

Study Case Description

The Vilaine, France

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1 Introduction

The Vilaine catchment (47.3 N 2.24W) covers 10 400 km² (NW of France). A dam closes the estuary

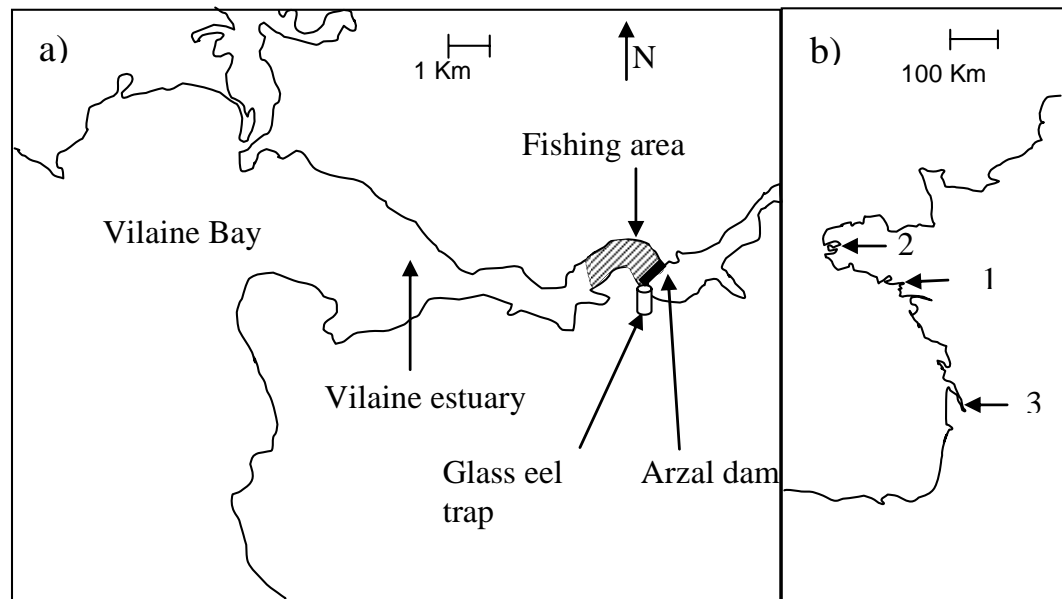


Figure Vil. 1. Map of the Vilaine estuary, and of the Atlantic coast of France, showing the location of several fisheries, 1- Vilaine, 2- Aulne, 3-Gironde.

2 Fishing capacity.

The number of licences in the Vilaine is fixed at 163. The actual number of fishermen in the estuary is in the range 100-130 when the effort is at its maximum.

3 Fishing effort.

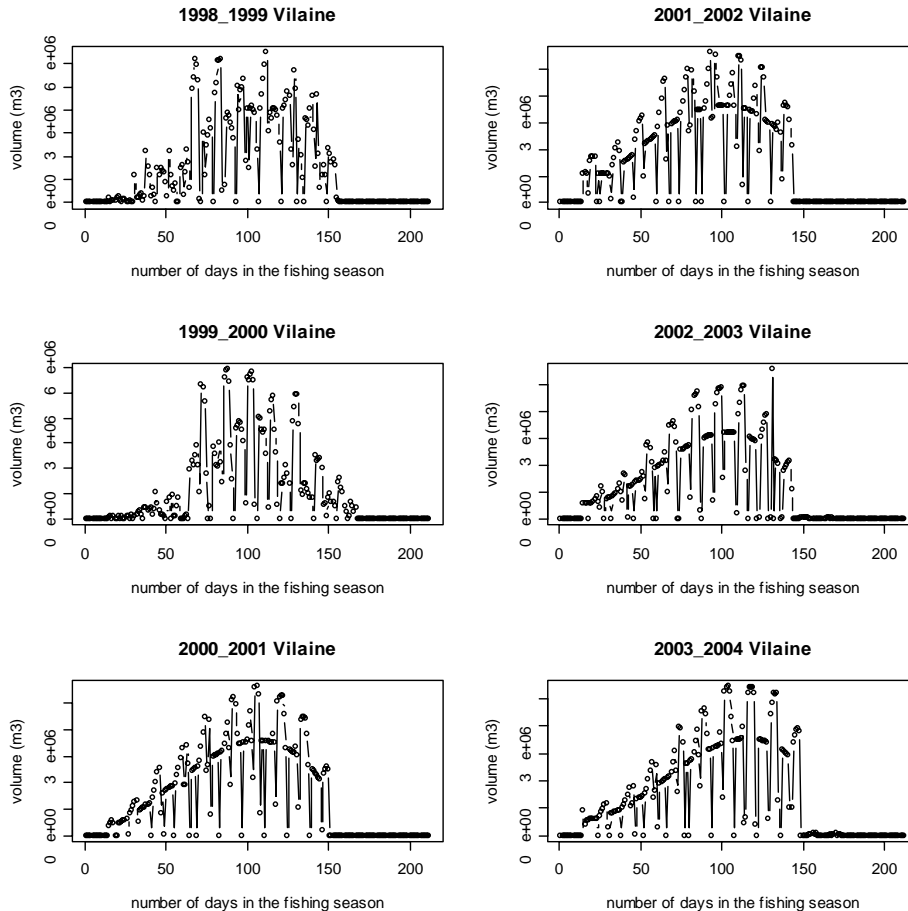
The filtration in the Vilaine was computed from a survey of the number of anchored boats corrected from the legal fishing duration from 2000 to 2005, and by an extrapolation from a sub sample of fishermen providing reliable data in the period 1996-2000 (Briand, Fatin et al. 2003).

