

# The integrated impacts of marine acidification, on bivalve assemblages: how to adapt? (ACIDBIV)

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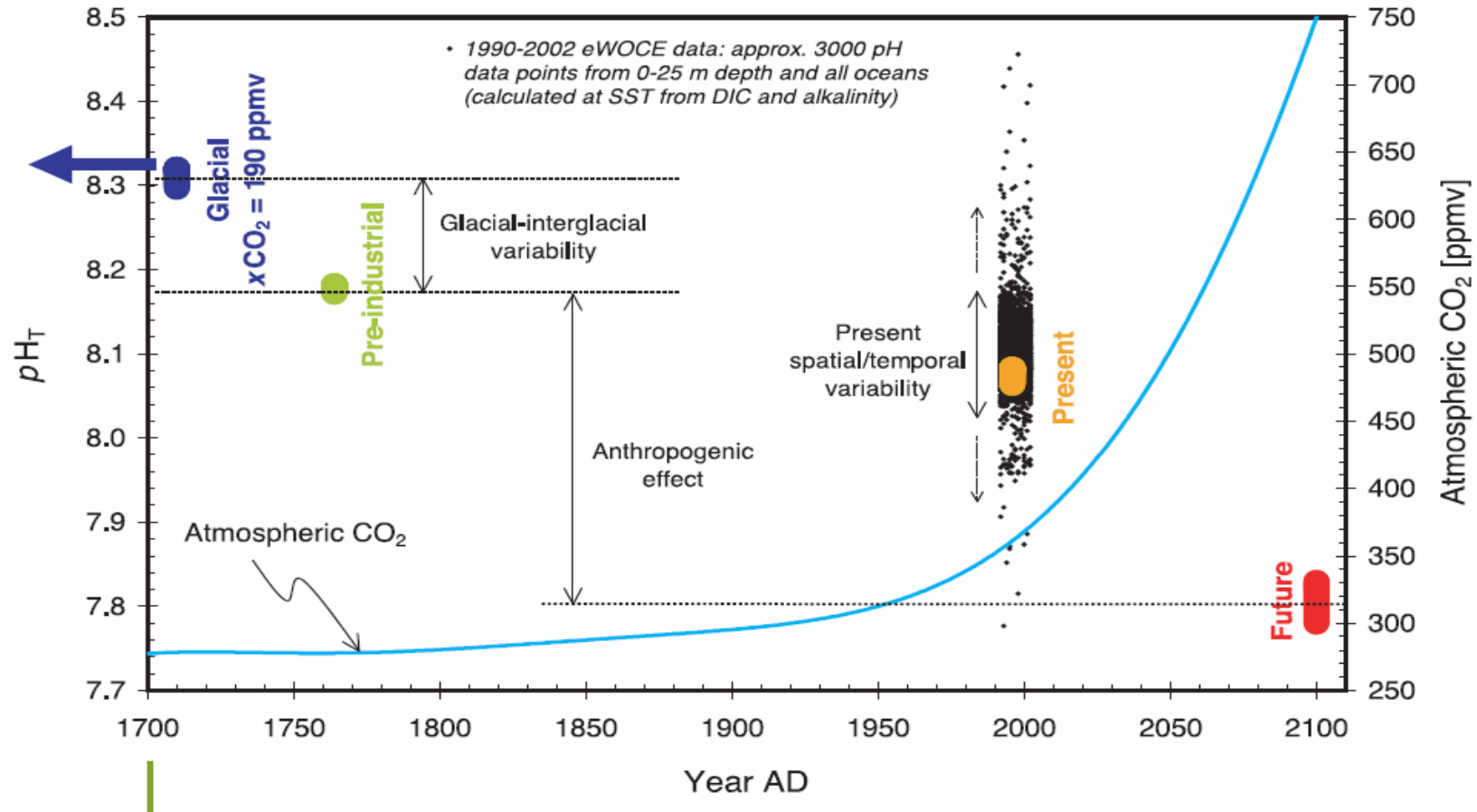
