

# Marine Benthos: ecological quality assessment

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Marine Benthos Research Group

Invertebrates as Bioindicators of  
Ecosystem Health

Main Lines of Research

Iñaki Sáiz    Maria Bustamante    Javi Tajadura



Dpt. Zoology and ACB  
Marine Benthos Research Group

# Marine Benthos Research Group



Since **1984** focused its investigation on the study of the effects of human activity on the **structure of rocky marine benthic communities**

Formed by **algologists and zoologists**, has allowed to assess the **coastal environmental quality** focusing on the benthic ecosystem as a whole

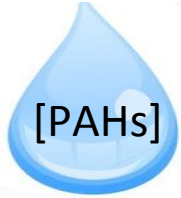
Marine Benthos Research Group UPV/EHU  
[www.ehu.eus/bentos](http://www.ehu.eus/bentos)

# From Chemistry... to Cytology... ..to Ecology

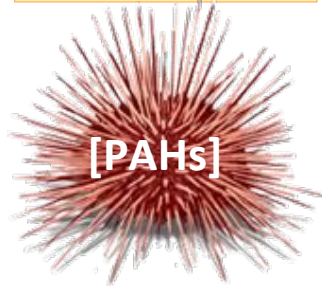


## RESPONSE VARIABLES

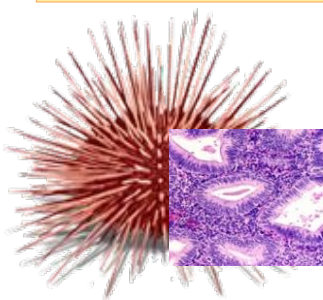
CHEMICAL



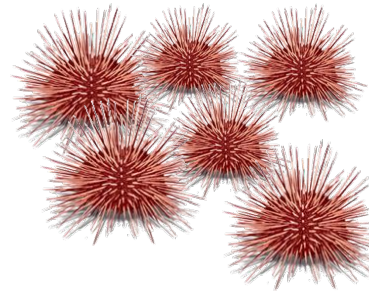
BIOCHEMICAL



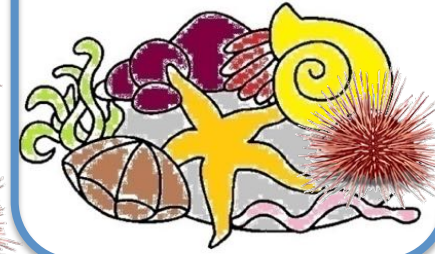
ORGANISM



POPULATION



COMMUNITY



**BENTHOS:** The seabed, including the bottom of the sea and the littoral  
The community of organisms living there



Sessile



# BENTOS: ANIMALES DE VIDA SÉSIL

Sessile



Integrate environmental conditions



valuable information:  
ecosystem health

**Bioindicators** of the  
environmental conditions



SENSITIVE: > Env. Cond. PRISTINE



OPPORTUNISTIC: > Env. Cond. ALTERED



# ECOLOGICAL QUALITY ASSESSMENT: PROTECTION



Water Framework Directive WFD (Directive 2000/60/EC)

Marine Strategy Framework Directive

FOCUS: Improvement and protection of the **chemical** and **biological** status: transitional & marine waters

**Physical**

**Chemical**

BIOLOGICAL QUALITY ELEMENTS

**Biological**

The Ecological Status of water has to be assessed according to:

