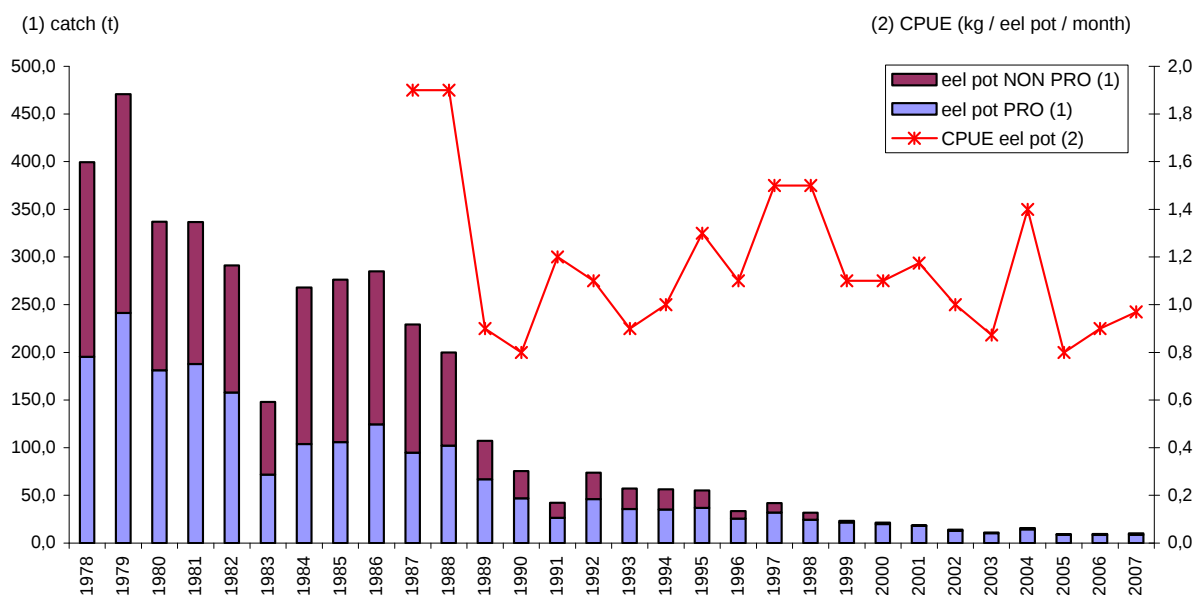


Figure FR.5. Cumulated catch of yellow eel for professional and non professional fishers, cpue on the Gironde basin for 1978–2007 (Source: Cemagref).

FR.F.3 Glass eel cpue in the Adour basin

The results are providing by Ifremer in connection with CNTS.

Table FR.r. Mean, maximum minimum annual cpue (Kg/trip) for the glass eel fishery (hand nets) 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

YEAR	CPUE MEAN	CPUE MIN	CPUE MAX	YEAR	CPUE MEAN	CPUE MIN	CPUE MAX
				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

FR.F.4. Comparison of yellow eel cpue between the Adour and the Gironde basins

The exploitation of the yellow eel in the Adour and the Gironde basins can be compared with two long historical series (Figure FR.6 and Figure FR.7). The Adour data concern marine professional fishers (source: Ifremer) and the Gironde data correspond to marine and river professional fishers (source: Cemagref). Catches have significantly decreased from 1978 to 1986 (Gironde data) mainly because of a strong decrease in nominal effort, the cpue (ratio between catch and nominal effort) has revealed a great variability during this period. From 1987 onwards (Adour and Gironde data), the nominal effort decreased slightly whereas catches fell. In the Adour basin, cpue decreased sharply in a first period (1987–1990) then decreased but more slightly (from 1990 onwards). In the Gironde basin, the decrease is more continuous since 1986. The overall decrease of cpue (1987–2003) in both basins seems to be of the same order of magnitude.

