TRENDS ON THE ONTOGENY OF THE DOMINANT FLATFISH SPECIES ON THE SOUTHERN BAY OF BISCAY: ECOLOGY AND DISTRIBUTION PATTERNS

O. Fernández-Zapico*, A. Punzón, A. Serrano, J. Landa, S. Ruiz-Pico and F. Velasco.

Instituto Español de Oceanografía, Centro Oceanográfico de Santander
Promontorio de San Martín s/n, 39004. Santander, Spain.

OUTLINE

- INTRODUCTION
- AIM
- METHODS
  1. Study area
  2. Data source
  3. Data analysis
- RESULTS
- DISCUSSION & CONCLUSIONS

INTRODUCTION

IMPORTANCE
- Ecological → benthos feeders → Intermediaries E transfer
- Ecological → benthos feeders → Bottom quality indicators
- Economical

PREVIOUS STUDIES
- Distribution commercial flatfish (eg. Sánchez *et al.*, 1998, Sánchez *et al.*, 2001, Gerritsen *et al.*, 2010)
- Environmental drivers in communities distribution (eg. Sullivan *et al.*, 2000, Serrano *et al.*, 2008)

GAP OF KNOWLEDGE
- •Pleuronectiformes order distribution
- •Ontogeny
- •Leading factors

AIM

Analyze the population of the order Pleuronectiformes in the Northern Spanish shelf

1 **describing** its **distribution** in the area,
2 establishing the **leading factors** that **drive** it.
3 observing the **ontogeny** in that **distribution.**

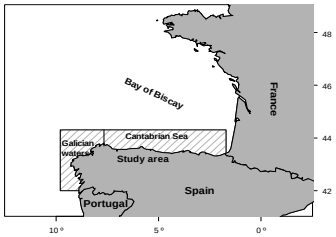
View metadata, citation and similar papers at core.ac.uk
brought to you by CORE
provided by Repositorio Institucional Digital del IEO

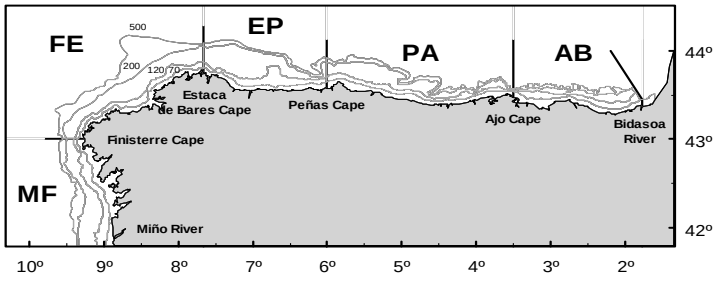
METHODS

1.Study area

Time-series from 2002 to 2011

Sampling strategy





METHODS

2.Data source

→ Biological data

Explanatory variables

- Latitude
- Longitude
- Depth (m)

Sieving & sedimentation / Combustion

- Median particle diameter (Q50,µm)
- Organic matter (%)
- Sorting coeficient (S_0)

- T (ºC)
- S (‰)