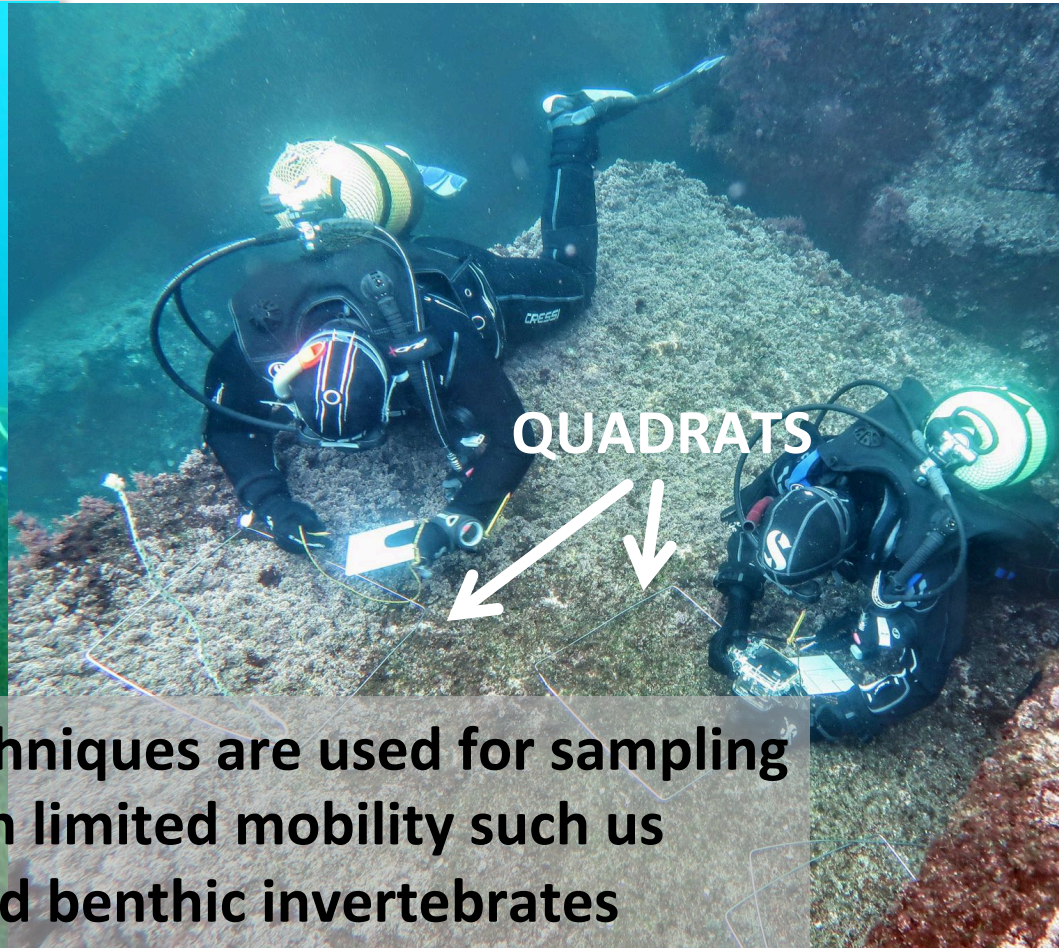
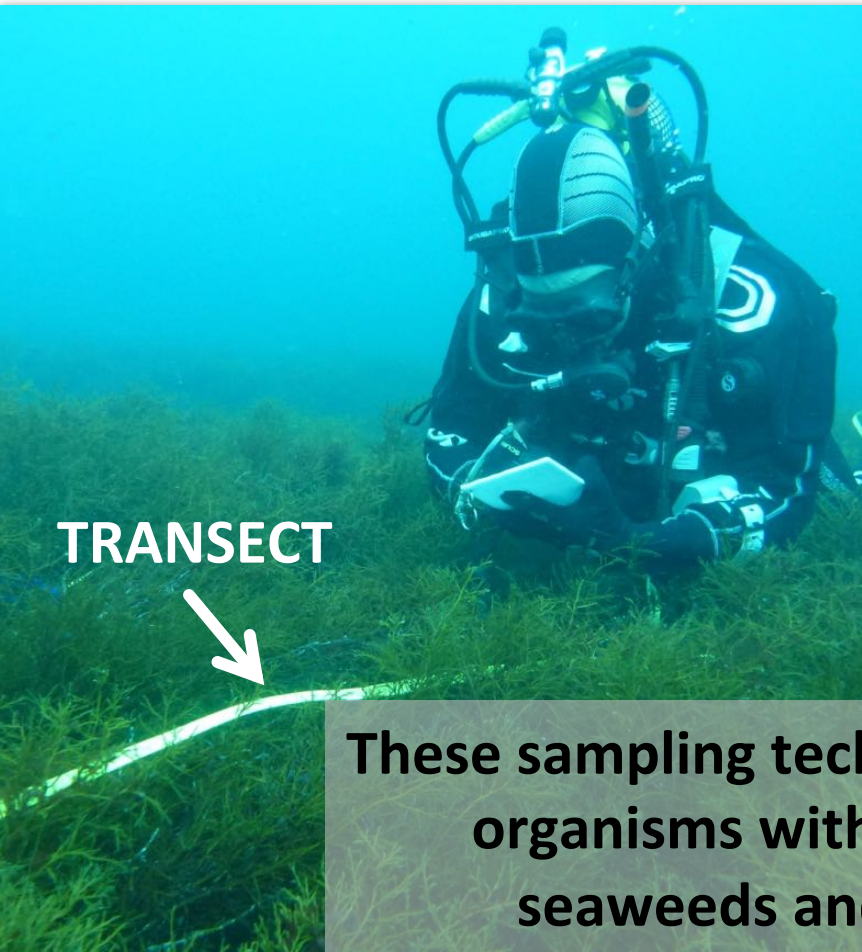
- Temperature
- Oxygenation
- Nutrient conditions