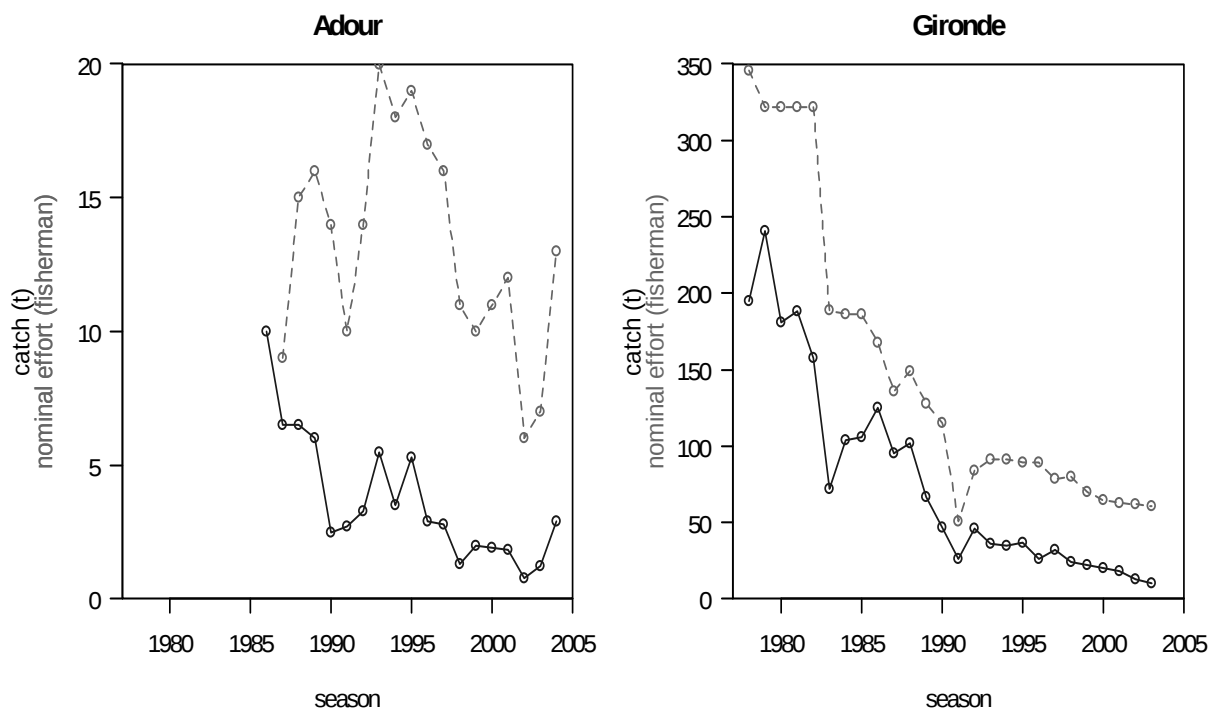


Figure FR.6. Catch (solid line) and nominal effort (dashed line) in the Adour (left panel) and Gironde (right panel) basins over the period 1978–2004. Source: Adour = Ifremer; Gironde = Cemagref.

