



**TYPOLOGY OF SILVER EELS
(*ANGUILLA ANGUILLA*, L.)
PRODUCTION IN SMALL COASTAL
CATCHMENTS:
FROM METHODOLOGICAL REFLECTIONS
TOWARDS A THEORETICAL APPROACH**

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Introduction

Decline of the European eel stock since the 1980's

Restoration of depleted stock (ICES, 1998)

Management Target= silver eels (Lambert & Feunteun, 2000; ICES, 2001)

**A need to estimate and survey the production of
spawning biomass by continental habitats (eg
coastal, estuarine & riverine)**

Background objectives

1. *Implement a general management adaptive restoration plan*
2. *Provide tools for decision makers (DSS)*

What's Known ?

Estimation of silver eels from natural environments

Large systems

Saint Laurent river (Caron *et al.*, 2000): 235 000/340 000 *A. rostrata* (mostly ♀)

Baltic sea (Moriarty, 1996): 2.5 MT ♀ silver eels (*A. anguilla*)

Loire River system (Boury *et al.*, this symposium): ~ 500 000 silver eels (80 % ♀)

Smaller systems

Frémur River (Feunteun *et al.*, 2000; France): 300 / 1200 silver eels (20-30 % ♀)

Erne River, Shannon (See McCarthy), Imsa (see Volestad), etc.

What is the breeding capacity of these systems ?

« Quality indices » (nb of ovocytes, turnover, fat content, contamination levels,...)

Reliable but « light » methods

for data poor systems (no fishery = no survey)

How to upscale ?

Objectives

Compare estimates of Silver eel production using two methods

'**Emigrating**' (*Wolf Traps*) or Traps and '**sedentary**' population size
(*Population characteristics in River systems*)

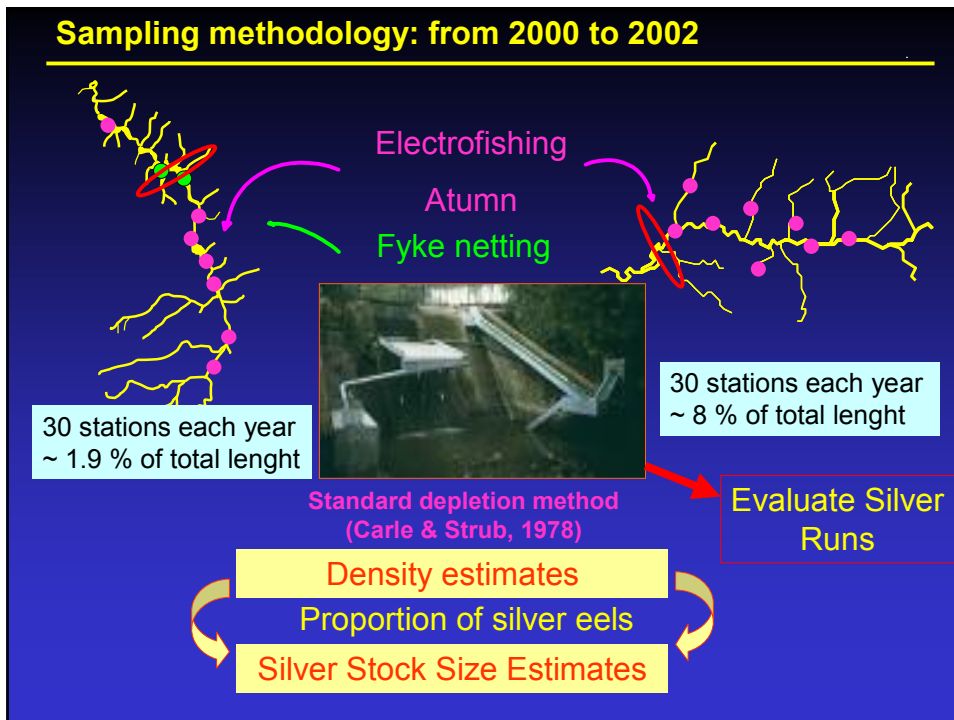
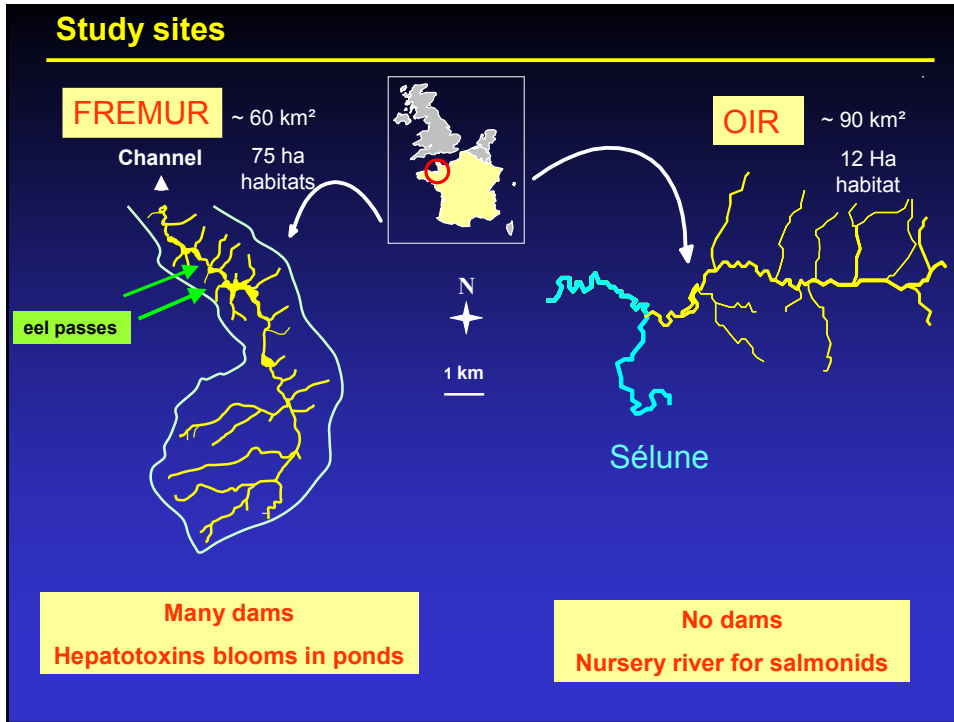
Estimate Breeding Capacity