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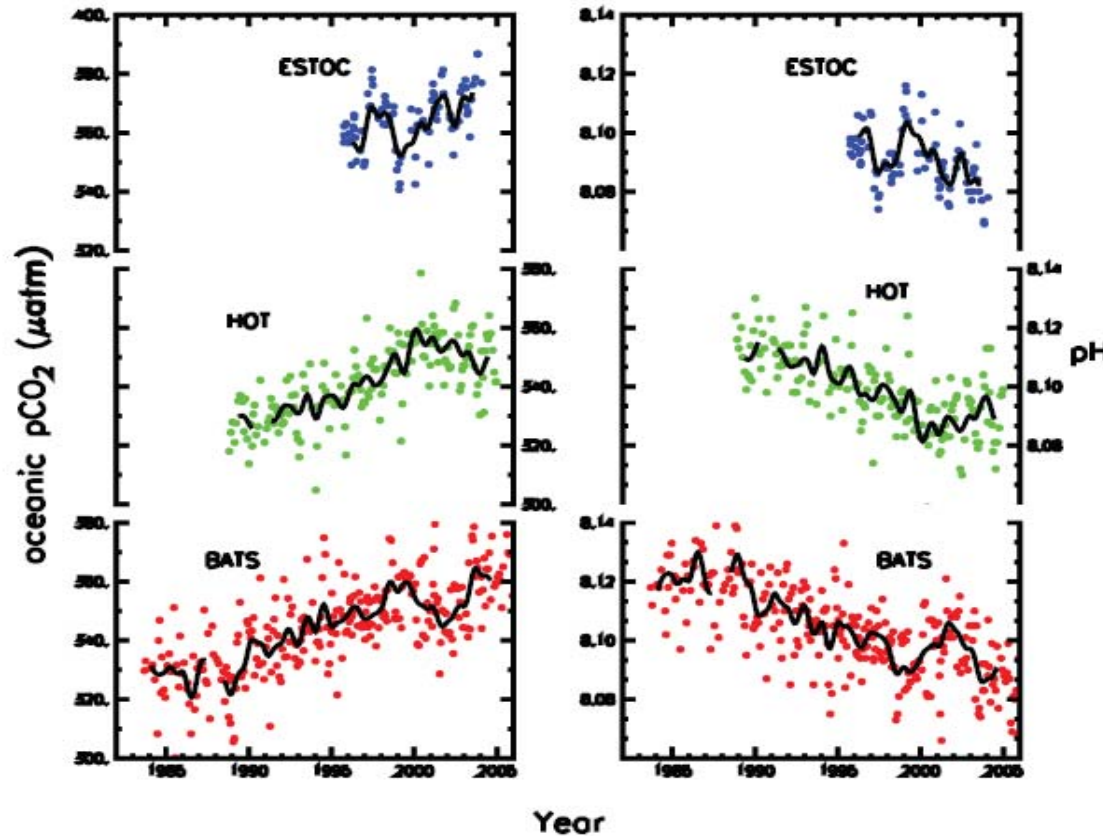
# PROJECT JUSTIFICATION : ATMOSPHERIC CO<sub>2</sub> AND OCEANS: RECONSTRUCTIONS AND PROJECTIONS



