GENETIC IMPACT OF THE REPRODUCTION DYNAMICS IN THE EUROPEAN FLAT OYSTER *Ostrea edulis*

Sylvie Lapègue[1], Nicolas Taris[1,2], Delphine Lallias[1], François Bonhomme[2], Pierre Boudry[1]

[1] Laboratoire IFREMER de Génétique et Pathologie, F-17390 La Tremblade, France

[2] Laboratoire Génome, Populations et Interactions - CNRS UMR 5000 Station Méditerranéenne de l'Environnement Littoral, 1 quai de la daurade, 34200 Sète, France

CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE

la science au service des hommes

Ostrea edulis

+ introduction in USA, Canada, Japan...

O. edulis population genetics:

How is the genetic variability distributed...

… in space ?

- Within *vs* among populations ?
- Atlantic *vs* Mediterranean populations ?
- Isolation by distance ?

... among genomes ?

- Nuclear *vs* Cytoplasmic ?

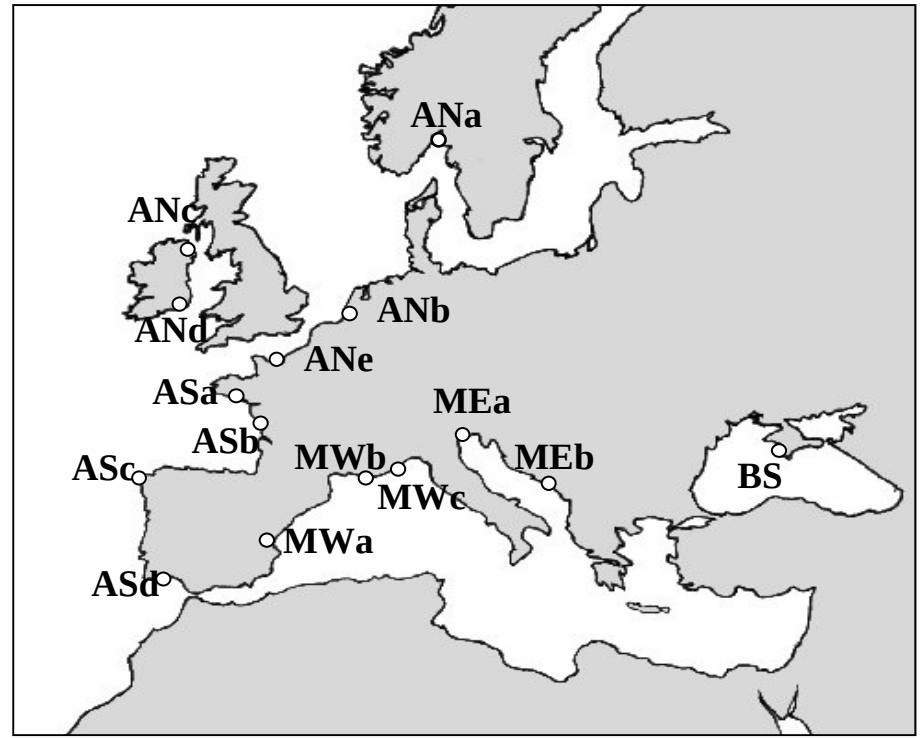
… over time and/or generations ?

- Adults *vs* juveniles
- Females *vs* larvae ?

Spatial distribution ?

Sampling:

