

# Is the Portuguese oyster *Crassostrea angulata* in Southern Europe endangered by the expansion of the Pacific oyster *C. gigas*?



F.M. BATISTA, P. BOUDRY, S. LAPÉGUE, S. HEURTEBISE & C.C. MONTEIRO

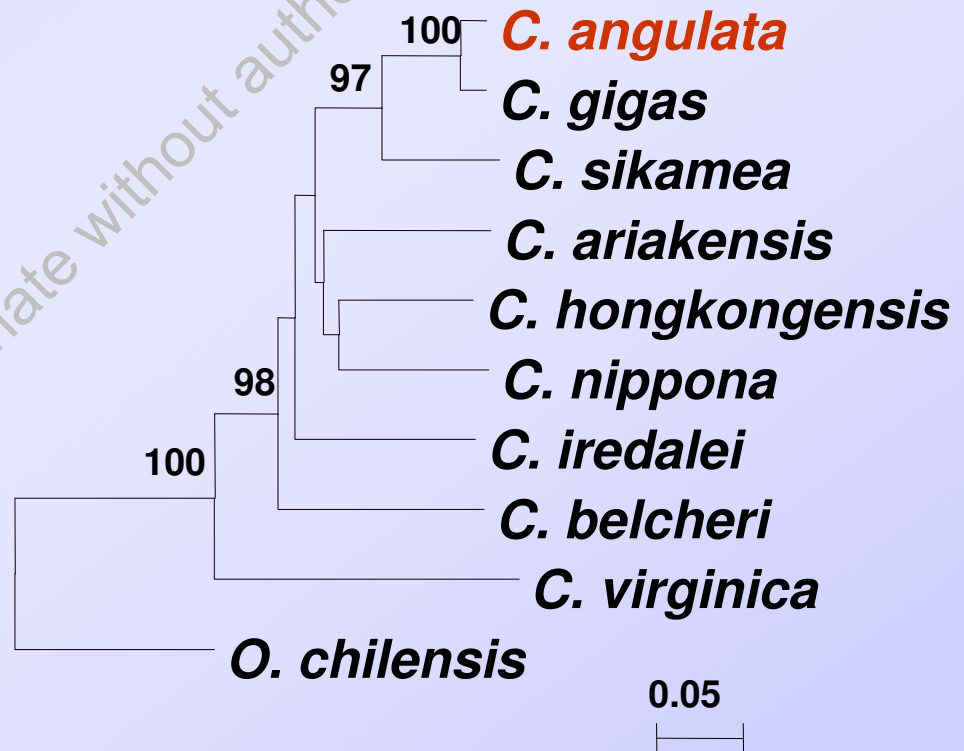
# Is *Crassostrea angulata* synonymous of *C. gigas*?

## Restriction enzymes banding

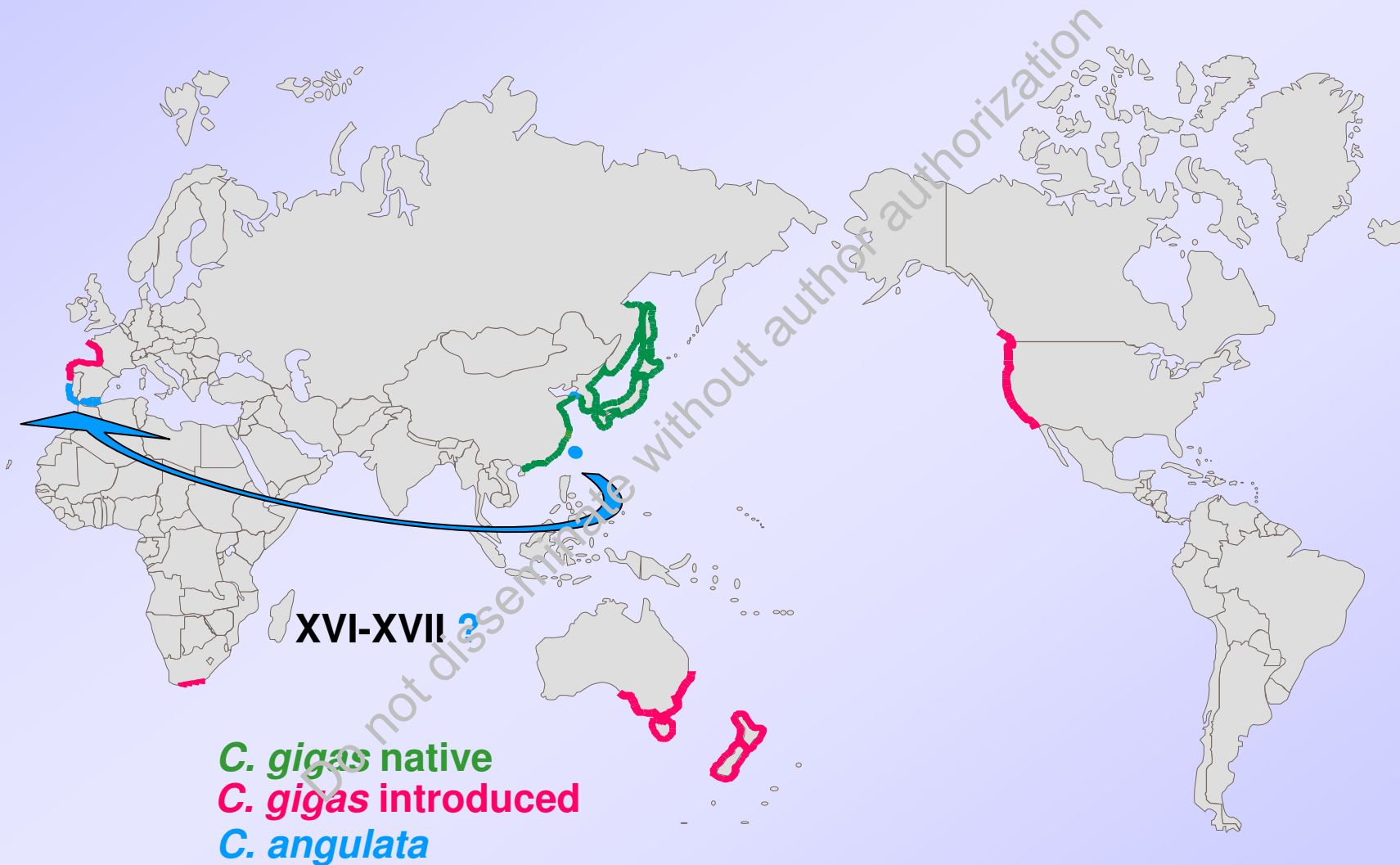
	Apa I		Hae III	
	<i>C. angulata</i>	<i>C. gigas</i>	<i>C. angulata</i>	<i>C. gigas</i>
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Source: A. Leitão