Adapted from Cicerone et al 2004



# SURFACE OCEANIC PCO2 AND pH: MEASUREMENTS FROM THE LAST 30 YEARS

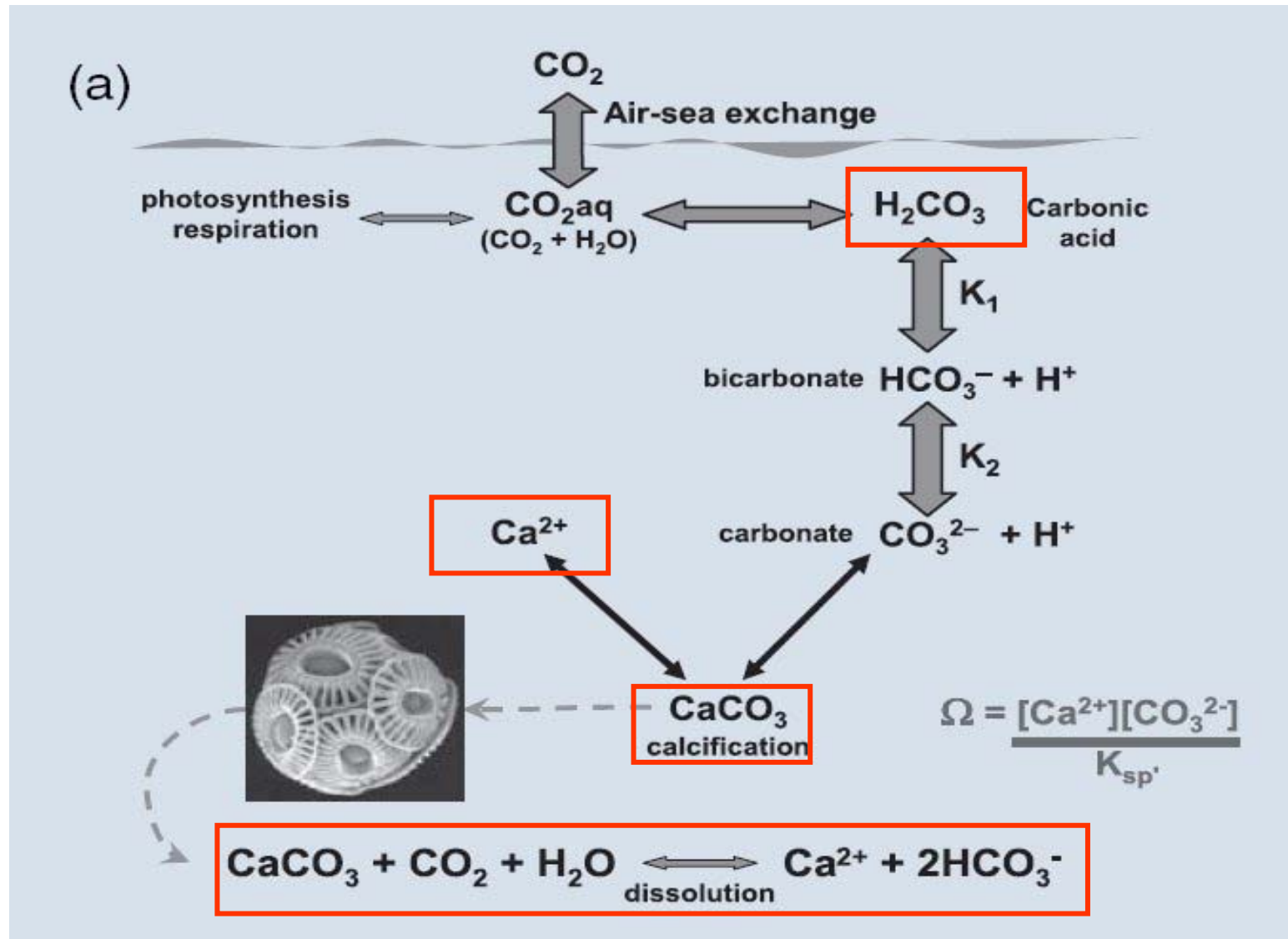


European Station for Time-series  
in the Ocean (29°N, 15°W)

Hawaii Ocean Time-Series  
(23°N, 158°W)