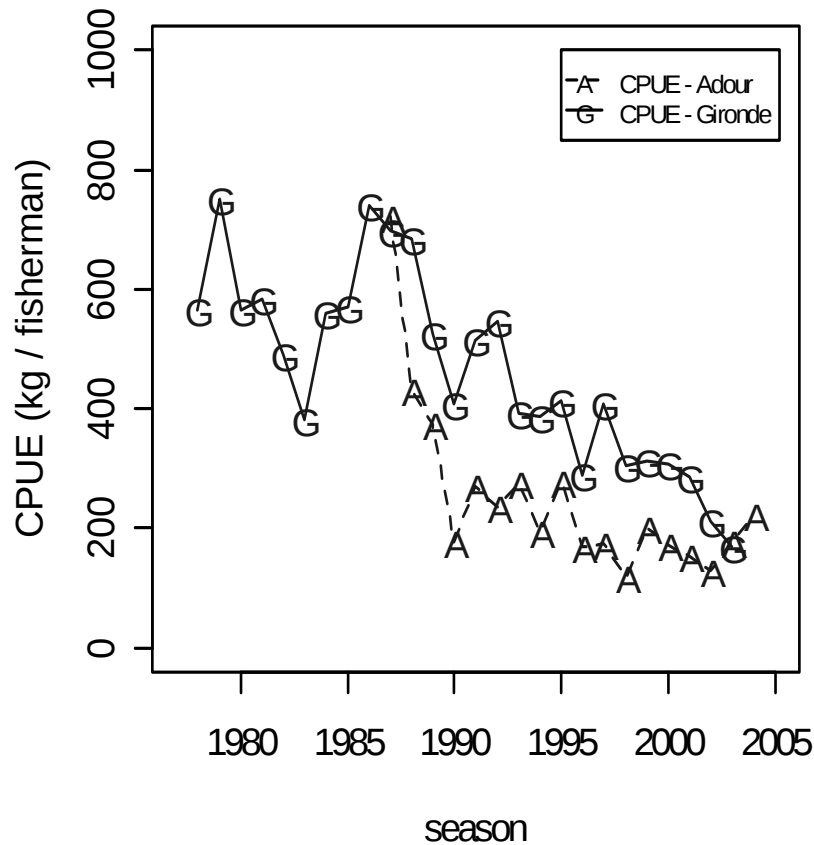


Figure FR.7. Cpue in the Adour (dashed line) and Gironde (solid line) basins over the period 1978–2004. Source: Adour = Ifremer; Gironde = Cemagref.

FR.G Scientific surveys of the stock

FR.G.1 Recruitment surveys, glass eel

Recruitment surveys have been set up in the Gironde since 1979. In the Adour it has been set since 1998 and in the Loire and Isle (tributary from the Gironde) since 2004 as part of the Indicang project. The methods are described in (Feunteun *et al.*, 2002). A fishery and trap based survey is also conducted in the Vilaine from 1996. The Loire time-series is based on catches.

FR.G.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 a research vessel (Figure FR.8) and aims at evaluating the abundance variations of the juveniles of fish and crustacean and the adults of small species.



Figure FR.8 The “Estuaries” boat used for scientific survey in the Gironde (Source: Cemagref).

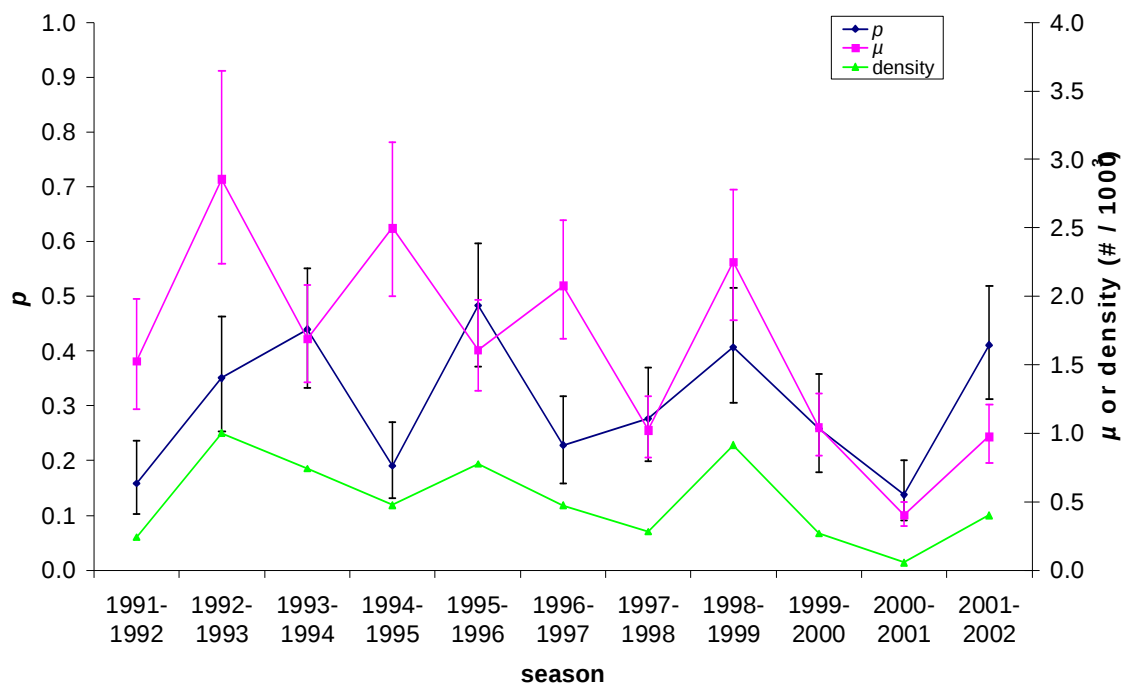


Figure FR.9. Results for glass eel of a delta-gamma analysis for season effect (p =probability of positive capture, μ =mean capture for only positive capture, density= $p \cdot \mu$) (extracted from Lambert, 2005).