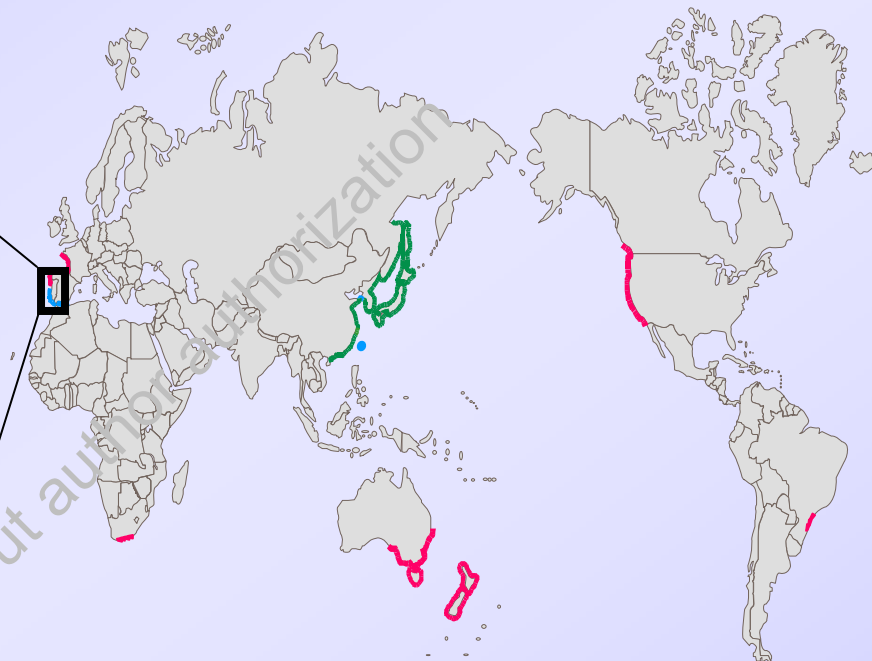
## Phylogenetic trees obtained from COI



Putative origin



# 8<sup>th</sup> International Conference on Shellfish Restoration, Brest, France 2-5 Octobre 2005



**Introduction of *C. gigas*  
in Portugal since 1980s**

Do not disseminate without authorization

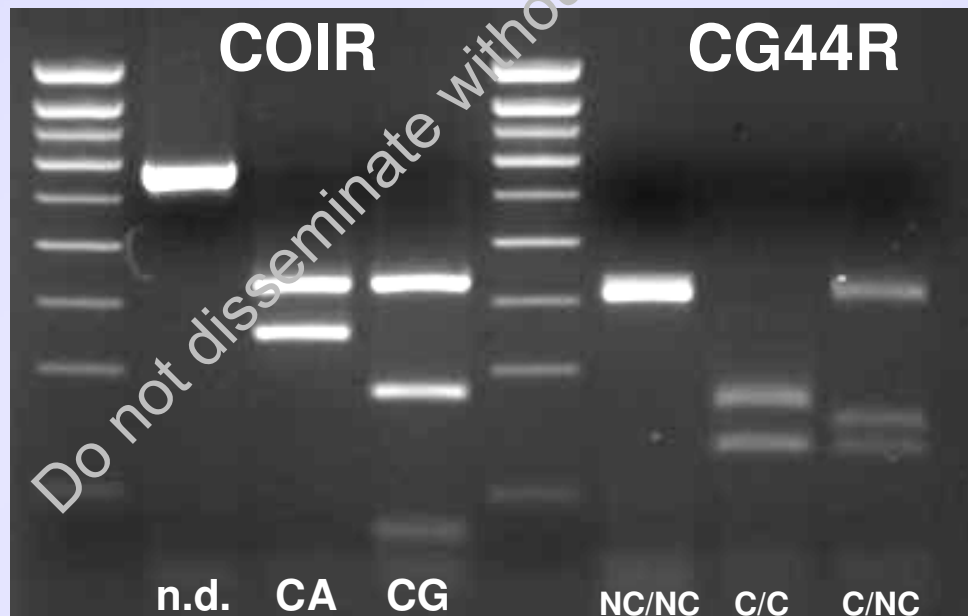
**PCR-RFLP markers**

**Mitochondrial marker - COIR**

(Boudry et al., 1998; Present study)

**Nuclear marker - CG44R**

(Huvet et al., 2004)

