THIN LAYERS AND HARMFUL PHYTOPLANKTON IN RÍA DE PONTEVEDRA (NW IBERIA)

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Hypothesis

In Ría de Pontevedra there is a relationship between the occurrence of TLP and harmful phytoplankton blooms

Main goals

1. To describe the **seasonal variability** of the **main phytoplankton species/genera** co-occurring with TLP

2. To investigate the **relationship** between the occurrence of **TLP** and **harmful phytoplankton** densities

Motivation


SST (°C)
<10.0
10.0
10.5
11.0
11.5
12.0
12.5
13.0
13.5
14.0
14.5
15.0
15.5
16.0
16.5
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25.0
25.5
26.0
26.5
27.0
27.5
28.0
28.5
29.0
29.5
>29.5
A Coruña
Porto
Lisboa
http://www.ieo-santander.net,
IEO-Santander

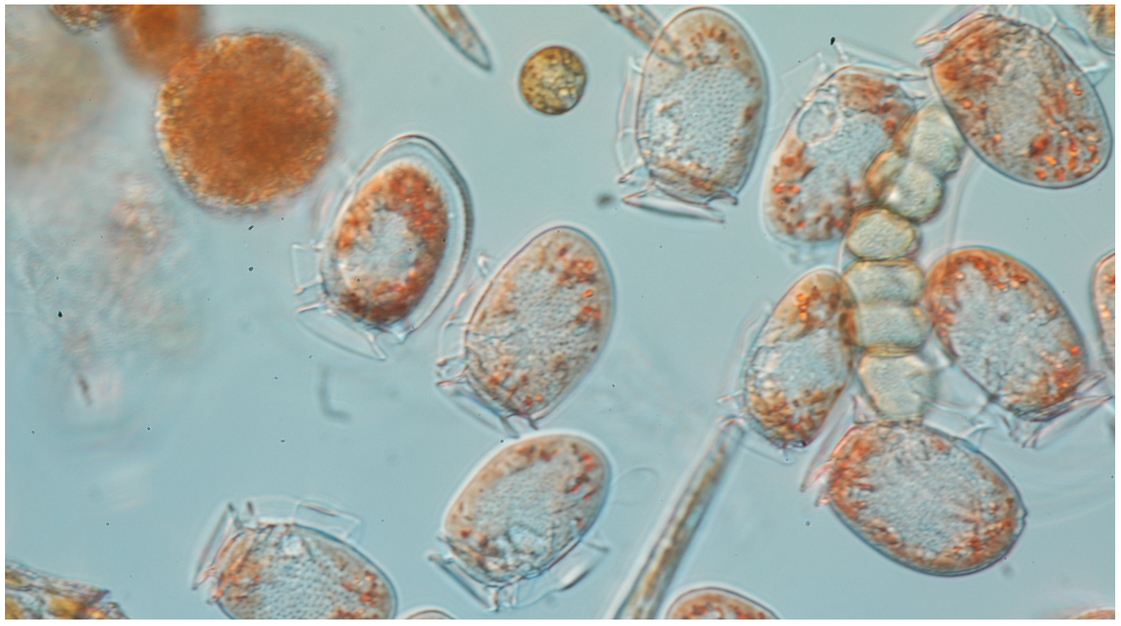
Main toxins in the Ría

DSP
Diarrhetic

ASP
Amnesic

PSP
Paralytic

- Dinoflagellates genus *Dinophysis*
- Low biomass blooms (10^2-10^4 cells L^{-1})