The level of fishing effort can be described in number of hours of fishing. The durations of fishing were calculated as following : Filtration time (h) = extrapolated number boats * fishing duration.

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Slime - Study Leading to Informed Management of Eels

Sixth Framework Programme, Priority 8.1, Policy-oriented research, Scientific Support to Policies.



As the GEMAC model uses m^3 of volume filtered, the fishing volume was calculated as following. Filtered volume= Filtration time(h)* $2.6m^3/s$ *3600 s/h*efficient time). The efficient time was considered as 0.9 in a first approach, *i.e.* 10 % of the fishing duration is spent during net handling and cleaning (see part VIL.G for measurement).

Figure Vil. 2. Estimation of the volume filtrated by the Vilaine glass eel fishery during the fishing season 1998-1999 to 1999-2000 (extrapolated) and 2000-2001 to 2003-2004 (reconstructed).

4 Catches and Landings.

The catches of the Vilaine fishery are collected by the administration after inquiry by the fish dealers working in the Vilaine. These data were consistent with those extrapolated from a sub-sample of reliable fishermen (Briand, Fatin et al. 2003).

The Vilaine time series is collected from total catches of the fishery (table Vil b). As the fishing closure has been modified from 1996, the time series of the Vilaine would be biased towards lower values if the late arrivals weren't accounted for. The 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. Uncorrected catches are provided in the next paragraph.

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	
7	52	41.2	22.85	
8	106	46.6	18.90	
9	209	36.7	16	

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

5 Catch per Unit of Effort

No data

6 Scientific surveys of the stock

6.1 Trapping ladder monitoring.

Year	Total catches(kg)	fishery	Trapping ladder (kg)	Experimental (kg)	fishing
1996	22 402		443		
1997	22 656		69		
1998	17 923		700		
1999	15 320		292	198	
2000	14 198		82	54	
2001	8 164		59		
2002	15 851		15	84	
2003	8 939		83	161 + 44.5	
2004	7 066		4	84 + 86 1	
2005	6 816		30	213	

Table Vil. b. Commercial fishery, trapping ladder and experimental fishing catches from 1996 to 2005 in the Vilaine estuary. Two data in the experimental fishing indicate an additional fishery during the fishing season.

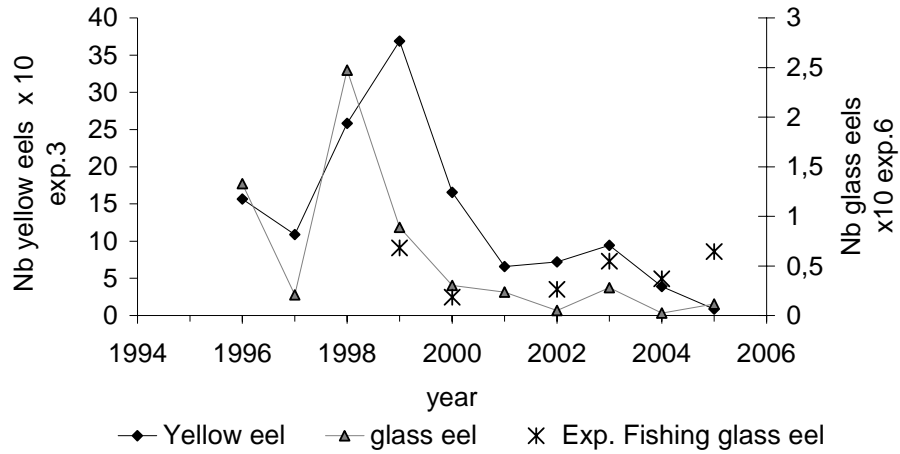


Figure Vil. 3. Number of glass eel and yellow eel collected and counted at the Vilaine trapping ladder. Fi

6.2 Experimental trips.

Experimental fishing have taken place in the estuary in 1999, 2000, 2002-2005.