15 populations sampled
14 to 50 individuals per location



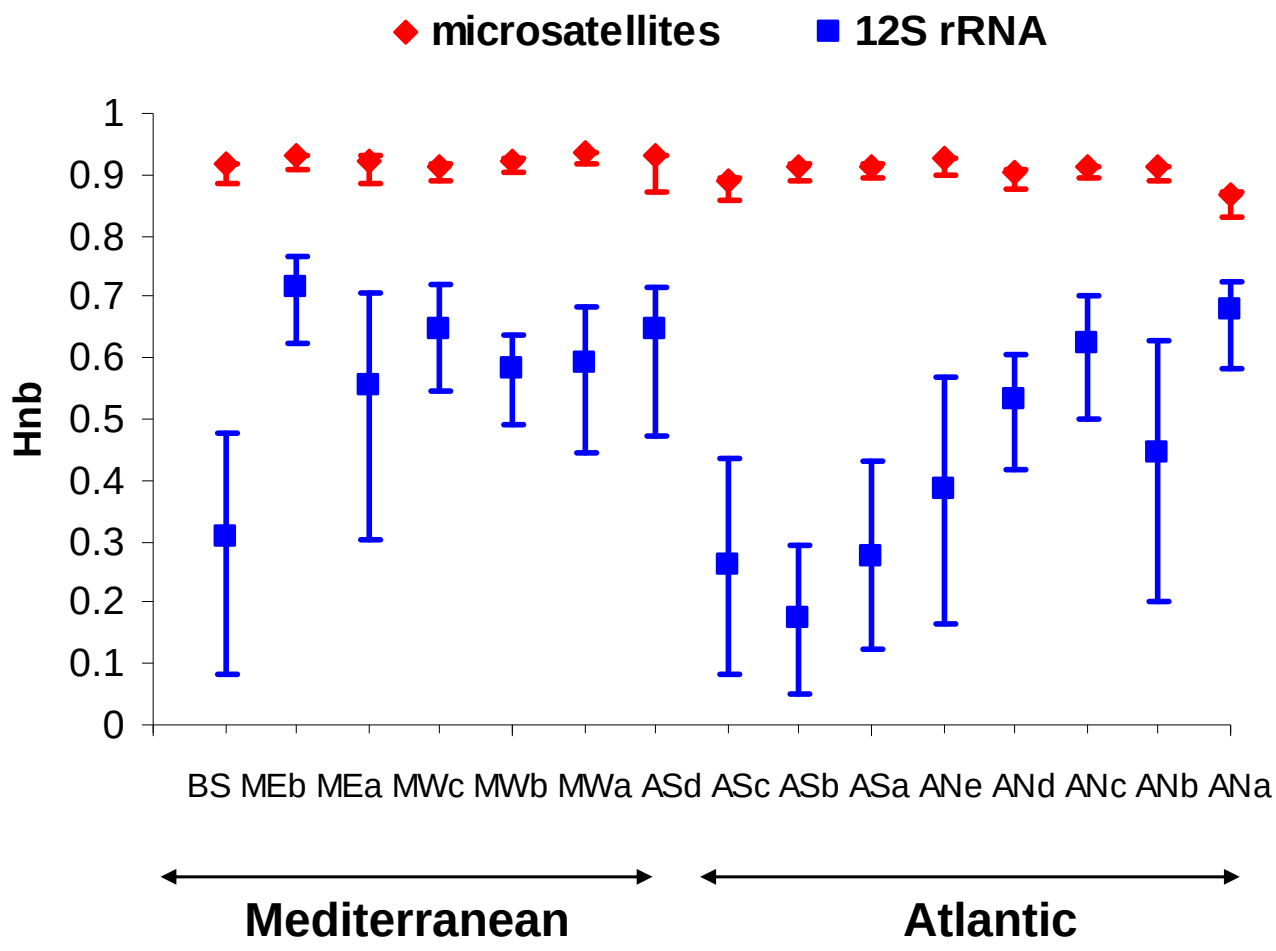
Markers:

- Allozyme loci (Saavedra *et al.*, 1993, 1995)
- microsatellite loci (Launey *et al*., 2002)
- 12S rRNA SSCP (Diaz Almela *et al*. in press)

Within population diversity :