METHODS

3.Data analysis: Species and length categories

Arnoglossus imperialis

Imperialis_s: 6-12 cm; Imperialis_l: 13-20 cm

Buglossidium luteum

Buglossidium_s: 7-11 cm; Buglossidium_l: 12-15 cm

Lepidorhombus boscii

Boscii_s 3-17 cm
Boscii_m 18-25 cm
Boscii l 26-44 cm

Arnoglossus laterna

Laterna_s: 2-10 cm; Laterna_l: 11-18 cm

Microchirus variegatus

Microchirus_s: 4-12 cm; Microchirus_l: 13-24 cm

L. whiffiagonis

Whiffi_s: 5-20 cm
Whiffi_m: 21-29 cm
Whiffi_l: 30-53 cm

Bathysolea profundicola

Bathysolea_s: 10-17 cm; Bathysolea_l: 18-23 cm

Pegusa lascaris

Lascaris_s: 19-23 cm; Lascaris_l: 24-37 cm

Solea solea

Solea_s 11-27 cm
Solea_m 28-39 cm
Solea_l 40-50 cm

METHODS

3.Data analysis: statistics

CLUSTER ANALYSIS → Associations among species and size groups

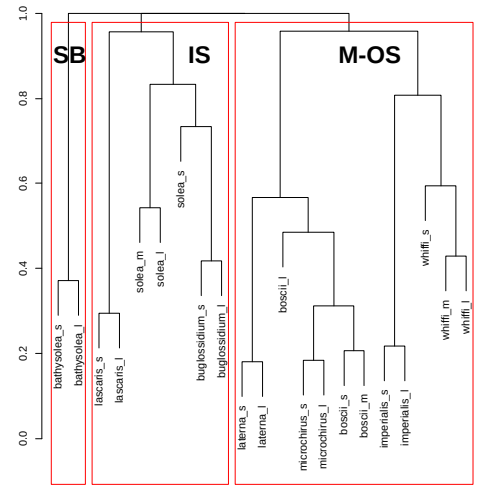
MANOVA → Significance of e.variables in the spp composition

Canonical Correspondance Analysis (CCA) → Ordered structure spp and e.variables

Centers of Gravity (CoG) → Mean value of the variable analized weighted to the abundance of the species.

$$COG = \sum_{i=1}^{n} (x_i * z_i) / \sum_{i=1}^{n} x_i$$

- x_i abundance of the species in the haul i
- z_i mean value of the environmental variable given



RESULTS

CLUSTER ANALYSIS

3 main assemblages

Inner shelf group (IS)
P.lascaris, *B.luteum, S.solea*

Medium and outer shelf group (M-OS)
A.laterna, *A.imperialis*, *M.variegatus*, *L.whiffiagonis,*
L. boscii

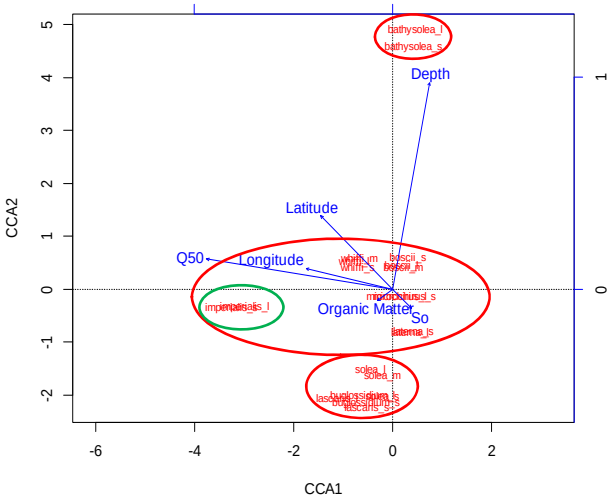
Shelf break and upper slope group (SB)
B.profundicola.

RESULTS

MANOVA: Importance of Explanatory variables

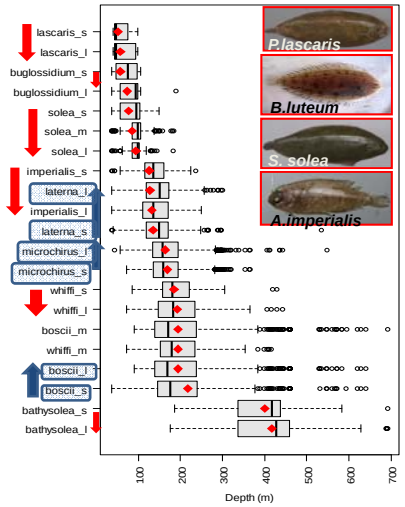
	Df	SumsOfSqs	MeanSqs	F.Model	R2	Pr(>F)
Depth	1	23.005	23.005	103.630	0.0858	0.001 ***
Q50	1	14.959	14.959	67.385	0.0558	0.001 ***
Longitude	1	7.432	7.432	33.478	0.0277	0.001 ***
Latitude	1	4.473	4.473	20.150	0.0167	0.001 ***
Temperature	1	2.132	2.033	9.603	0.0080	0.001 ***
Organic Matter	1	1.316	1.316	5.928	0.0049	0.001 ***
So	1	1.219	1.219	5.493	0.0046	0.001 ***
Salinity	1	0.396	0.396	1.785	0.0014	0.051 .
Residuals	960	213.115	0.211	0.751		
Total	968	268.048			1	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1