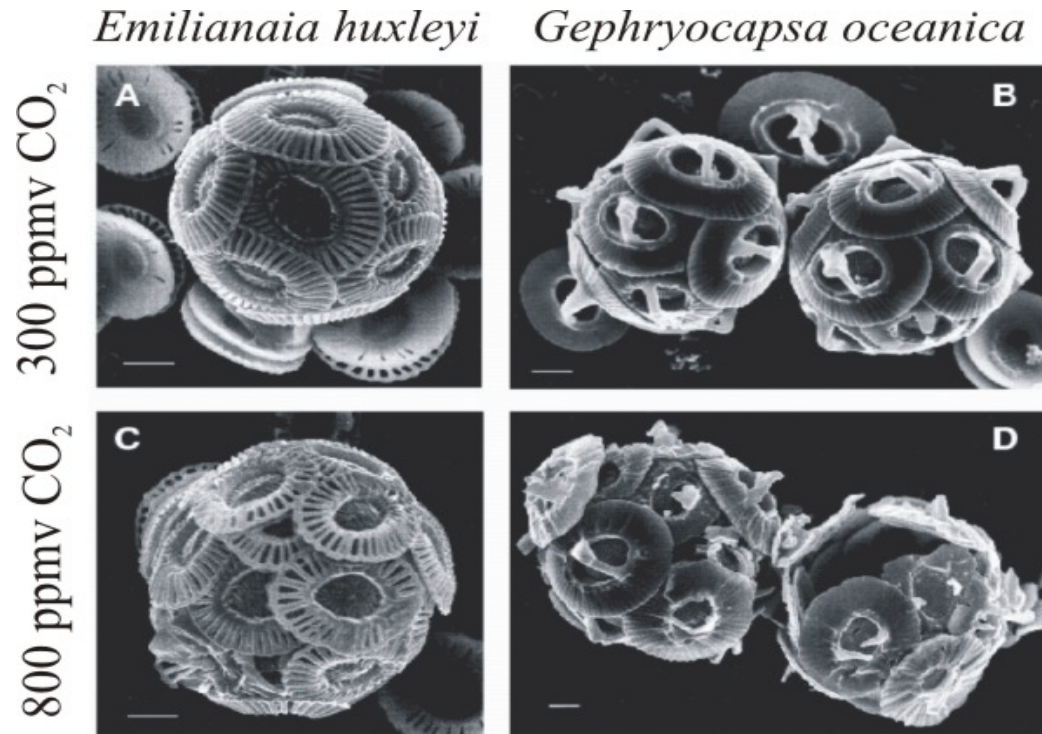
Bermuda Atlantic Time-series  
Study (31/32°N, 64°W)

# OCEAN ACIDIFICATION: THE PROCESS



Adapted from Kleypas et al 2006