- Fish
- **Benthic invertebrates**
- Aquatic flora

# Diving for Science: Underwater Research

The **abundance of species** in a given area is one of the most **basic pieces of data in ecology**

➤ Usually estimated by measures of percentage covers of organisms along transects or in defined areas such as quadrats: **NON DESTRUCTIVE MEASURES**



**These sampling techniques are used for sampling organisms with limited mobility such as seaweeds and benthic invertebrates**



Intertidal



Subtidal





***Sea urchin***



***Anemones***



**Polychates**



***Molluscs***



***Sea stars***



***Bryozoans***

# Marine Benthos Research Group: Main lines of Research

## LÍNEAS DE INVESTIGACIÓN

ESTUDIOS DE EVALUACIÓN  
AMBIENTAL

MEDIR EL IMPACTO EN EL  
MEDIO MARINO  
Zoobentos sustrato duro

ESTUDIOS DE MONITORING  
Forma continuada

FINANCIACIÓN:  
Empresa privada



# Marine Benthos Research Group: Main lines of Research

## RENDIMIENTO CIENTÍFICO

TESIS

TFG / TFM

PAPERS

TRANSFERENCIA

Proyectos: Diseño experimental (Replicación temporal y espacial)

Proyectos: Variables ambientales de apoyo a las biológicas

Magnitud del impacto pequeña

Información del Bentos completa



# Marine Benthos Research Group: Main lines of Research

Fuente de Contaminación más común en la Costa: Produciendo alteraciones crónicas en el medio marino

EDAR GALINDO

EDAR GORLIZ

EDAR BAKIO

EDAR LEKEITIO

EDAR ONDARROA

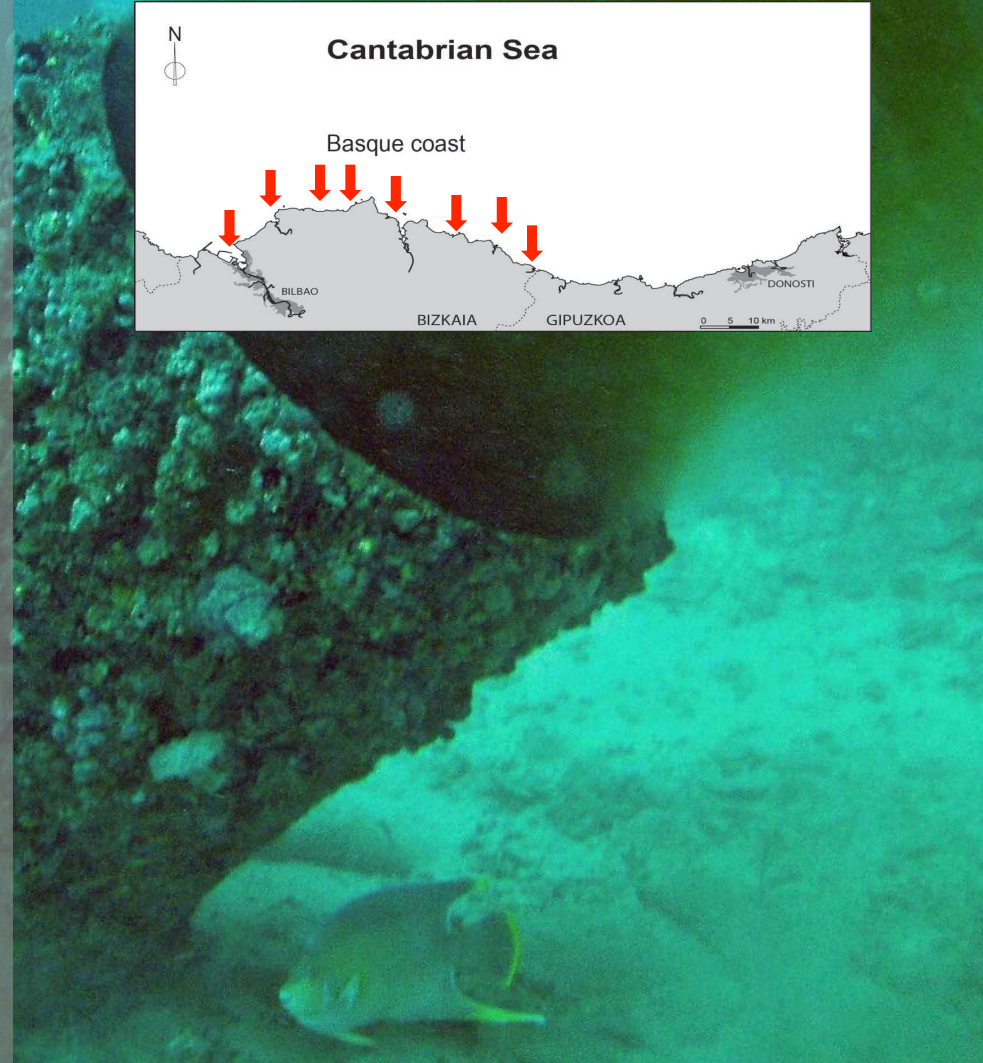
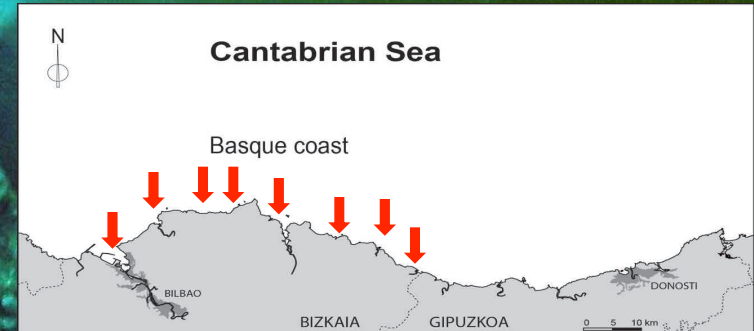
EDAR EA