Microsatellites: allele/locus/pop = 18.5 ± 4.5
mean He = 0.914 ± 0.018

12S rRNA: 14 SSCP haplotypes

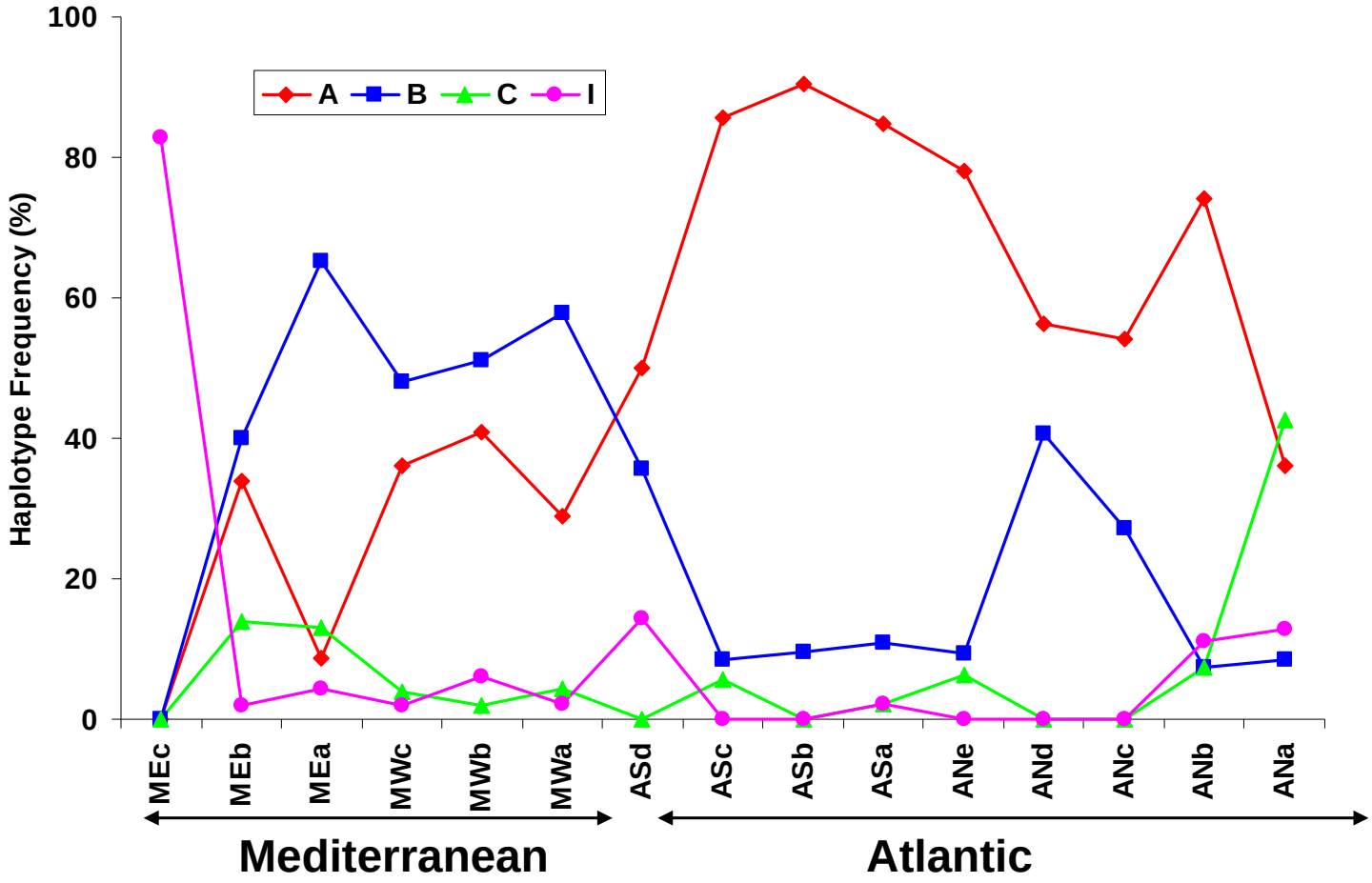


Among population differentiation :