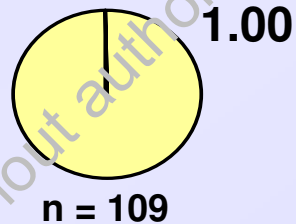




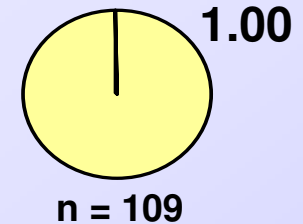
## Natural populations

### Mitochondrial marker (CAPs)

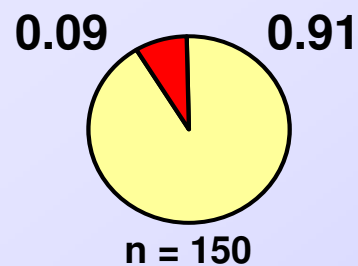
#### P1 - Sado estuary



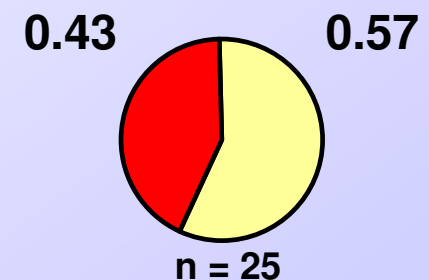
#### P2 - Mira estuary



#### P3 - Ria Formosa



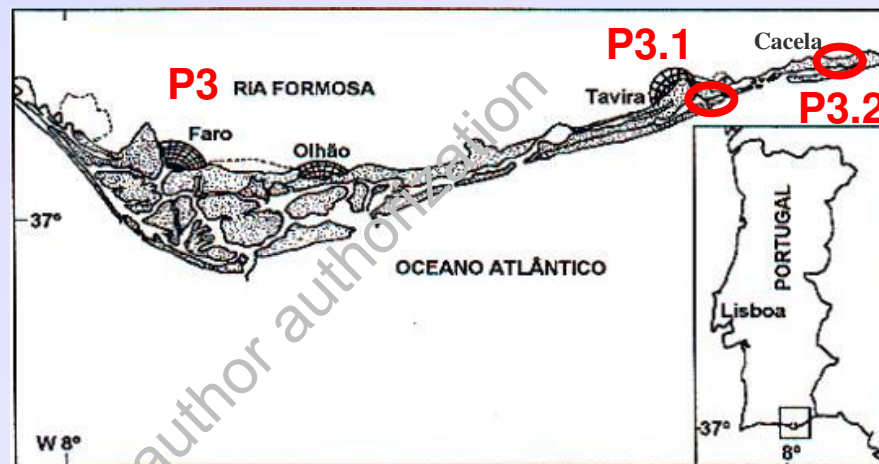
#### P4 - Guadiana estuary



■ - *C. angulata* haplotypes

■ - *C. gigas* haplotypes

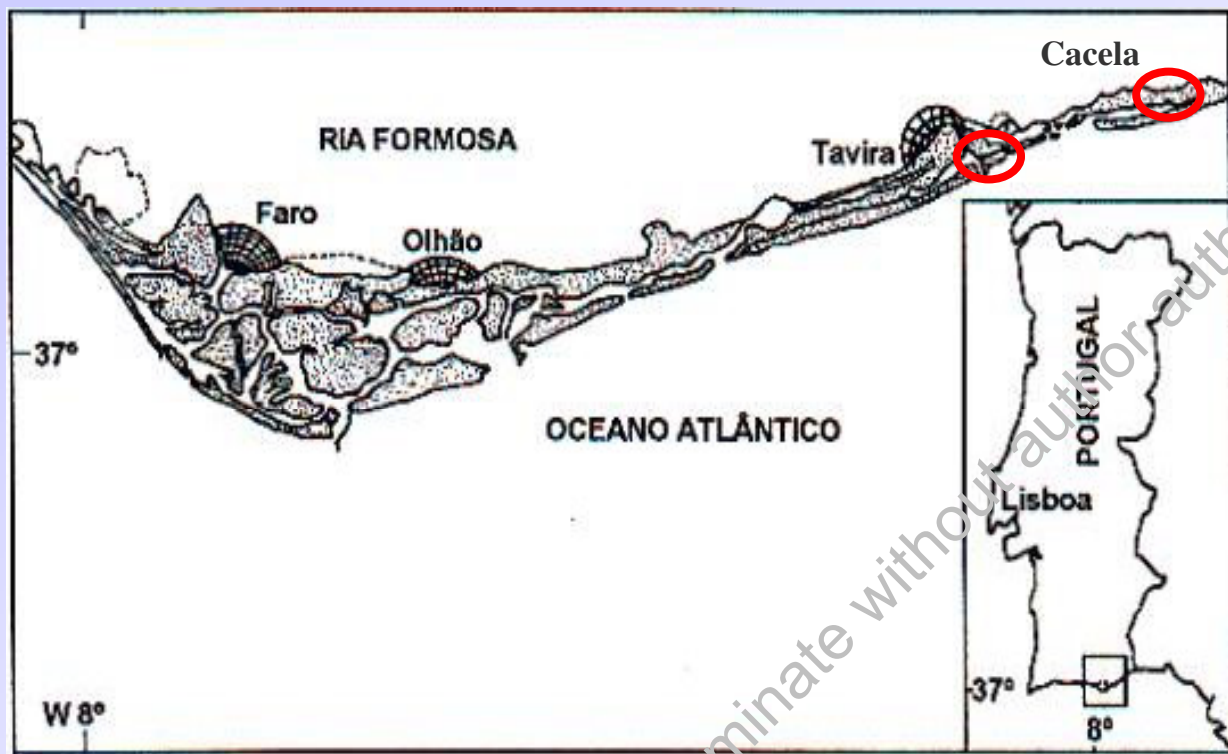
# 8<sup>th</sup> International Conference on Shellfish Restoration, Brest, France 2-5 Octobre 2005



## Non-cut allele frequency, $H_0$ , $H_e$ and $F_{is}$ for the CG44R

Population	N	NC freq	$H_0$	$H_e$	$F_{is}$
Tavira (P3.1)	46	0,217	0,130	0,344	<b>0,623*</b>
Cacela (P3.2)	50	0,130	0,180	0,229	0,214
Guadiana (P4)	23	0,500	0,043	0,511	<b>0,917*</b>