EDAR ELANTXOBE

EDAR LAIDA

EDAR LAMIARAN

EVALUAR EFECTO DE EFLUENTES DE AGUAS RESIDUALES  
(vertido: zona inter y submareal)



# Marine Benthos Research Group: Main lines of Research

Investigamos el potencial beneficio de las mejoras en el tratamiento de las aguas residuales



EDAR GALINDO

EDAR GORLIZ

EFECTO DE MEDIDAS  
CORRECTORAS: MITIGACIÓN

Cantabrian Sea

MONITORING  
PROGRAMS

Basque coast



# Marine Benthos Research Group: Main lines of Research

EDAR GALINDO

Serie temporal recuperación Abra: Índice Biológico Uso Oficial contemplado en normativa

Ecological Indicators 12 (2012) 58–71

Contents lists available at ScienceDirect

Ecological Indicators

journal homepage: www.elsevier.com/locate/ecolind



Development of a tool for assessing the ecological quality status of intertidal coastal rocky assemblages, within Atlantic Iberian coasts

I. Díez<sup>a,\*</sup>, M. Bustamante<sup>b</sup>, A. Santolaria<sup>a</sup>, J. Tajadura<sup>b</sup>, N. Mugerza<sup>a</sup>, A. Borja<sup>c</sup>, I. Muxika<sup>c</sup>, J.I. Saiz-Salinas<sup>b</sup>, J.M. Gorostiaga<sup>a</sup>

RICQI = SpBIO + MCA + R + FC



I. Díez et al. / Ecological Indicators 12 (2012) 58–71

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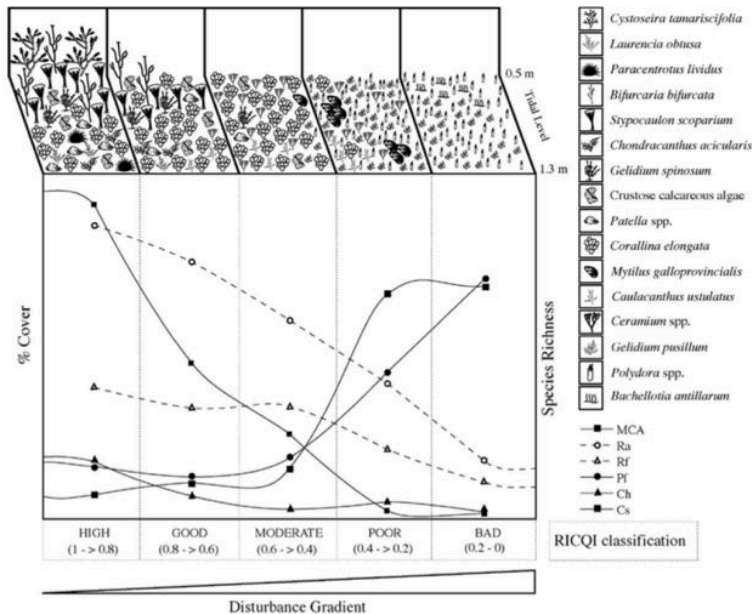