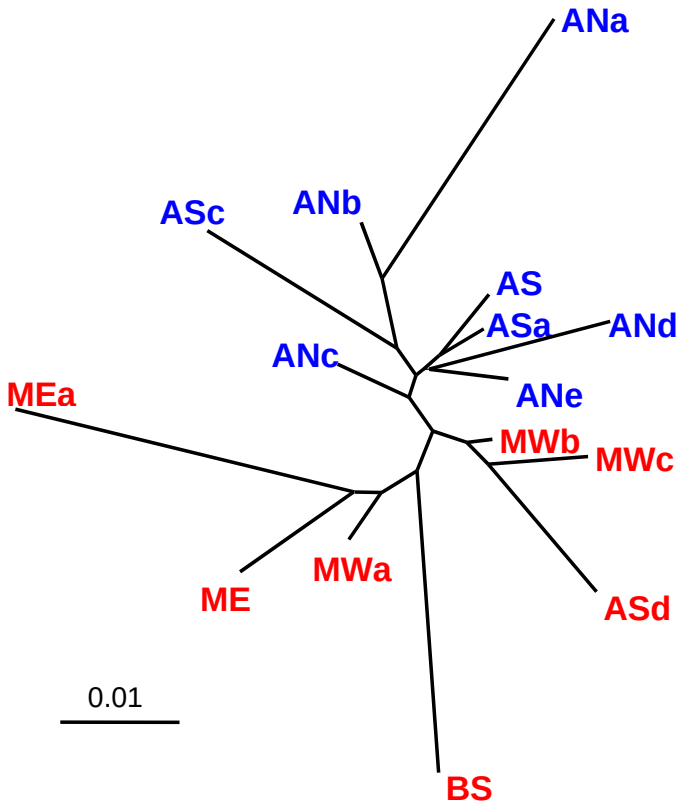
Microsatellites : *Fst* = 0.019***

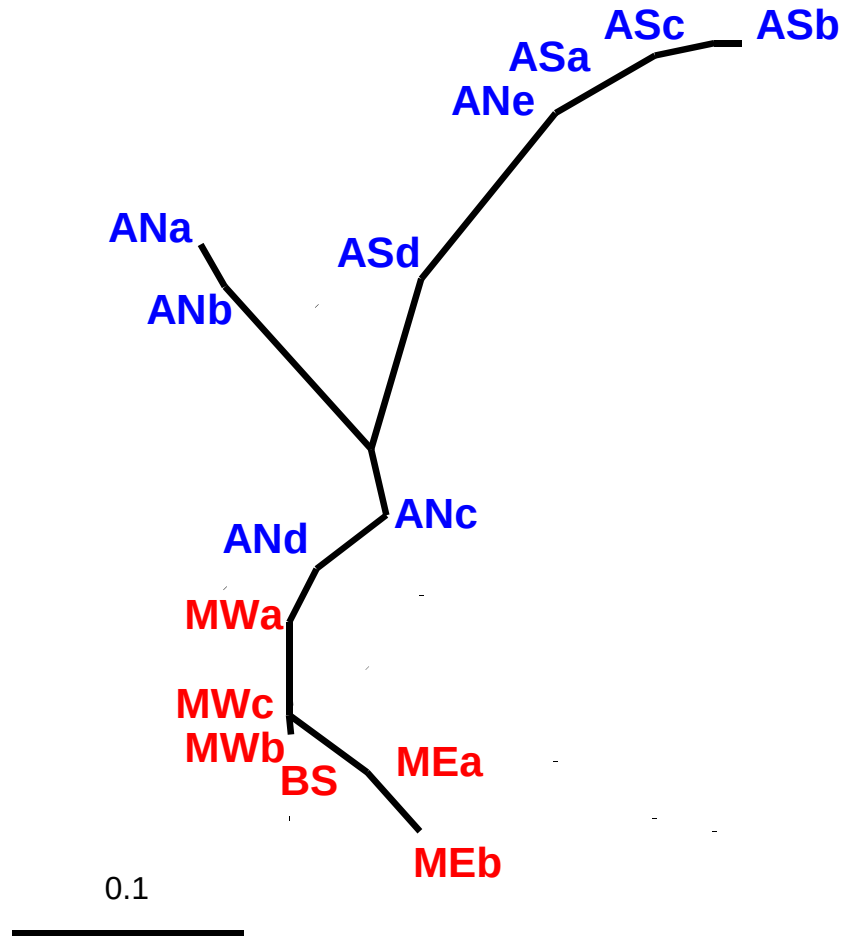
12S rRNA : *Fst* = 0.224***

10 X



Among population differentiation :