## 8<sup>th</sup> International Conference on Shellfish Restoration, Brest, France 2-5 Octobre 2005



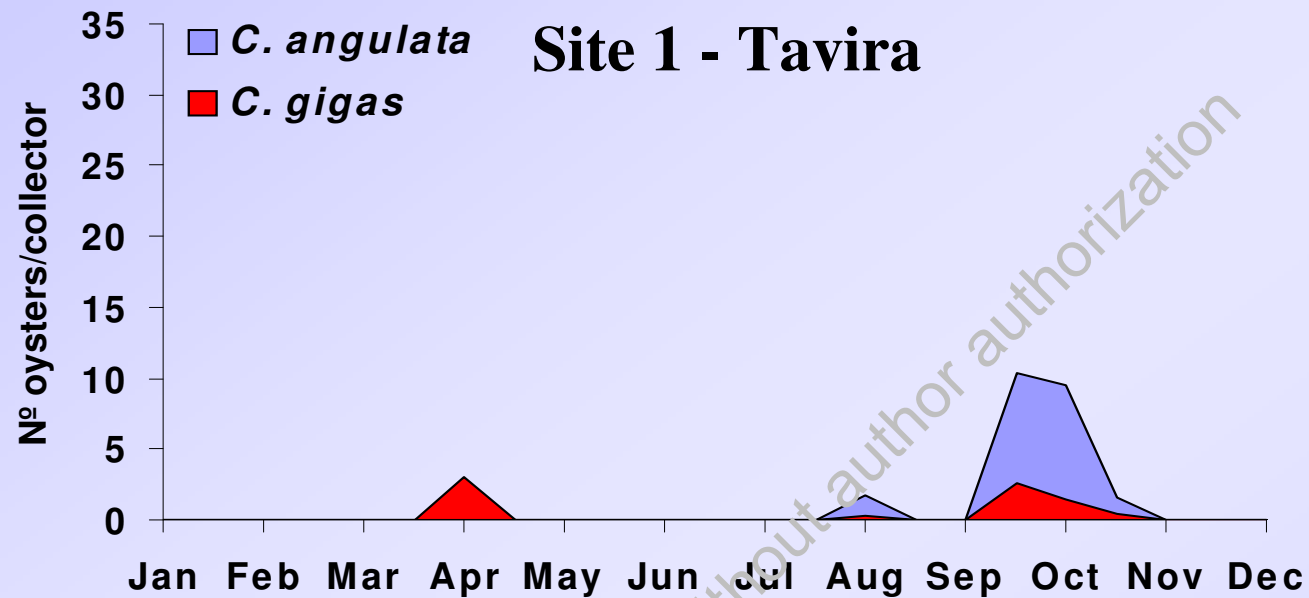
**Nursery**



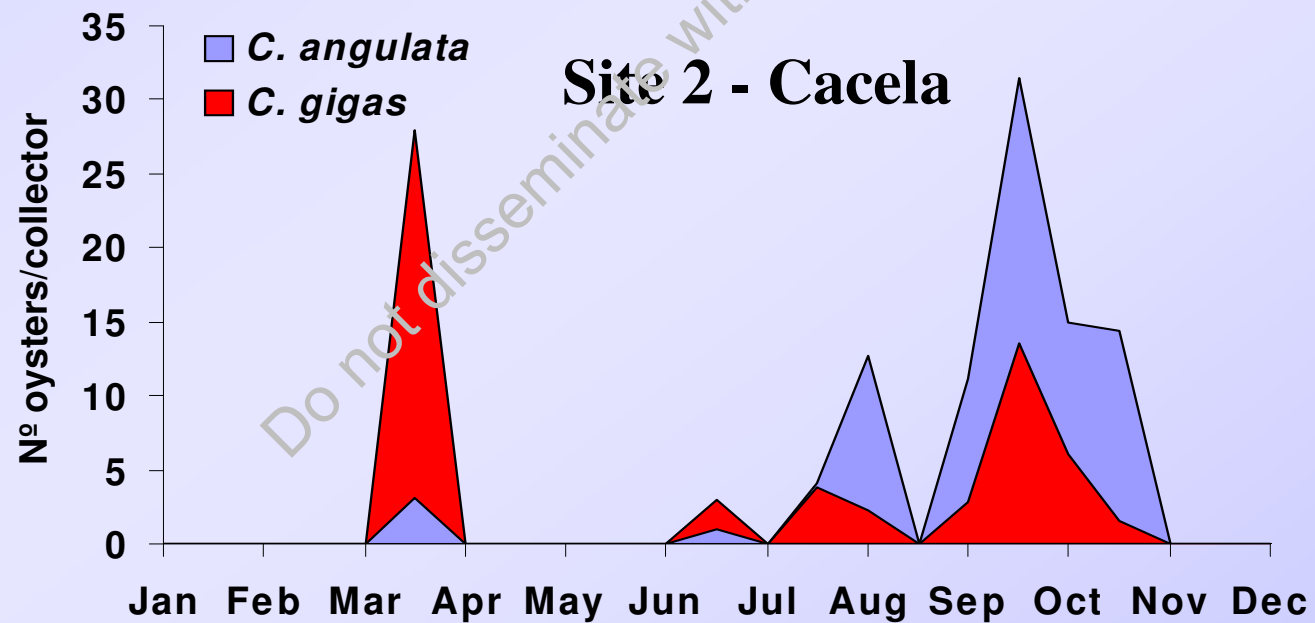