These data were recently 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 both performed thanks to generalized linear models (GLM;

(McCullagh and Nelder, 1989)) with spatial and temporal effects. Only results on season effect for glass eel are presented in Figure FR. 9. (For more details see Lambert, 2005). All combinations of p and μ are encountered. However, we can notice 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. In the main, this analysis confirms results coming from fishery data (see FR.F.1) even if some little differences remain to analyse.

FR.G.1.2 Recruitment survey, the Adour

The Adour survey aims at estimating the glass eel flux transported during flood tide in the estuary. The protocol is based on the simultaneous catch of glass eels located at the surface (Figure FR.10) and in full water along three longitudinal transects. These catches are done downstream from the dynamic tide reversal area, at a fixed station and during the entire flood.

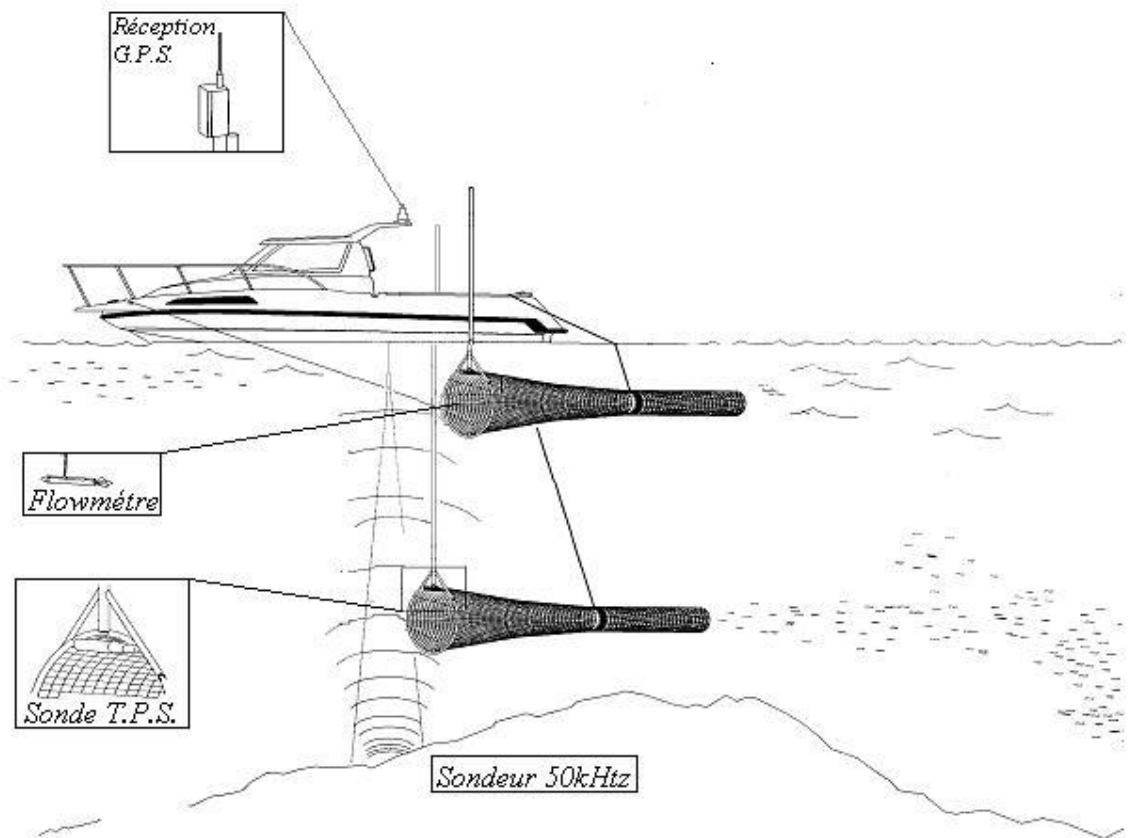


Figure FR.10. Descriptive diagram of the materials of catch and positioning used in the Adour protocol (Source: Cereca).