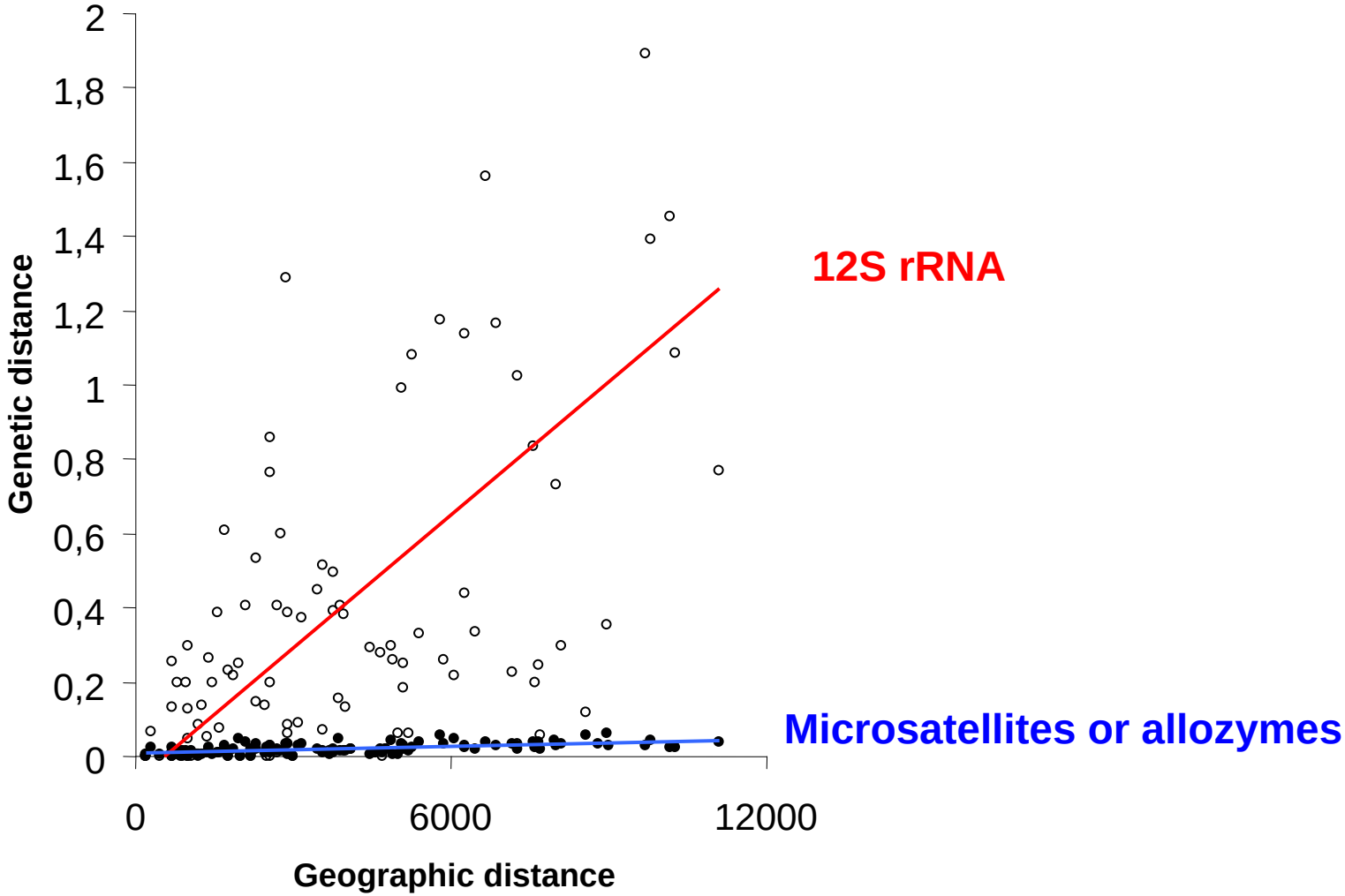




Microsatellites

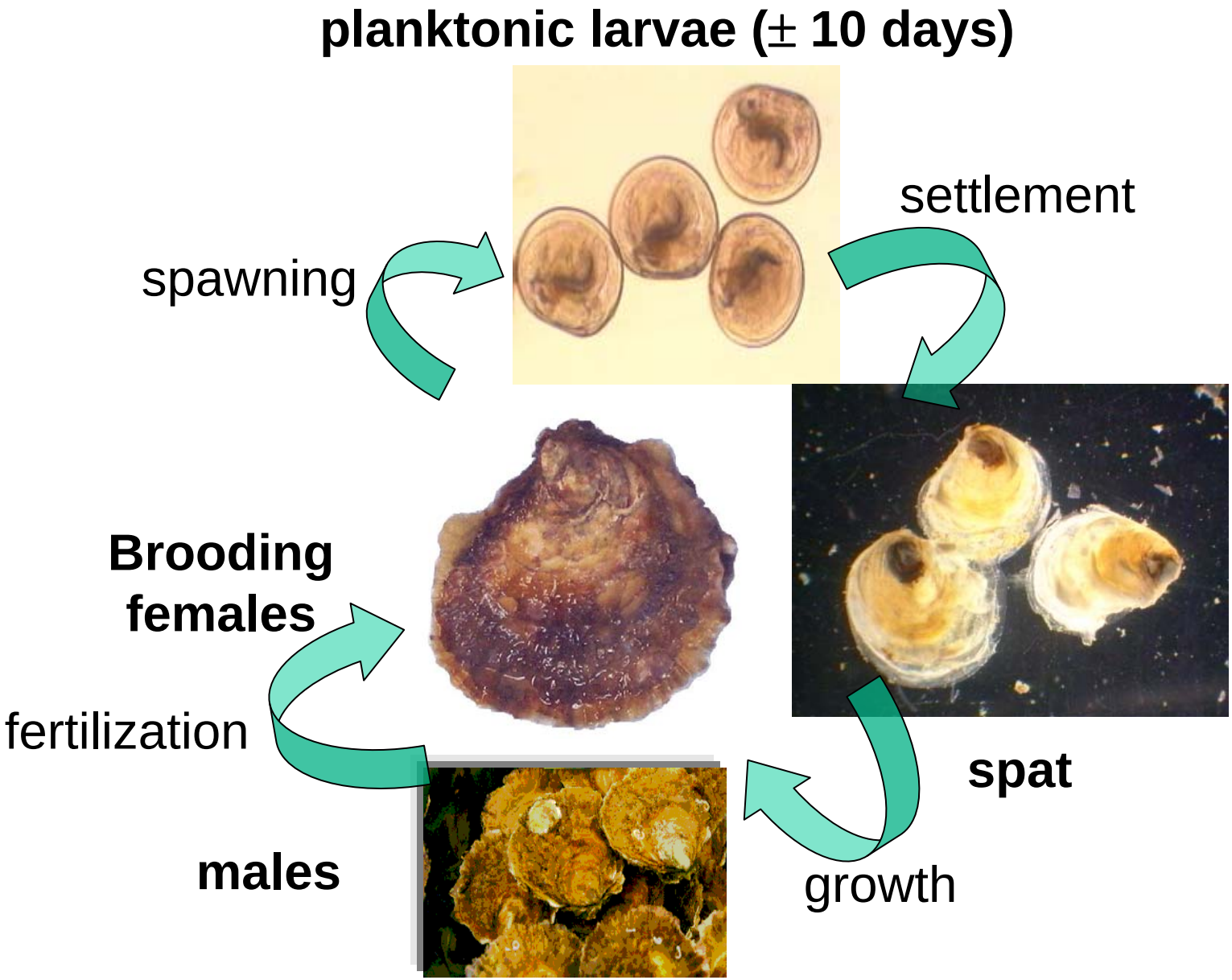
12S rRNA

Isolation by distance :