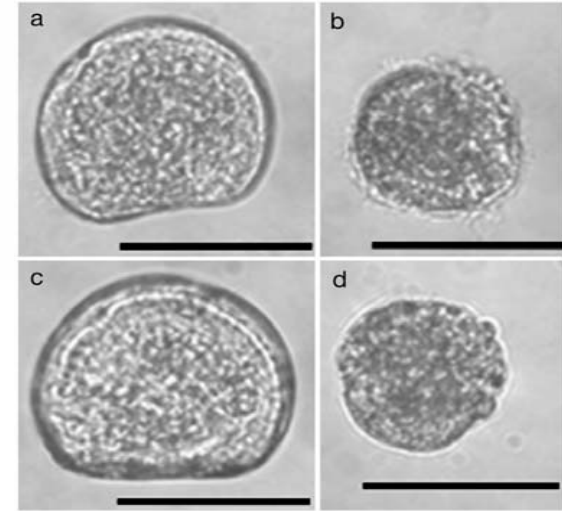
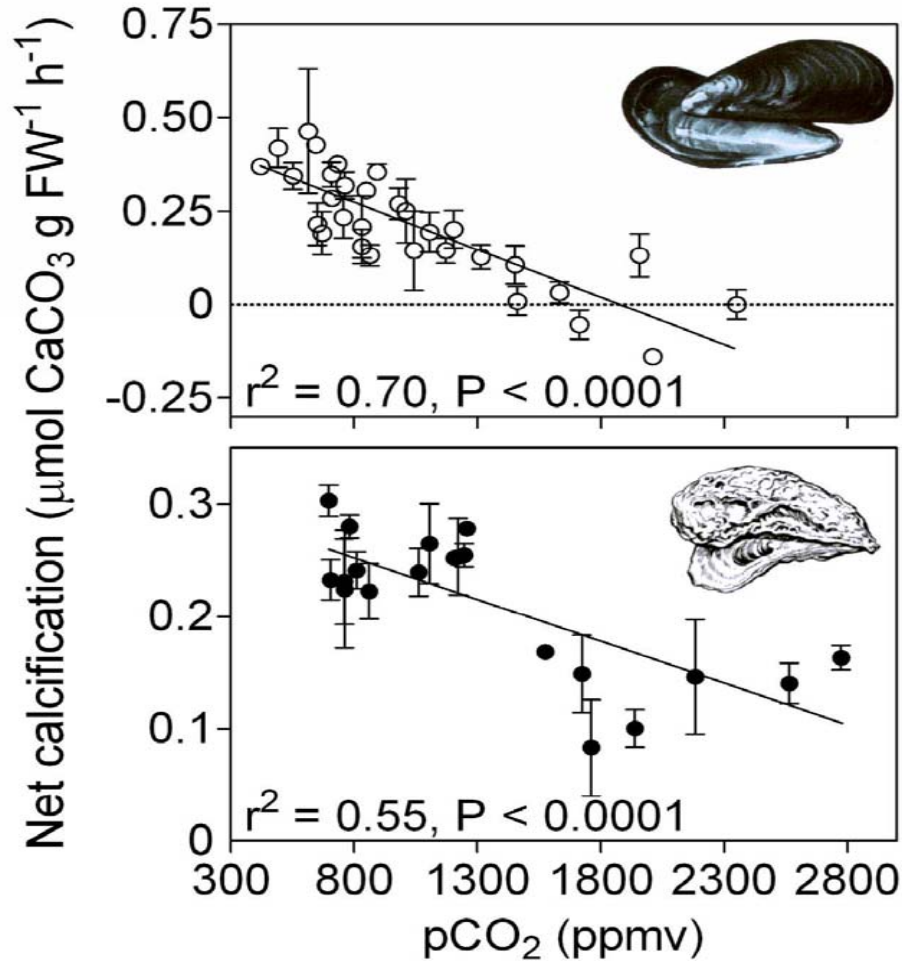
# CONSEQUENCES OF OCEAN ACIDIFICATION FOR MARINE ORGANISMS