Year	1999	2000	2001	2002	2003	2004	2005
Nb of experimental fishing	18	15	-	20	26	40	60

Table Vil. c. Number of experimental fishing trips from 1999 to 2005.

These fishing experiments allow to obtain a CPUE value along with an estimation of stock in marking recapture (Briand, Fatin et al. 2006).

Date	Marking type	Origin and recapture	Delay after release (days)	Bath duration (h)	Stock estimation (kg)	inf	sup
9-avr.-99	BB	estuary-estuary	0	3	453	81	125
14-avr.-99	RN1	trap-estuary	0.5	5	710	57	69
16-avr.-99	RN1	trap-estuary	2.5	5	478	49	61
24-avr.-99	BB	estuary-estuary	0.5	3	328	21	24
24-avr.-99	RN1	trap-estuary	0.5	5	372	22	26
26-avr.-99	RN1	trap-estuary	1.5	5	265	34	9
5-mai-99	BB	trap-estuary	0.5	3	1123	218	356
8-mai-99	BB	trap-estuary	3.5	3	913	198	351
10-mai-99	BB	trap-estuary	5.5	3	765	102	139
10-mai-99	RN2	estuary-estuary	3.5	5	965	163	247
14-mai-99	RN2	estuary-estuary	2	5	726	51	60
14-mai-99	RN2	estuary-trap	0.5	5	341	21	24
17-mai-99	RN2	estuary-estuary	5	5	700	71	90
3-mai-00	BB	estuary-estuary	0.5	3	377	31	37
3-mai-00	RB	estuary-trap	0.5	4	419	0	68
3-mai-00	RB	estuary-estuary	0.5	4	364	28	33
13-mai-00	RB	trap-estuary	1.5	4	187	32	48
19-mai-00	BB	estuary-estuary	1.0	4	223	42	66
19-mai-00	RB	estuary-trap	1	4	203	33	49
19-mai-00	BB	trap-estuary	1.0	3	46	4	5
11-avr.-02	RN1	estuary-estuary	0	4	77	2	2
24-avr.-02	RB	estuary-estuary	0	4	23	5	8
30-mars-03	RB	estuary-estuary	0	4	179	7	7
1-avr.-03	RN1	trap-estuary	0	4.5	57	4	4
16-avr.-03	RB	estuary-estuary	0	4.5	169	24	35
30-avr.-03	RB	estuary-estuary	0	4	109	7	9
3-avr.-04	RB	estuary-estuary	0	4	128	13	16
18-avr.-04	RN1	estuary-estuary	0	4.2	48	3	4
21-avr.-04	RB	estuary-estuary	0	3.5	164	29	46
24-mars-05	RB	estuary-estuary	0	2.7	171	23	32
30-mars-05	RN1	estuary-estuary	0	3	190	21	27
5-avr.-05	RB	estuary-estuary	0	2	96	24	47
8-avr.-05	RN1	estuary-estuary	0	2	130	7	8
20-avr.-05	RB	estuary-estuary	0	2	157	17	22
22-avr.-05	RN1	estuary-estuary	0	2.4	137	28	47
25-avr.-05	RN1	estuary-estuary	0	3	106	15	21
6-mai-05	RB	estuary-estuary	0	2	75	8	9

Table Vil. d. Summary of marking recaptures allowing an estimation of the estuarine stock since 1999.

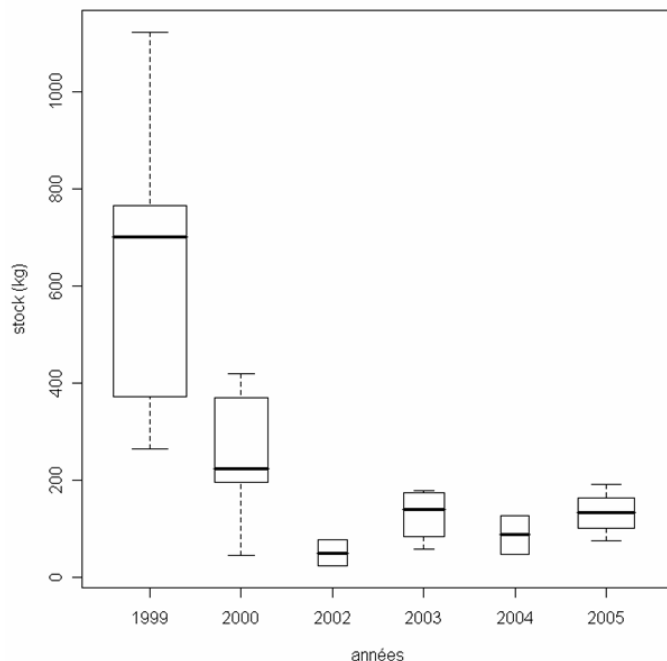


Figure Vil. 4. Box plot of marking recaptures stock estimations since 1999.