The variability of the glass eel captures over the recent period 1985–2002 (Table Fr.s) seems especially related to the fluctuations of hydro-climatic conditions (Figure FR.11).

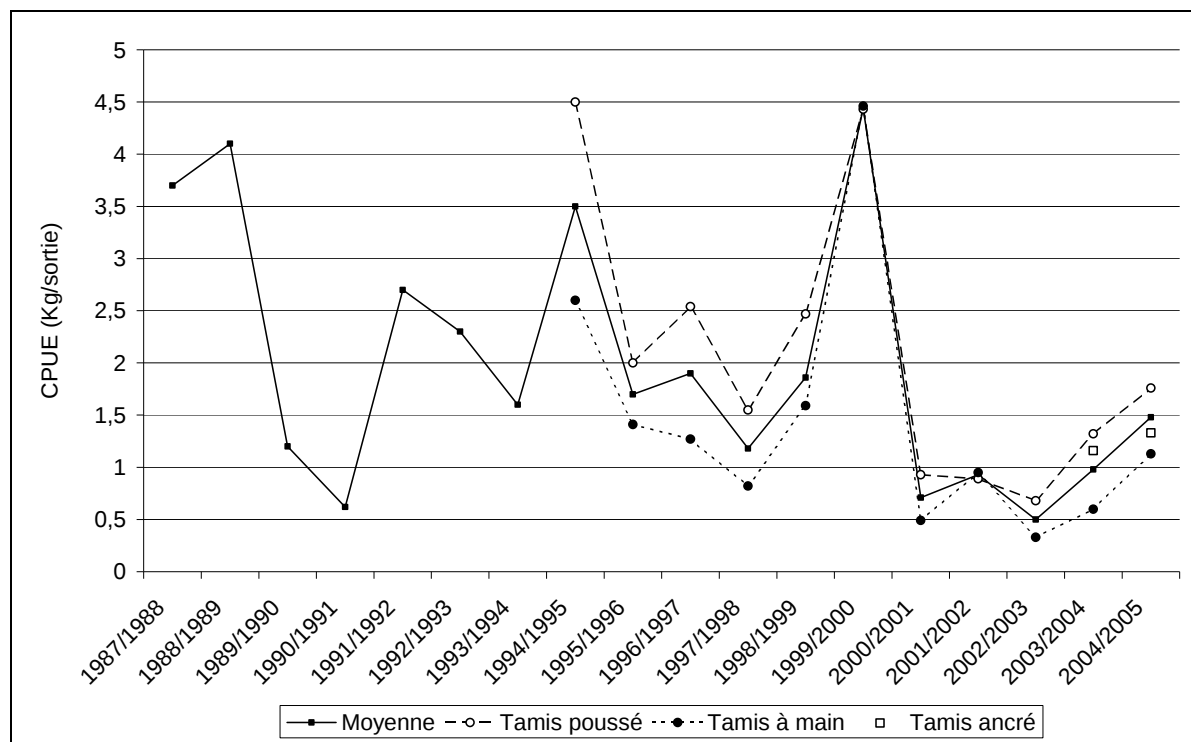


Figure Fr.11. Variations of glass eels captures per type of fishing gears in the Adour estuary. Moyenne = mean, tamis poussé = small pushnet, tamis à main = scoopnet, tamis ancré = fixed scoopnet (Lissardy *et al.*, 2007).

Table Fr.s. Total catches for the glass eel fishery (from 2000 only marine fishers combining small pushnets and scoopnets) in the Adour estuary.

DECADE				
Season (n-1,n)	1970	1980	1990	2000
0			3.2	9
1			1.5	2
2			8	2,4
3			5.5	0.6
4			3	1.7
5			7.5	3,2
6		8	4.1	
7		9.5	4.6	
8		12	1.5	
9		9	4.3	

FR.G.1.3 Time series of catches of glass eel and yellow eel, the Vilaine

The Vilaine time-series is collected from total catches of the fishery. As the fishing closure has been modified from 1996, those catches are corrected from the evaluation of the standing stock after the closure of the fishery. These evaluations are based on marking recaptures surveys performed in April and May and modelling (Table FR.t). The results of the monitoring of the trapping ladder are summarized in Figure Fr. 12.