- affect physiological rates (eg. respiration)
- Reduce calcification rates
- Reduce growth rates
- Reduce reproductive activity

**SIMILAR IMPACTS ARE EXPECTED ON BIVALVES**

# CONSEQUENCES OF OCEAN ACIDIFICATION FOR BIVALVES



Exposure to pH values under 7.5 during the post-settlement stage can cause dissolution of the shell and strongly reduce or stop growth



Ecologic and economic impacts

# PROJECT ACIDBIV AIMS

- 1 - evaluate the effects of ocean acidification on bivalve physiology and shell structure, particularly on larval and juvenile phases;
- 2 - develop an ecophysiological model for the response of bivalves under different combined temperature and pH values
- 3 - propose general measures to sustain the ecological and economic role of bivalves in coastal Mediterranean areas (eg. control water quality, bivalve fisheries and aquaculture)

# PROJECT PARTNERS AND FUNDING

## Partners:

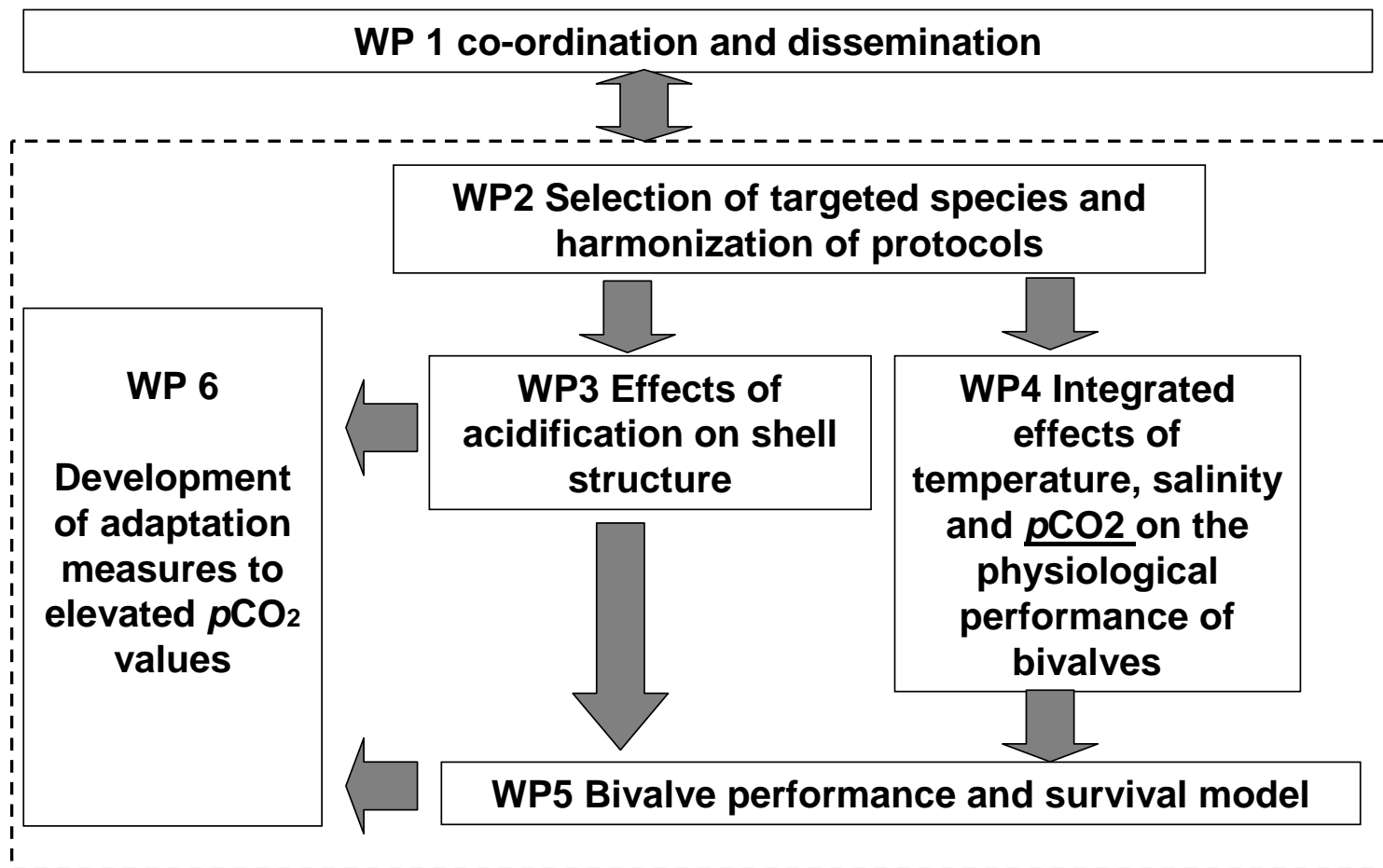
- Centro de Ciências do Mar do Algarve (CCMAR), Portugal (Leader)
- Dipartimento di Biologia - Università di Padova (UNDP), Italia
- Consejo Superior de Investigaciones Científicas (CSIC), Espanha
- Faculté des Sciences de Bizerte - Université 7 Novembre à Carthage (FSB), Tunisie

## Funding institutions

- Fundação para a Ciência e a Tecnologia (FCT), Portugal
- Ministero dell'Ambiente e della Tutela del Territorio (IMELS), Italia
- Consellería de Innovación e Industria – Xunta de Galicia, Espanha



# PROJECT STRUCTURE AND ORGANIZATION



Pert diagram- Organization of ACIDBIV- WP articulation.

Arrows show the main routes of information and data between work packages

# PROJECT STRUCTURE

## **WP1:** Coordination and dissemination (CCMAR)

- Ensure articulation and compliance with project requirements
- Ensure efficient exchange and disseminate information among all partners;
- Dissemination to society

## **WP2:** Selection of targeted species and harmonization of protocols (FSB)

- Select target species (ecological and economic importance)
- Select and harmonize methods and development of protocols
- Select and harmonize data analysis methodology

## **WP3** – Effects of acidification on shell structure (CCMAR)

- Evaluate the effect of different pCO<sub>2</sub> in bivalve shells morphology
- Evaluate the level of susceptibility to damage of post-larvae and juvenile shells under different pCO<sub>2</sub> conditions
- Measure and compare the growth and mortality rates of bivalve larvae and post-larvae different pCO<sub>2</sub> conditions