Fig. 8. Conceptual model proposed for successional stages along a gradient of increasing environmental disturbance and associated values of metrics included in the index. Key: MCA: Morphologically complex algae; Ra: algal species richness; Rf: invertebrate species richness; Pf: faunal percentage with respect to benthic community; Ch: herbivores cover; and Cs: suspension cover.

EDAR GORLIZ

Aplicar Diseño experimental tipo BACI Analisis de la varianza complejo (5 Factor)

Marine Environmental Research 80 (2012) 27–37

Contents lists available at SciVerse ScienceDirect

Marine Environmental Research

journal homepage: www.elsevier.com/locate/marenv




Detecting human mitigation intervention: Effects of sewage treatment upgrade on rocky macrofaunal assemblages

María Bustamante<sup>a,\*</sup>, Stanislaw Bevilacqua<sup>b</sup>, Javier Tajadura<sup>a</sup>, Antonio Terlizzi<sup>b</sup>, José Ignacio Saiz-Salinas<sup>a</sup>

Table 4  
PERMANOVA results and pair-wise comparisons on taxonomic distinctness for the four

Source	df	Intertidal			
		Mid		Low	
		MS	F	p	MS
B-v-A	1	771.78	0.24		16659.00
I-v-Cs	1	3637.20	0.77		6859.90
Ti(B-v-A)	3	4134.30	17.83	<b>0.004</b>	2503.40
Lo(I-v-Cs)	2	383.22	2.26	<b>0.082</b>	189.05
B-v-A × I-v-Cs	1	485.56	0.15		10187.00
Si(Lo(I-v-Cs))	8	198.38	0.34		1508.20
B-v-A × Lo(I-v-Cs)	2	23.93	0.57		525.04
Ti(B-v-A) × I-v-Cs	3	4627.80	19.96	<b>0.004</b>	2133.30
B-v-A × Si(Lo(I-v-Cs))	8	845.61	1.43		1508.70
Ti(B-v-A) × Lo(I-v-Cs)	6	231.90	0.39		1321.90
Ti(B-v-A) × Si(Lo(I-v-Cs))	24	598.68	2.75	<b>0.0004</b>	418.65
Residual	120	214.23			375.22
Total	179				
<b>Pair-wise</b>					
B-v-A × I-v-Cs	B				
	A				
Ti × I-v-Cs	2001		I-v-Cs	<b>0.0032</b>	
	2009		I-v-Cs	<b>0.0114</b>	

B: before; A: after; I: impact location; Cs: control locations; Ti: time; Lo: location; Si: site



## CAMBIO CLIMATICO: DEFORESTATION AREAS SUBMAREALES Fenomeno a escala Global y en Euskadi

- ✓ El macrofito más abundante de la costa que formaba grandes extensiones está en retroceso

CAUSES under investigation

➤ EXTREME EVENTS:  
storms, waves, T<sup>a</sup> & Irradiance

Recurso clave para la fauna:

SUSTRATO BIOGENICO  
FUENTE DE ALIMENTO  
COBIJO



*Gelidium corneum*

# Marine Benthos Research Group: Main lines of Research

## DECLIVE DE BOSQUES DE ALGAS IMPLICACIONES PARA LA FAUNA



Especies sólo se desarrollan en *Gelidium* desaparecen  
Bosque Descenso : Abundancia animal, riqueza y densidad

Journal of Sea Research 130 (2017) 166–179

Contents lists available at ScienceDirect

Journal of Sea Research

journal homepage: [www.elsevier.com/locate/seares](http://www.elsevier.com/locate/seares)



### Structural impoverishment of the subtidal vegetation of southeastern Bay of Biscay from 1991 to 2013 in the context of climate change

N. Muguerza<sup>a,\*</sup>, I. Díez<sup>a</sup>, E. Quintano<sup>a</sup>, M. Bustamante<sup>b</sup>, J.M. Gorostiaga<sup>a</sup>

<sup>a</sup> Department of Plant Biology and Ecology, University of the Basque Country, PO Box 644, 48080 Bilbao, Spain.  
<sup>b</sup> Department of Zoology and Cellular Biology, University of the Basque Country, PO Box 644, 48080 Bilbao, Spain.