- 4 collectors per site every 15 days
- 90 days in the Nursery



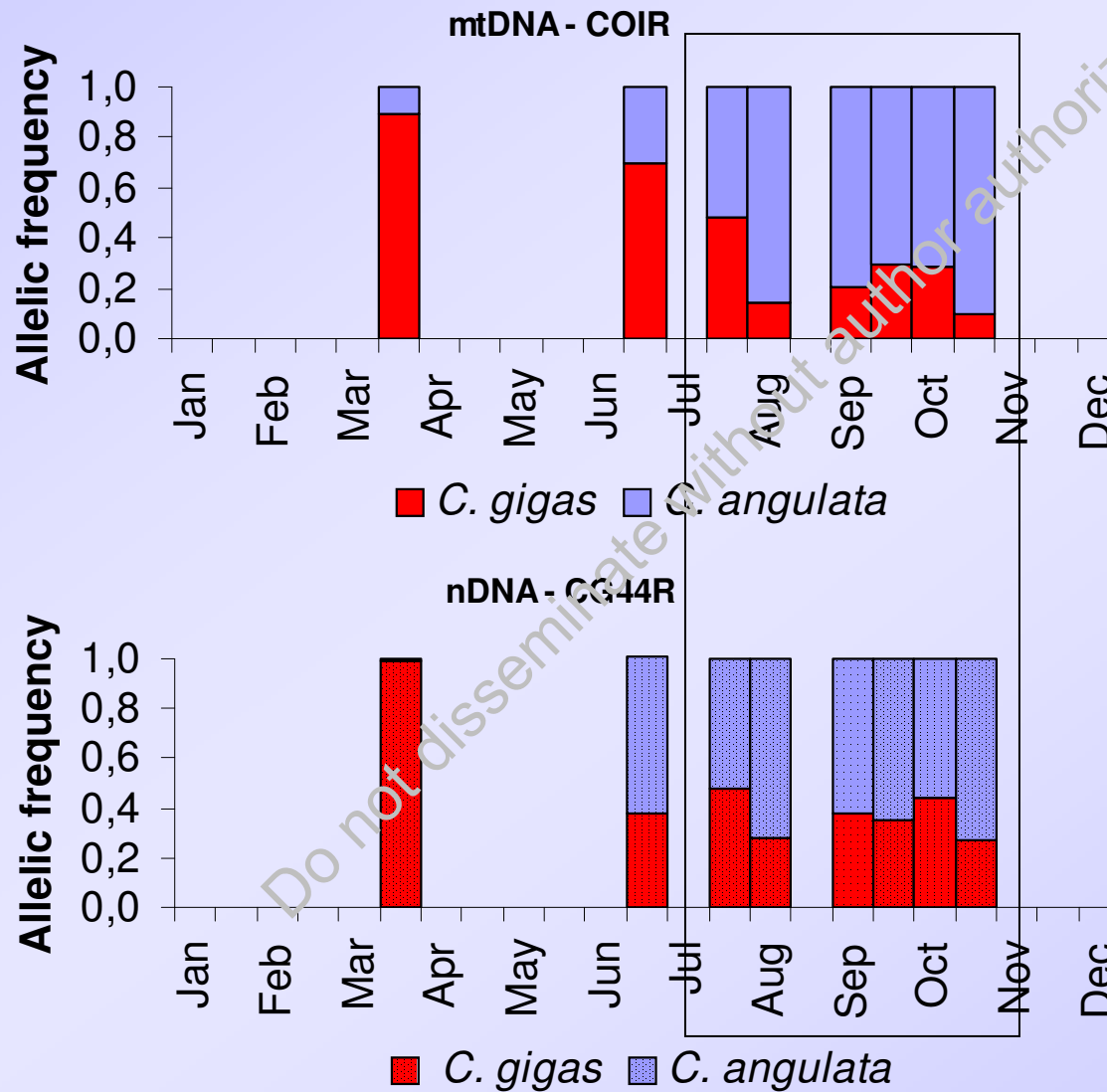
# 8<sup>th</sup> International Conference on Shellfish Restoration, Brest, France 2-5 Octobre 2005