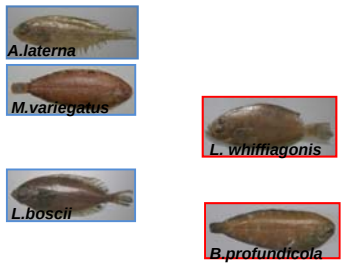
RESULTS

CCA: Biological vs. Explanatory data



RESULTS

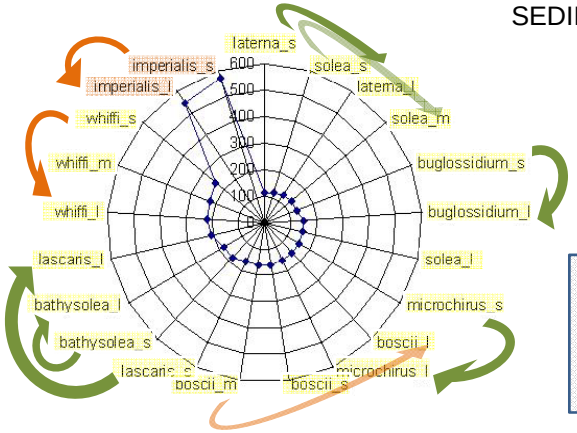
FLATFISH DISTRIBUTION WITH DEPTH (CoG)



◆ (CoG)

RESULTS

FLATFISH DISTRIBUTION WITH SEDIMENT SIZE (CoG)

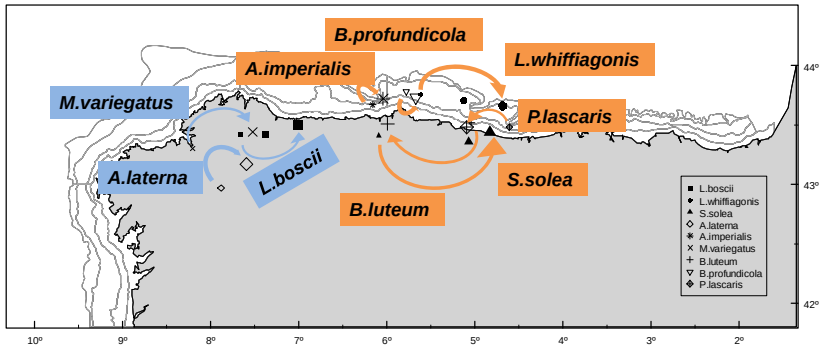


Median particle diameter

125-250 µm-> "Fine sands"
250-500 µm-> "Middle sands"
500-1000 µm-> "Coarse sands"

RESULTS

FLATFISH DISTRIBUTION WITH LONGITUDE AND LATITUDE (CoG)



DISCUSSION & CONCLUSIONS

Depth
- Intere-species → Bathymetric segregation → Diet composition → Strategy: Resource partitioning (Piet, 1998) → Avoid interspecific competition (Sánchez, 1993)
- Ontogeny (intra-species)
  - (+) → 6/9 spp
  - (-) → 3/9 spp

1. Depth has been revealed as the main factor in structuring flatfish distribution.
   **previous papers have explained the bathymetric segregation as a strategy of resource partitioning & avoiding inter-specific competition, on the basis of their diet.

2. A positive pattern between ontogeny and depth in 6/9 spp analyzed was found.
   **this pattern has been confirmed for several flatfish species in other areas.

DISCUSSION & CONCLUSIONS

Sediment size
- Inter-species → Fine sands 8/9 spp; *A.imperialis* → Coarse sands
- Ontogeny (intra-species)
  - (+) → 6/9 spp
  - (-) → 3/9 spp

Ability to bury f (spp & sizes) (Stoner & Ottmar, 2003) → sediment choice (Gibson, 2014) → Avoid predation

3. Sediment size has been revealed as the second factor in structuring flatfish distribution.
   **Avoiding predation and feeding is considered the main reason for association with sediment; previous studies have related sediment choice with the ability to bury in it as a function of the species and size.

4. A positive pattern has been found between ontogeny and sediment size in 6/9 spp analysed.

DISCUSSION & CONCLUSIONS

Longitude & Latitude

- Interespecies
  - W: *L.boscii*, *A.laterna*
  - E: *L.whiffiagonis*, *A.imperialis*
- Ontogeny (intraspecies) → No ontogenetic changes, **but trend** → Fishing mortality?

5. Longitude and Latitude are also important factors in structuring flatfish distribution.
6. These variables differenciate species into the genus *Arnoglossus* and *Lepidorhombus,* probably as a consequence of the sediment they are associated.
7. They don't seem to show ontogenetic changes in relation to latitude and longitude, but they follow a trend, with higher abundance of larger individuals towards the east, maybe as a consequence of a stronger fishing effort in the western area.

17

18