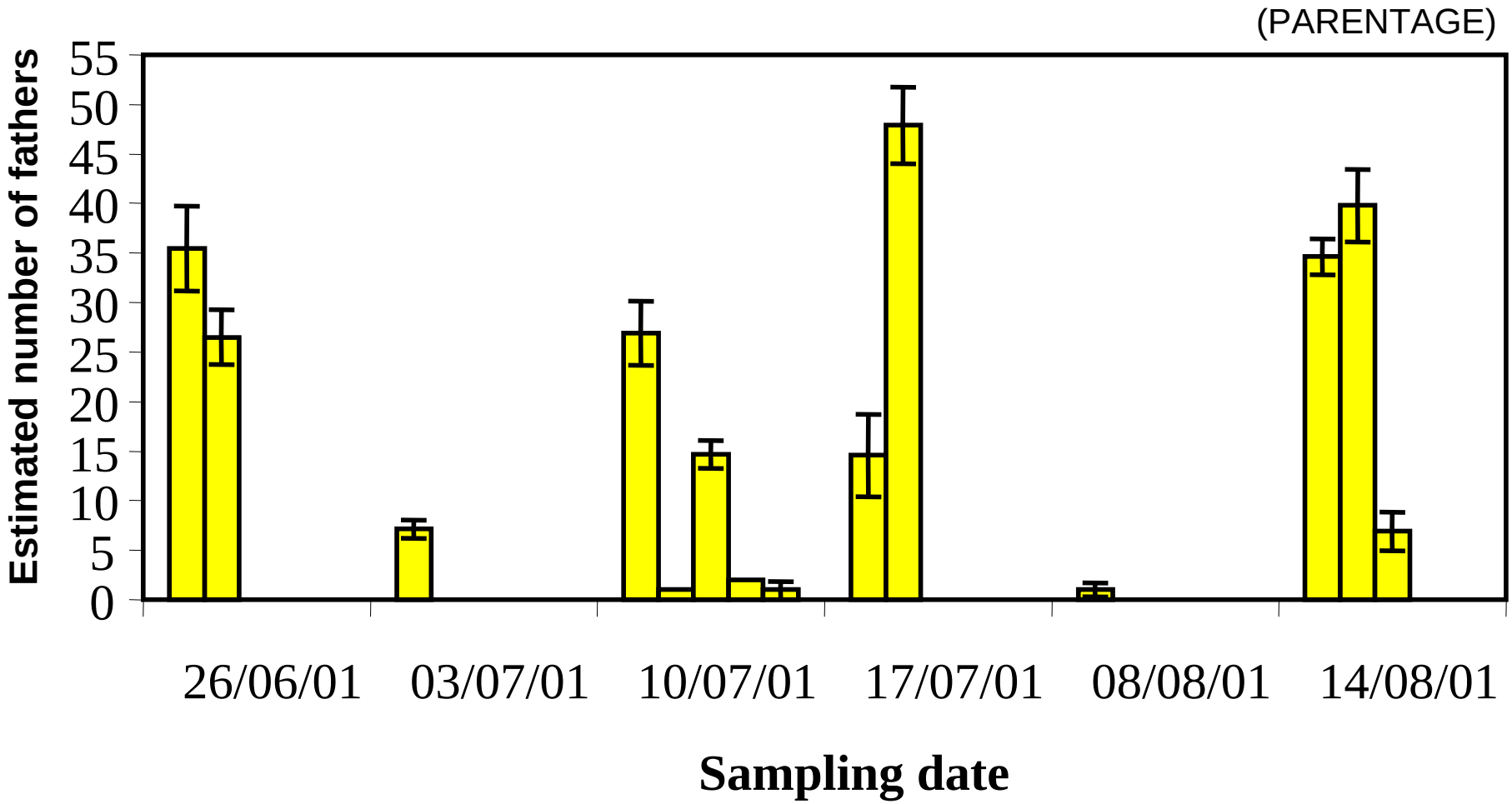


Higher variance in reproductive success in the female than in the male ?

Reproductive cycle

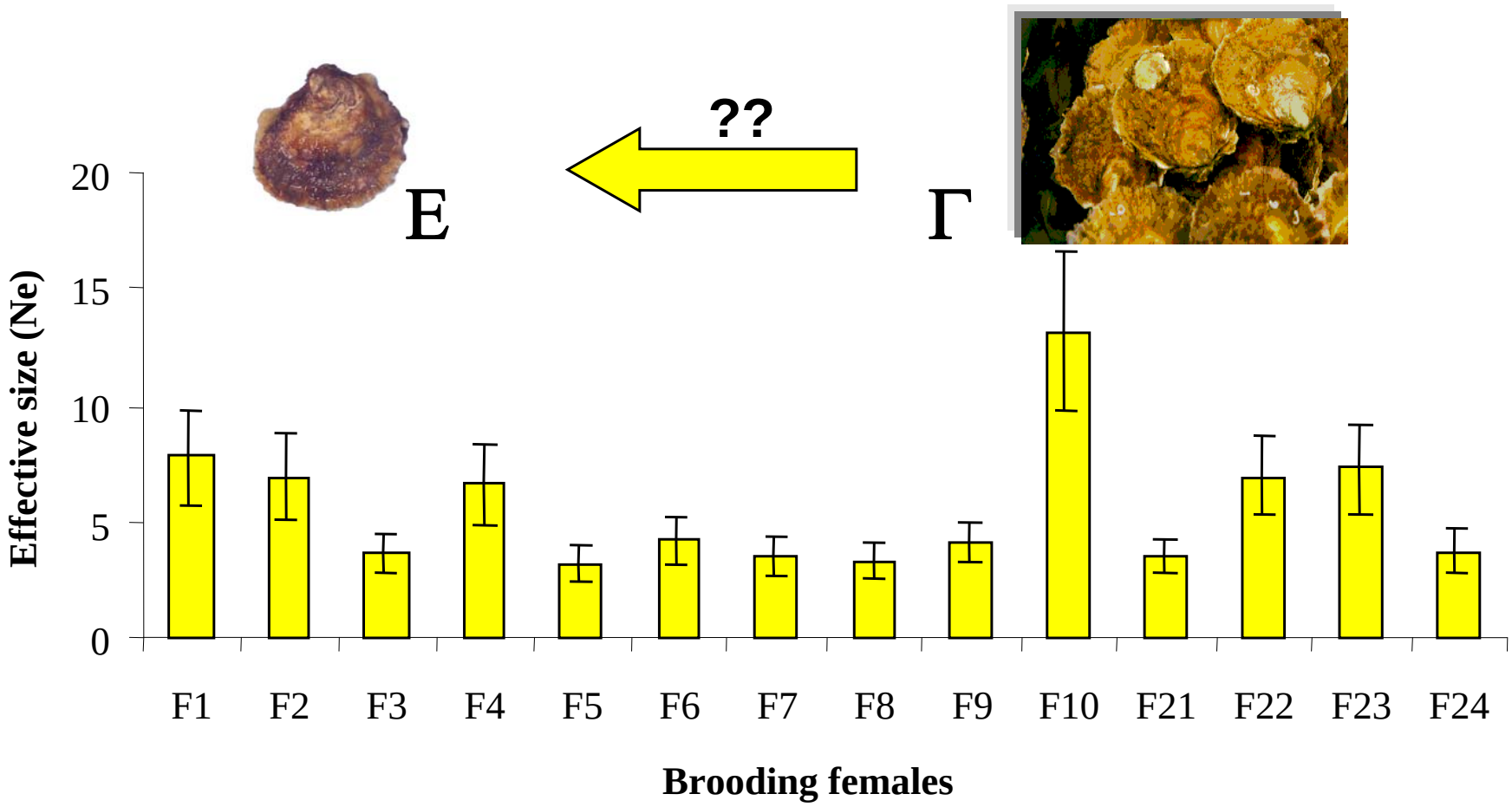


how many males / female ?