mtDNA  
COIR



## Site 2 - Cacela



**Cytonuclear  
Disequilibrium**

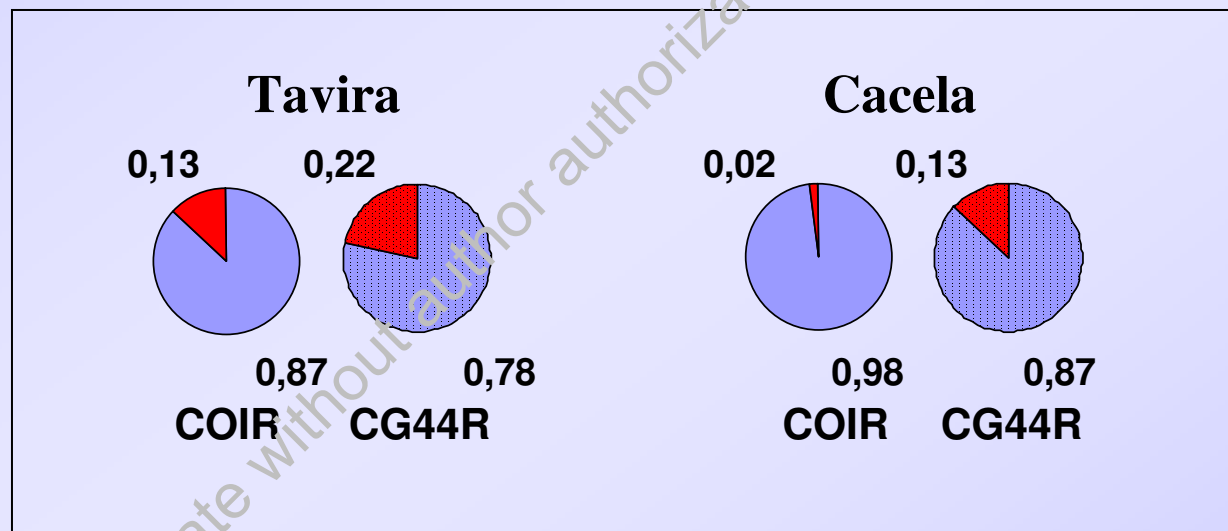
$D = 0.029$

# 8<sup>th</sup> International Conference on Shellfish Restoration, Brest, France 2-5 Octobre 2005

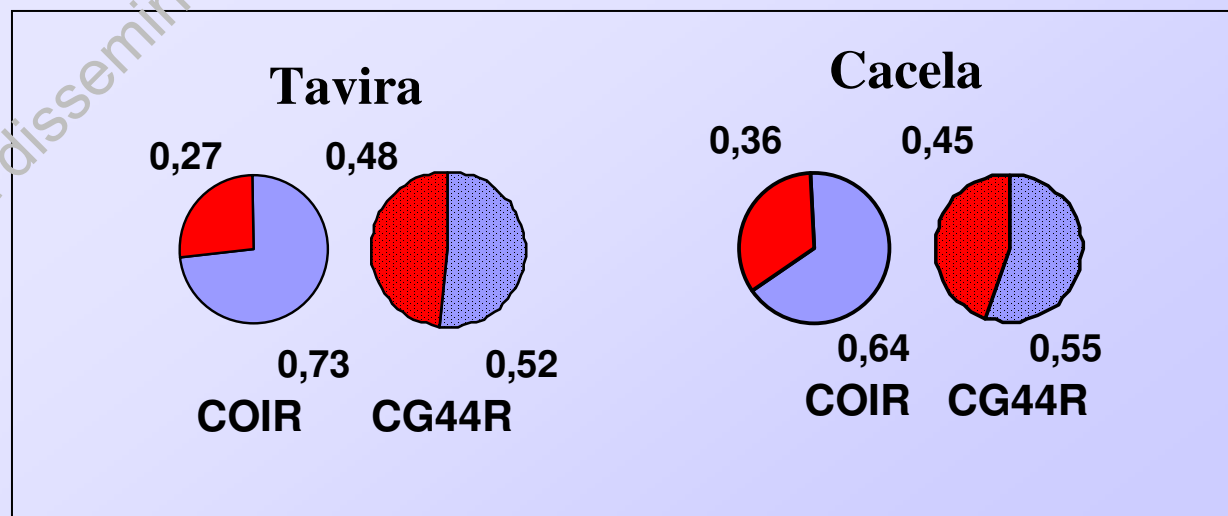
■ - *C. angulata*

■ - *C. gigas*

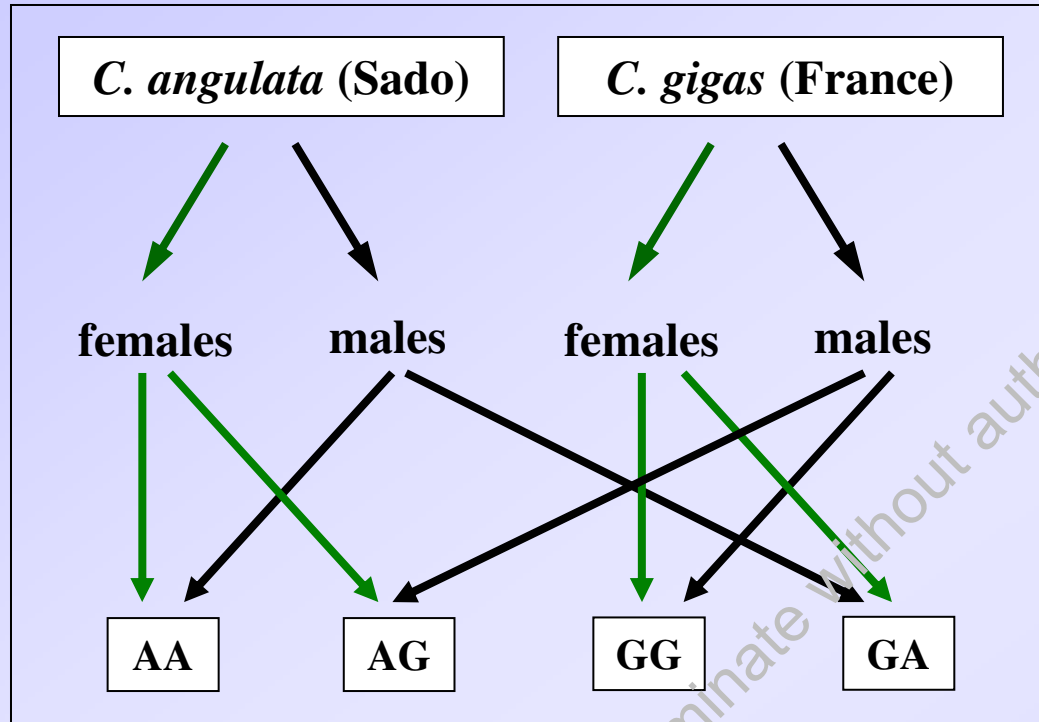
Natural  