(abundance, Sex Ratio, Size, Condition Coef.)

Comparison of potential breeders characteristics

(mean weight, mean condition factor)

Are there differences among rivers of similar size according to
anthropogenic context (*land use, and river development*)



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Population characteristics

Maturity (field criteria + Pankhurst)

Breeding Capacity

Sex ratio Size and biomass Condition

Results: Population structure

FREMUR

Interannual variability of recruitment

Potential breeders variations
(silver and yellow/silver eels)

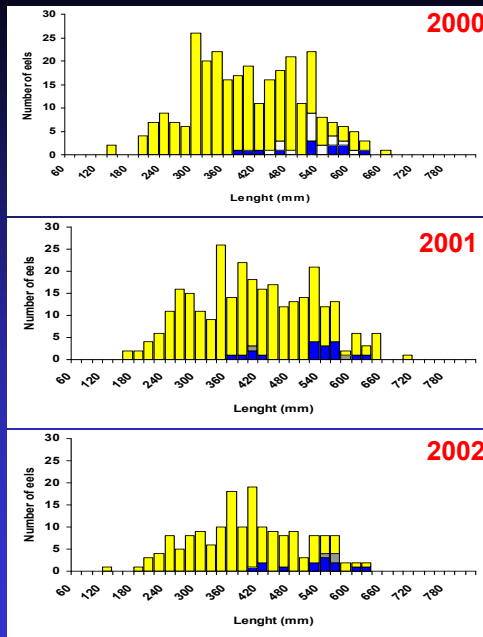
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9% in 2000
5.1% in 2001
6.3% in 2002

Sex Ratio of silver eels
~ 85% ♂ on average
Sedentary & Migrating

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Results: Populations structures



Oir

Low recruitment,
stable population
structures

Potential breeders
(silver and yellow/silver eels)

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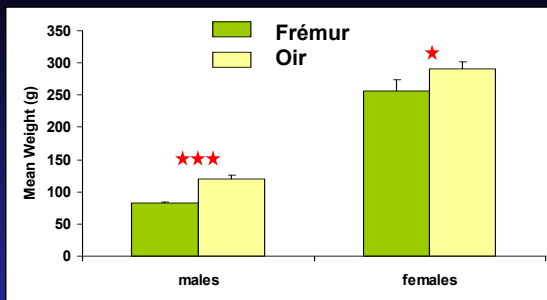
10 % in 2000

7 % in 2001

9 % in 2002

Sex Ratio of silver eels
~ 80 % ♀ on average
Sedentary & Migrating

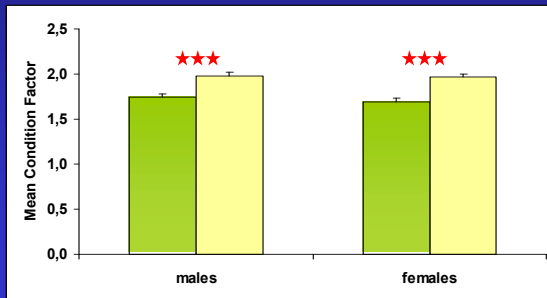
Results: Potential breeders characteristics