Table Fr.t. Time series for the Vilaine glass eel recruitment (corrected from late arrivals).

SEASON (N-1,N)	1970	1980	1990	2000
0		95	35.9	14.45
1	44	57	15.35	8.46
2	38	98	29.57	15.90
3	78	69	31	9.37
4	107	36	24	7.49
5	44	41	29.7	7.36
6	106	52.6	23.286	6.6
7	52	41.2	22.85	7.7
8	106	46.6	18.90	5.1
9	209	36.7	16	

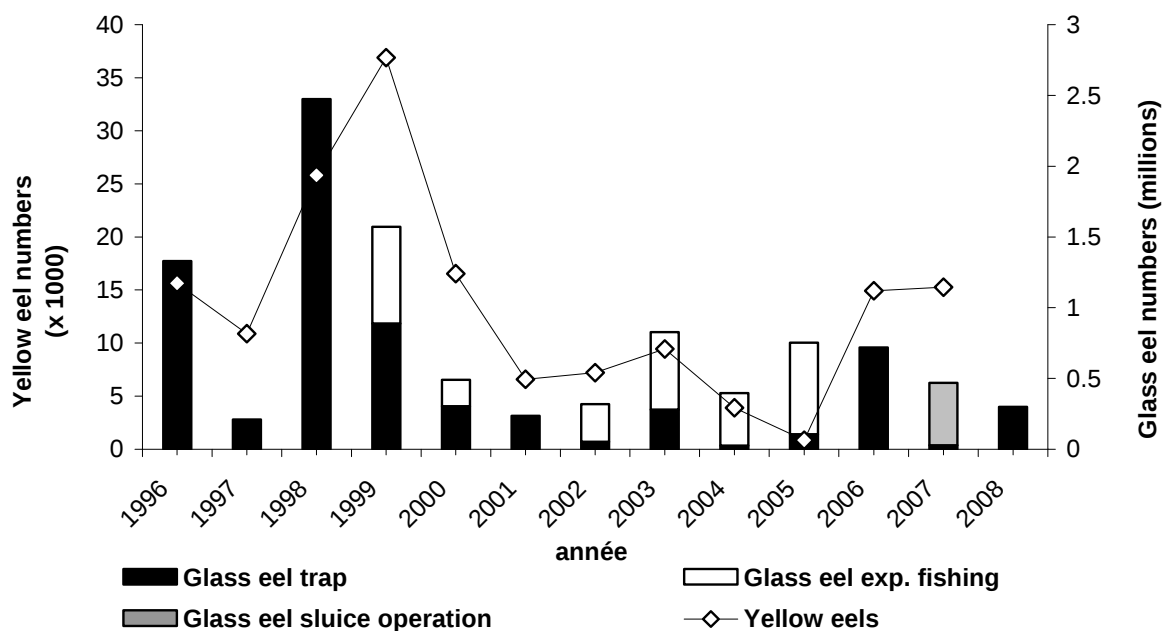


Figure Fr.12. Number of glass eel and yellow eel collected and counted at the Vilaine trapping ladder.

FR.G.1.4 Time series of catches, the Loire

The historical data of glass eel fishery (Table FR.u) have been provided by Ifremer and for the recent years, the Tableau de Bord Loire has gathered them from CSP, CRTS, DDAM.

Table Fr.u. Time series for the Loire glass eel fishery, marine and fluvial professionals until 2001, only marine professionals from 2002 to 2007 (* an assumption was made for catches of fluvial fishers, not available for this year).

DECADE SEASON (N-1,N)	1950	1960	1970	1980	1990	2000
	86	411	453	526	96	80
1	166	334	330	303	36	33
2	121	185	311	274	39	42
3	91	116	292	260	91	53
4	86	142	557	183	103*	27
5	181	134	497	154	133	17
6	187	253	770	123	81	15
7	168	258	677	145	71	21
8	230	712	526	177	66	
9	174	225	642	87	87	

FR.G.2 Stock surveys, yellow eel

Specific stock surveys were performed in small basin (Frémur, Oir). The results are in previous ICES reports.