	1999	2000	2002	2003	2004	2005
Moy	0.021	0.022	0.049	0.052	0.035	0.031
SD	0.018	0.014	0.048	0.037	0.019	0.032
N	13	7	2	4	2	8

Table Vil. e. Efficiency per hour of fishing

The experimental fishing allows us to determine some of the fishery parameters. The efficient fishing duration, *i.e.* the time during which net are propelled forward divided by the total duration of the fishing is 0.79 when nets are set at the surface and 0.76 when the nets are set deeper in the water column. These values underestimate the efficient time during the commercial fishery since they were collected during experimental fishing, when fishermen are not competing and the tow duration is strictly controlled.

The mean filtration speed measured by flow meters from 2000 on 64 sampling trips was 2.97 m³/s sd 0.61.

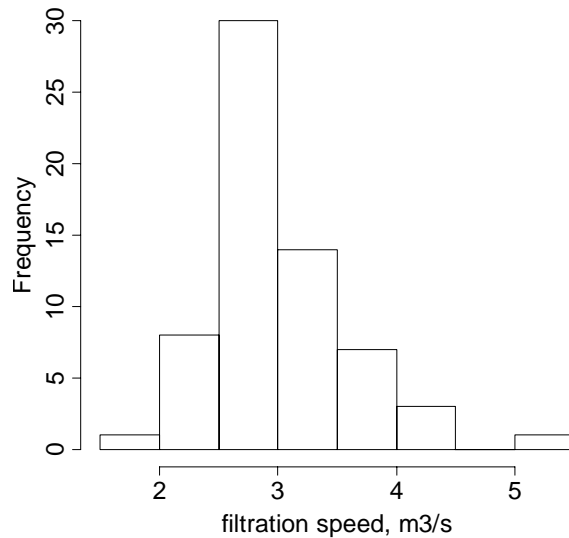


Figure Vil. 5. Histogram of filtrations speed measured during experimental trips.

7 Management of the Vilaine glass eel fishery

It is interesting in the context of the slime project to provide an insight into the Vilaine management procedure. Two managers of the fishery were interviewed (see WP 2) and their comments can be related to the description of the management process and target described in the following paragraph.

The process of setting a management target in the Vilaine is eased by the monitoring of the trapping ladder which allows comparing the fishery catches and amount of glass eel collected in the trapping ladder, and subsequently released in freshwater above the estuarine dam. The target setting has first aimed at enabling the glass eel to ascend the ladder as soon as the weather conditions were good (temperature 12 °C). This procedure was abandoned as it led to heated discussion on the real temperature of the estuary, and did not enable to take account of the decreasing recruitment. The large recruitment in 1996 and 1998 led to an important colonisation of the Vilaine basin, with very large densities observed in the lower (0-50 river km) and middle basin (50-100 rkm)(Briand, Fatin et al. 2006). The recruitment of 1998 (700 kg) was therefore from 2001 considered as the target and although it was never attained in post evaluation procedures, it was reduced further from 2003. Indeed the decreasing recruitment implied too harsh management measures on the fishery if it were to attain the target and it was felt that this local measure would never be accepted. The lesser reduction in fishing effort was compensated by the introduction of fishing trips, first at the end of the season and then during the fishing season (Figure Vil 3).

This local escapement target is not related to a wider objective set at the stock level. The GEMAC model proposes to relate the filtration rate of the fishery to either a %SPR or a pristine biomass target. It also ensures that a proximate target could be set in other, data poorer estuaries

Year	Season start	Season end	Escapement target (management rule)	Escapement target (measured estuary)	Exploitation rate	Trapping ladder efficiency
1996	15-nov	15-avr		886	96.2%	50%
1997	15-nov	30-avr		250	98.9%	28%
1998	15-nov	06-avr	stop 12 °C	1 400	92.8%	50%
1999	15-nov	02-avr	stop 12 °C	700	95.6%	42%
2000	15-nov	15-avr	stop 12 °C	250	98.3%	33%
2001	15-nov	30-mars	700 kg > fresw	300	96.5%	20%
2002	15-nov	23-mars	700 kg > freshw	180	98.5%	8%
2003	15-nov	23-mars	700 kg freshw	430	93.4%	19%
2004	15-nov	27-mars	600 kg freshw	270	95.4%	1%
2005	1-dec	20-mars	400 kg freshw + 400 kg estuary	539	88.9%	6%

Table Vil. f. Summary of the Vilaine management target and post-evaluation.

8 Literature references.

Briand, C., D. Fatin, et al. (2003). "Estuarine and fluvial recruitment of European glass eel in a fished Atlantic estuary." Fisheries Management and Ecology **10**(6): 377-384.

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