Very variable number of males / female

Variability over generation:
how many males / female ?



Variability over generations : *Ne* = ?

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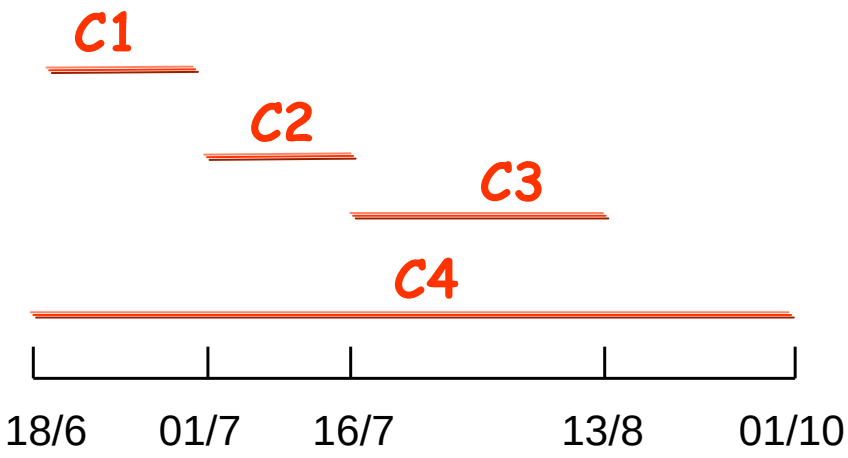
- **1994 : one cohort recruited over 15 days in Sète**

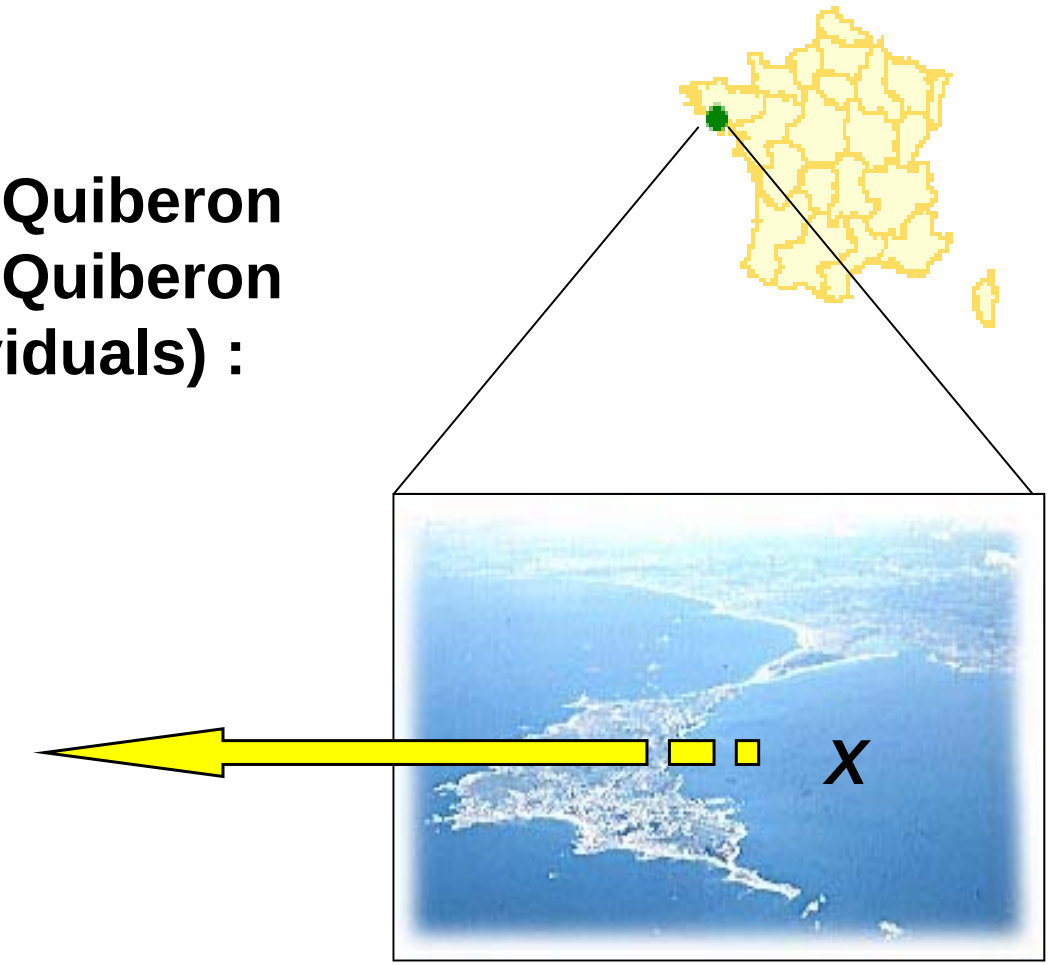
alleles / locus : spat (16.4) ≠ adults (21.8)

Ne = 16 [11,23] **(Launey *et al*., in prep)**

Variability over generations: *Ne* = ?