# PROJECT STRUCTURE

## **WP4** - Integrated temperature, salinity and $p\text{CO}_2$ effects on physiology (CSIC/UNPD)

- Evaluate physiological response of bivalve post-larvae and juveniles (filtration, respiration, ingestion, excretion) under different combinations of the parameters considered

## **WP5** – Bivalve performance and survival model (CCMAR)

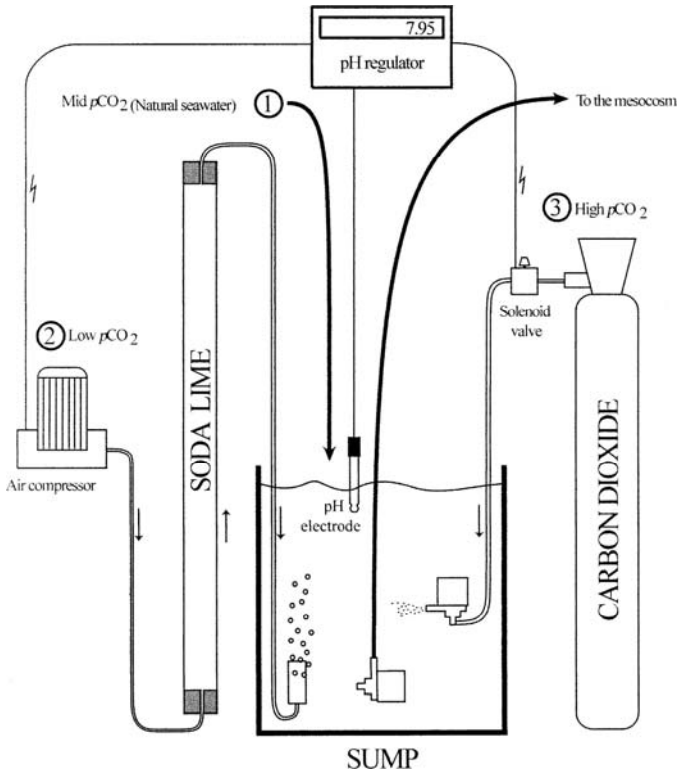
- Develop model to evaluate physiological response of bivalves for the values of environmental variables tested
- Use the model outputs to estimate the impact on water quality caused by bivalves under different environmental conditions

## **WP6** – Proposal of adaptation measures to elevated $p\text{CO}_2$ (CCMAR)

- Eventual increase in shell fragility and damage with the impact of the bivalve fishing gears
- Modification in growth rates and shell shape in bivalve aquaculture production
- Eventual decrease in filtration rates and impacts on water quality

# METHODS – EXPERIMENTAL DESIGN

Figure adapted from LeclercqEtAl2002





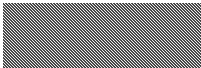


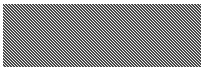








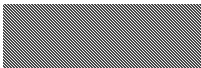




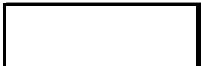




Manipulating the concentration of CO<sub>2</sub> and pH of seawater



Experimental system

# METHODS – EXPERIMENTAL DESIGN

	Levels of seawater pH			
	natural	-0.3	-0.7	
bivalves + microalgal food				n = 3 aquaria
				
				
Control for microalgae				n = 2 aquaria
				
blank control				n = 2 aquaria
				
acclimatization				

# DELIVERABLES AND DISSEMINATION

## Deliverables:

- scientific papers
- reports
- ecophysiological model

## Dissemination

- project webpage
- presentations in seminars, workshops, conferences and congresses, at national and international levels
- project brochures
- *workshops to stakeholders, depending on the type of results (water and fisheries managers)*

# Time table

	November 2008												October 2010											
Project months	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Work packages																								
WP1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
WP2	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
WP3																								
WP4																								
WP5																								
WP6																								
Circle Med meetings																								
kick-off: Rome	■																							
mid-term: Portugal																								
Final																								
Acid-Biv meetings																								
kick-off: Tunisia	■																							
to be decided																								
to be decided																								
to be decided																								
to be decided																								
Reports																								
1st year																								
2nd year																								
Dissemination workshops																								
two per partner - dates to be decided in the kick-off meeting in Tunisia																								

**THANK YOU**