Weight and
Condition factor

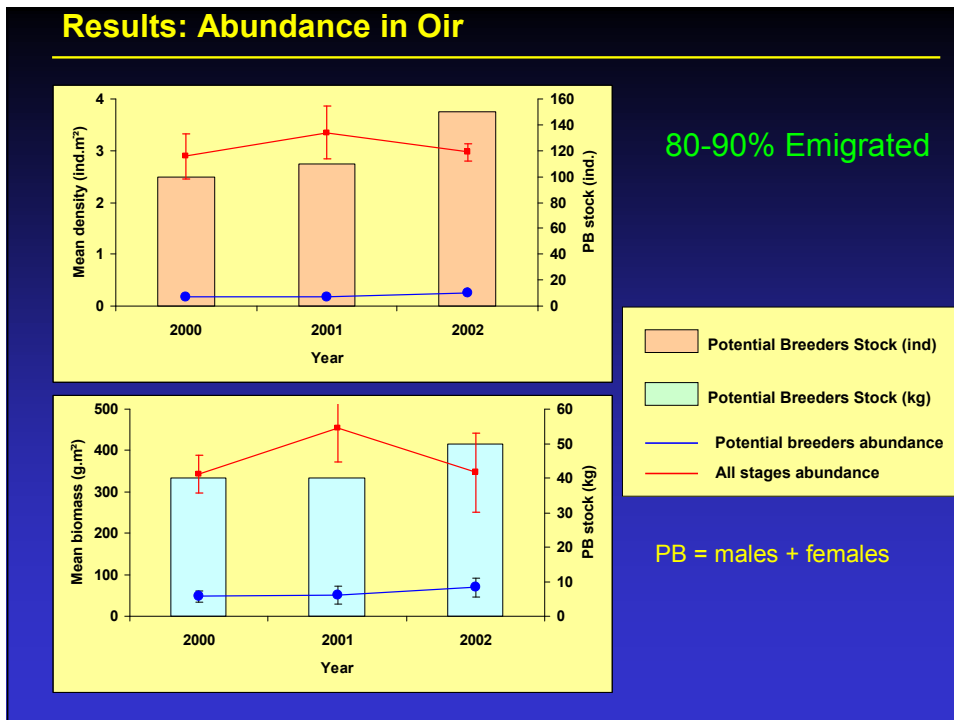
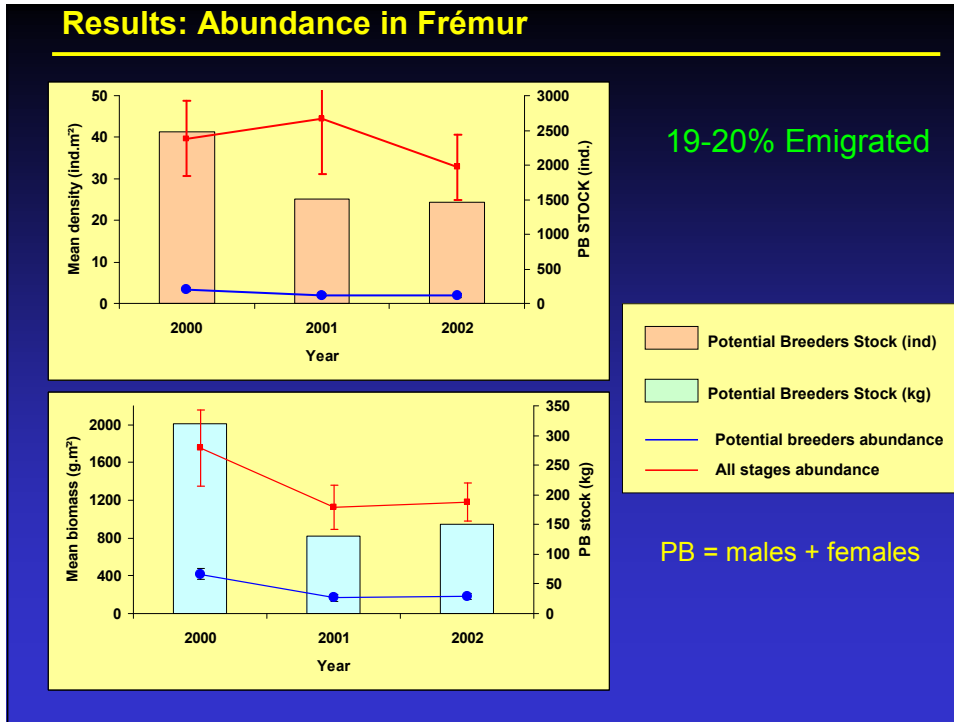
Significantly higher in the
Oir River

Sedentary & Migrating



Post hoc comp. Tukey test
Significative diff. at
p<0.05 *
p<0.001 ***

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Results: Females potentially emigrant eels production

	Frémur				Oir			
	2000	2001	2002	Mean ± SE	2000	2001	2002	Mean ± SE
Sex Ratio %females	19.7	14.6	10.5	14.9 ± 2.7	87.71	70	81.2	79.7 ± 5.2
Stock (Nb)	489	219	153	287 ± 102.6	88	77	122	95.5 ± 13.5
Stock (kg)	63	19	15,8	32.6 ± 15.3	35.1	28	40.6	34.6 ± 3.7

Discussion

Electro fishing surveys are reliable to produce indices of silver eel production by river systems

Estimating breeding capacity of river systems requires to:

- Know the population characteristics (sex ratio, size combined with density) to estimate
- Estimate the escapement (impact of mortality through turbines, fisheries, barriers to migration).

Estimating the Potential Breeding Success Requires to measure

- Contamination levels by chemical compounds
- Parasite infestation
- Condition Factor and fat Content

Management implications

- Strong variability of population characteristics among systems
- Impact of anthropogenic pressure
- A need to develop upscaling methodologies to extrapolate at the relevant population wide level.

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