The “Reseau hydrobiologique et piscicole” (RHP) is a survey of 761 stations yearly sampled with electrofishing. These samples are used to determine the ecological status request by the Water framework directive. The abundance of eel distribution reveals a classical downstream increase in density (Figure FR. 13). No peculiar trend can be given by the first analysis of the 1995–2003 time-series (see p. 21 of Anonymous, 2004.). A detailed observation of the stations of higher density in 1995 reveals significant erosion during the first year of the monitoring. A programme starting in 2006 will analyse the data more deeply.

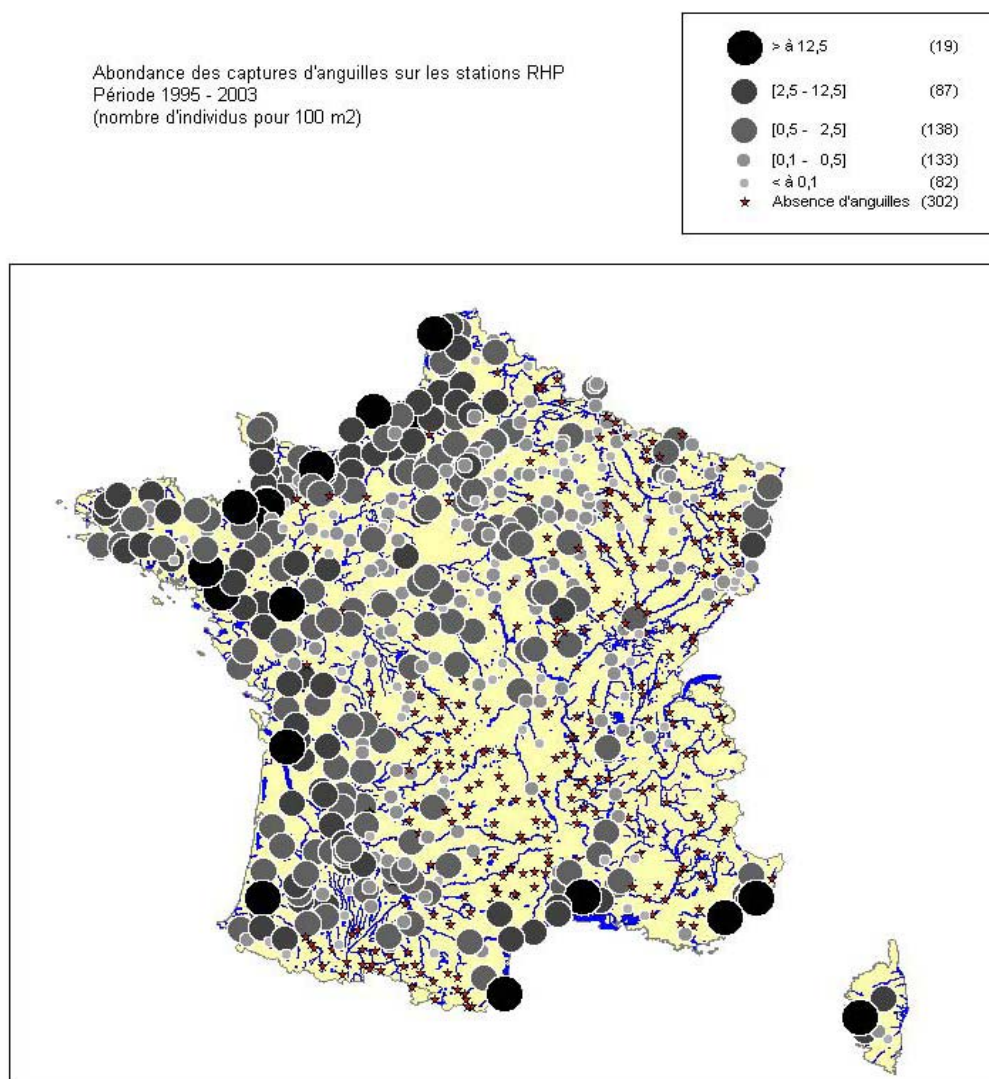


Figure FR.13. RHP electrofishing stations, mean value from 1995 to 2003 (Source: CSP).

FR.G.3 Silver eel

These 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.H. Catch composition by age and length

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

FR.I. Other biological sampling (age and growth, weight, sex, maturity, fecundity)

There is no routine programme measuring parameters of the eel population dynamics at the national level in France.

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