1995 : 49 adults collected in Quiberon
2001 : 68 adults collected in Quiberon
+ 4 cohorts (672 individuals) :





4 microsatellites
12S sequence

Differentiation among cohorts (*Fst*)

	Cohort 1	Cohort 2	Cohort 3	Cohort 4	Adults
Cohort 1		-0.019	-0.014	**0.052***	**0.058***
Cohort 2	0.000		-0.024	0.041	0.049
Cohort 3	0.001	-0.001		0.021	0.029
Cohort 4	0.000	0.002	0.002		-0.019
Adults	0.001	0.002	0.002	0.000	

**** p < 0.05***

No differentiation using microsatellites

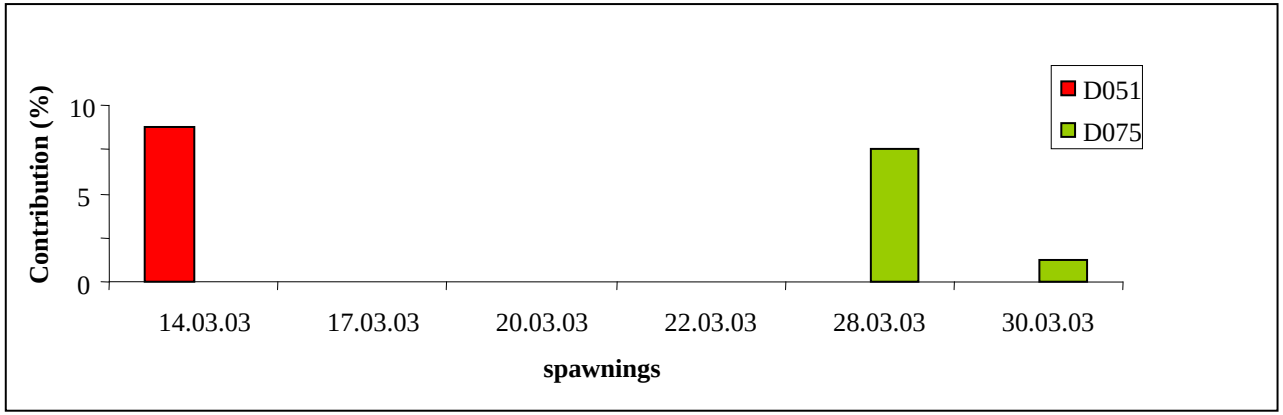
Low mitochondrial differentiation (cohort 1)

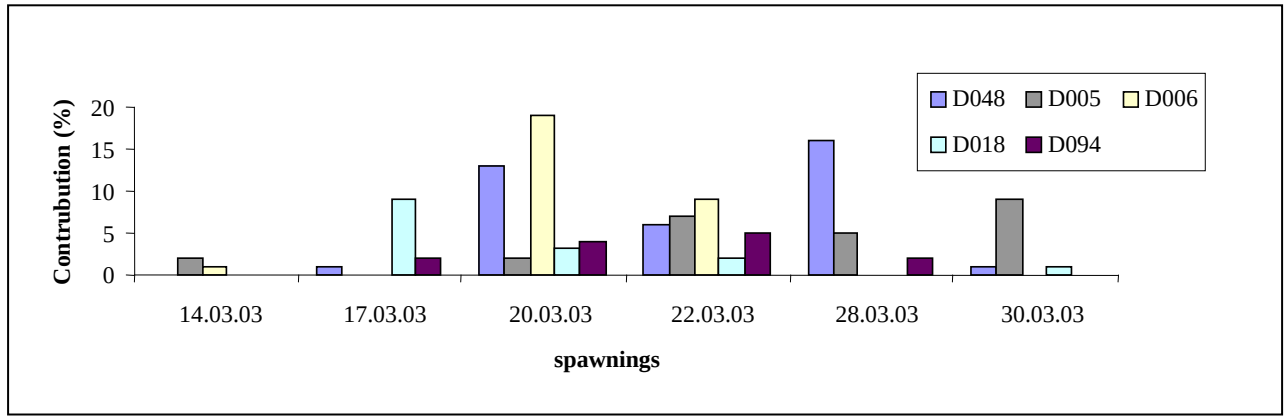
Variability over generations: *Ne* = ?

- **alleles / locus : spat = adults**
- **adults /spat : *Ne* = 135** [44, +∞]
- **adults 1994 / adults 2001 : Ne = 137** [60, +∞]

Spawning behaviour under controlled conditions :

60 individuals in a spawning tank
Ne / spawning event = 7 to 17





→ **Variation of reproductive success**

Risks and benefits of hatchery propagated spat to enhance production ?

- **Breeding programs have been initiated to improve disease resistance** (Naciri-Graven et al., 1998; Culloty et al., 2001)

- **Hatchery populations usually have low *Ne*** (Hedgecock et al., 1992) **in *O. edulis* :**
  - ✓**Saavedra & Guerra (1996): *Ne* ≈ 4**
  - ✓**Launey et al. (2001): *Ne* = 3 to 20**

- **Today hatchery-based production is still very limited**

- **Its development could have a positive impact in terms of aquaculture but might have a strong negative impact on genetic diversity of wild populations.**