populations



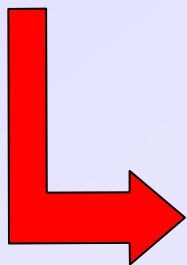
Settlement  
experiment



## Crosses



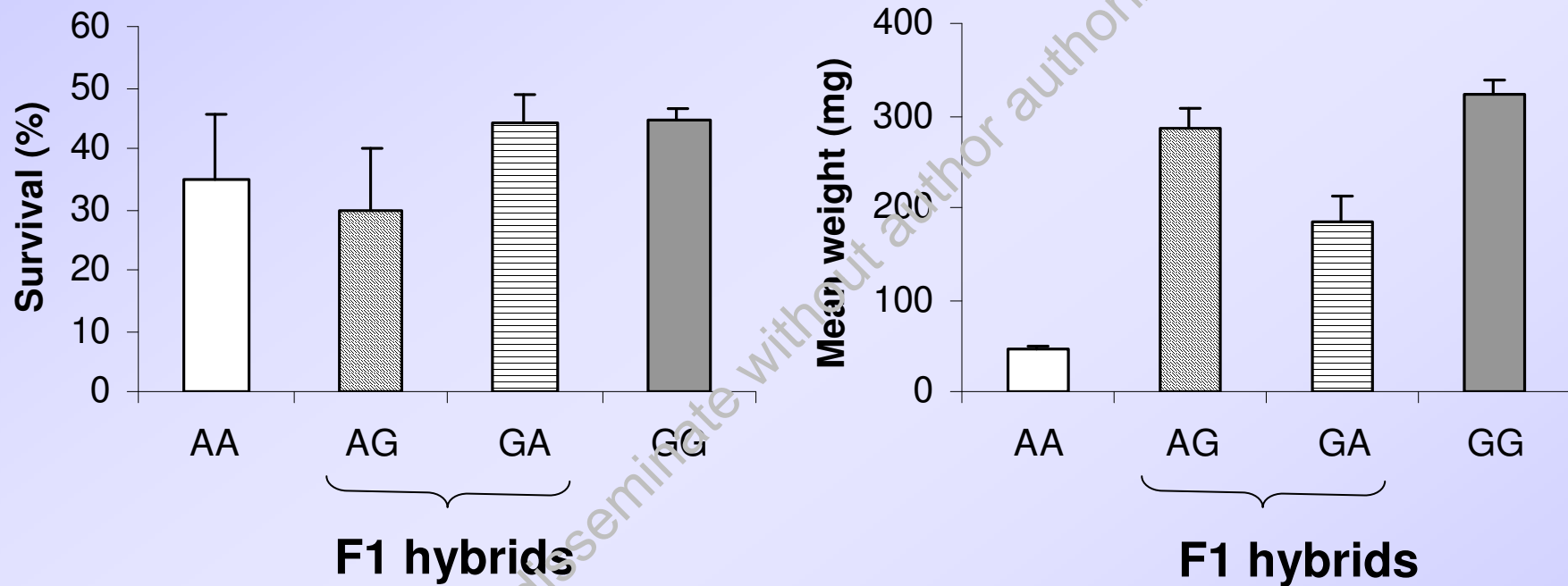
## Larval rearing



## Nursery phase

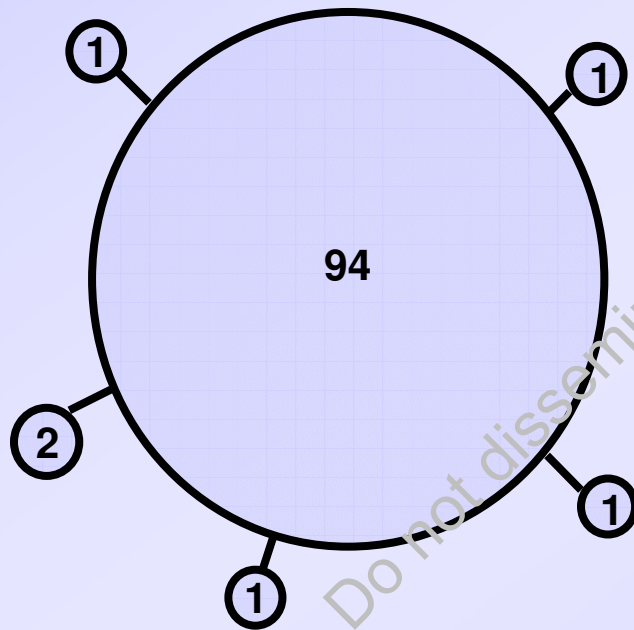


After 90 days - Nursery

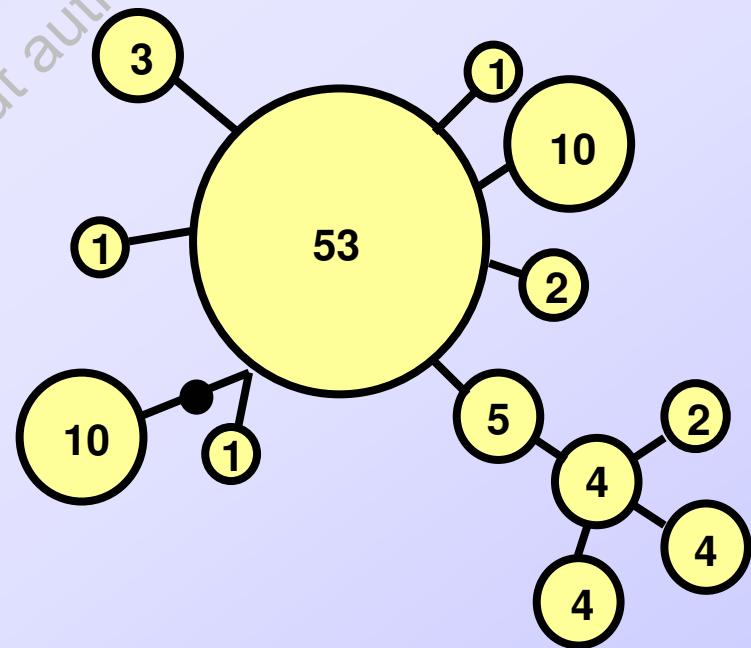


Lower relative viability of *C. angulata* and the hybrids AG when compared with *C. gigas* and the hybrids GA

*Crassostrea gigas*  
haplotypes % (COI)



*Crassostrea angulata*  
haplotypes % (COI)



## CONCLUSIONS

- Different settlement pattern in *C. angulata* and *C. gigas*
- Evidences of natural hybridization between the two taxa (August - October)
- Evidences of a selective pressure against *C. gigas* in Ria Formosa