Estuarine, Coastal and Shelf Science 147 (2014) 148–155

Contents lists available at ScienceDirect

Estuarine, Coastal and Shelf Science

journal homepage: [www.elsevier.com/locate/ecss](http://www.elsevier.com/locate/ecss)



### Response of rocky invertebrate diversity, structure and function to the vertical layering of vegetation

María Bustamante<sup>a,\*</sup>, Javier Tajadura<sup>a</sup>, José María Gorostiaga<sup>b</sup>, José Ignacio Saiz-Salinas<sup>a</sup>

<sup>a</sup> Department of Zoology and Cell Biology, Faculty of Science and Technology, University of the Basque Country, Box 644, E-48080 Bilbao, Spain  
<sup>b</sup> Department of Plant Biology and Ecology, Faculty of Science and Technology, University of the Basque Country, Box 644, E-48080 Bilbao, Spain

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Ecology (2020) 167:61

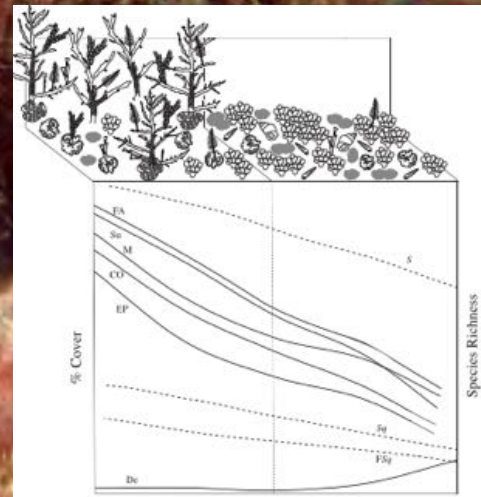
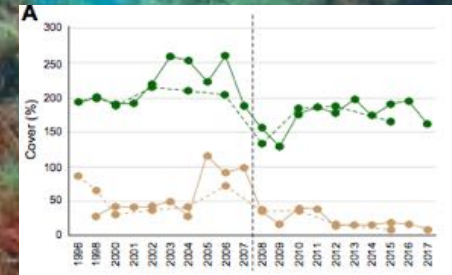
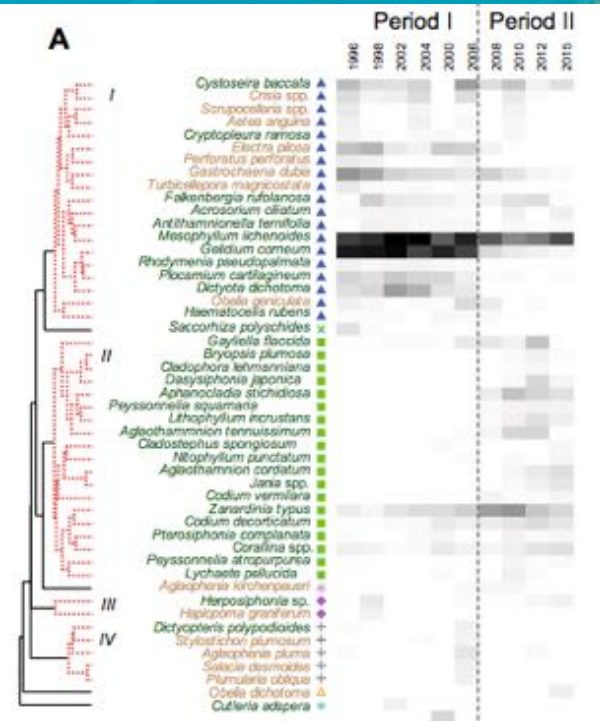
<https://doi.org/10.1007/s00227-020-3675-1>

ORIGINAL PAPER



### Long-term surveys reveal abrupt canopy loss with immediate changes in diversity and functional traits

N. Muguerza<sup>1</sup>, M. Bustamante<sup>2</sup>, I. Díez<sup>1</sup>, E. Quintano<sup>1</sup>, F. J. Tajadura<sup>2</sup>, J. I. Saiz-Salinas<sup>2</sup>, J. M. Gorostiaga<sup>1</sup>





**Eskerrik asko!**