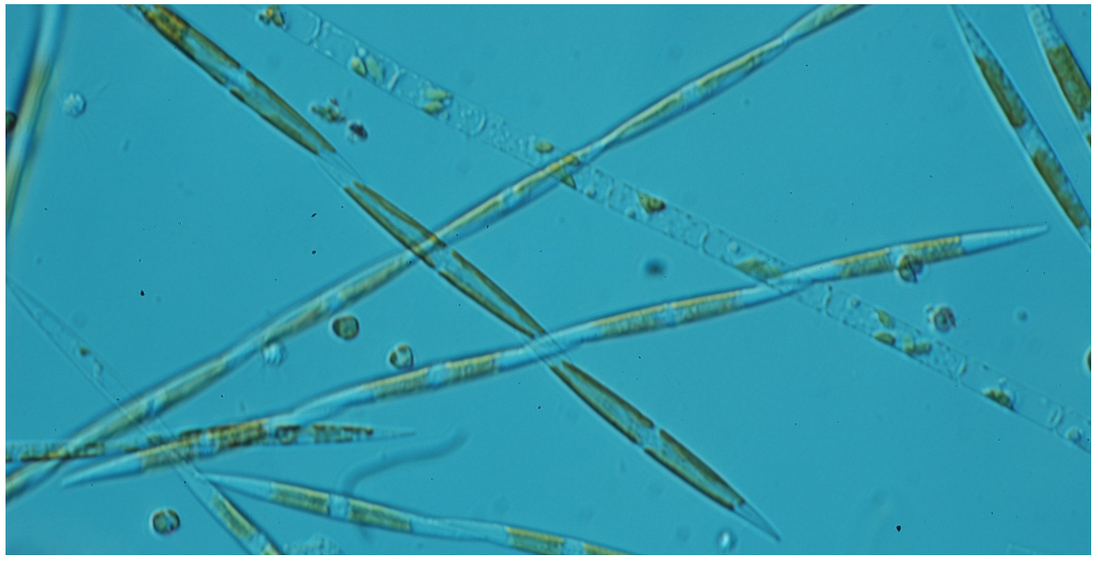
Main toxins in the Ría

DSP
Diarrhetic

ASP
Amnesic

PSP
Paralytic

- Diatoms genus *Pseudo-nitzschia*
- High biomass blooms (10^5-10^6 cells L^{-1})



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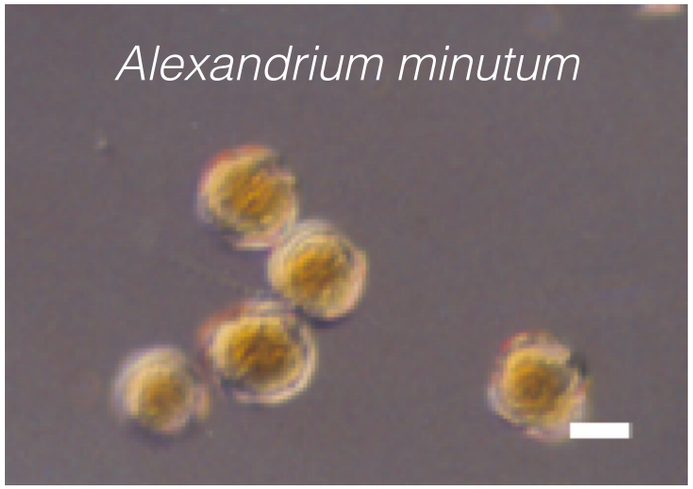
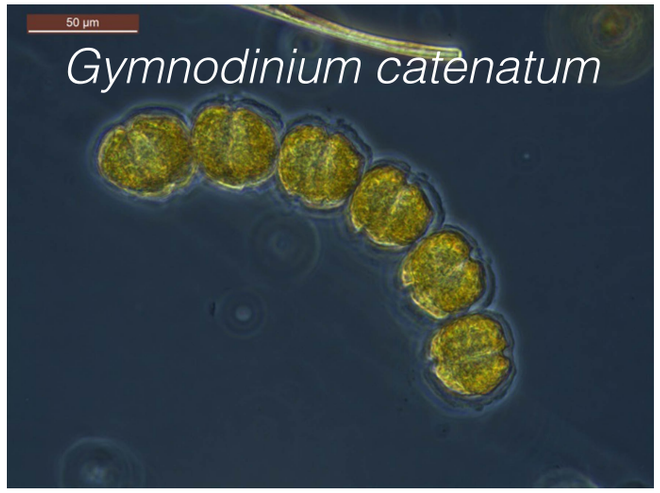


WHOI, D. Anderson 2016
www.whoi.edu

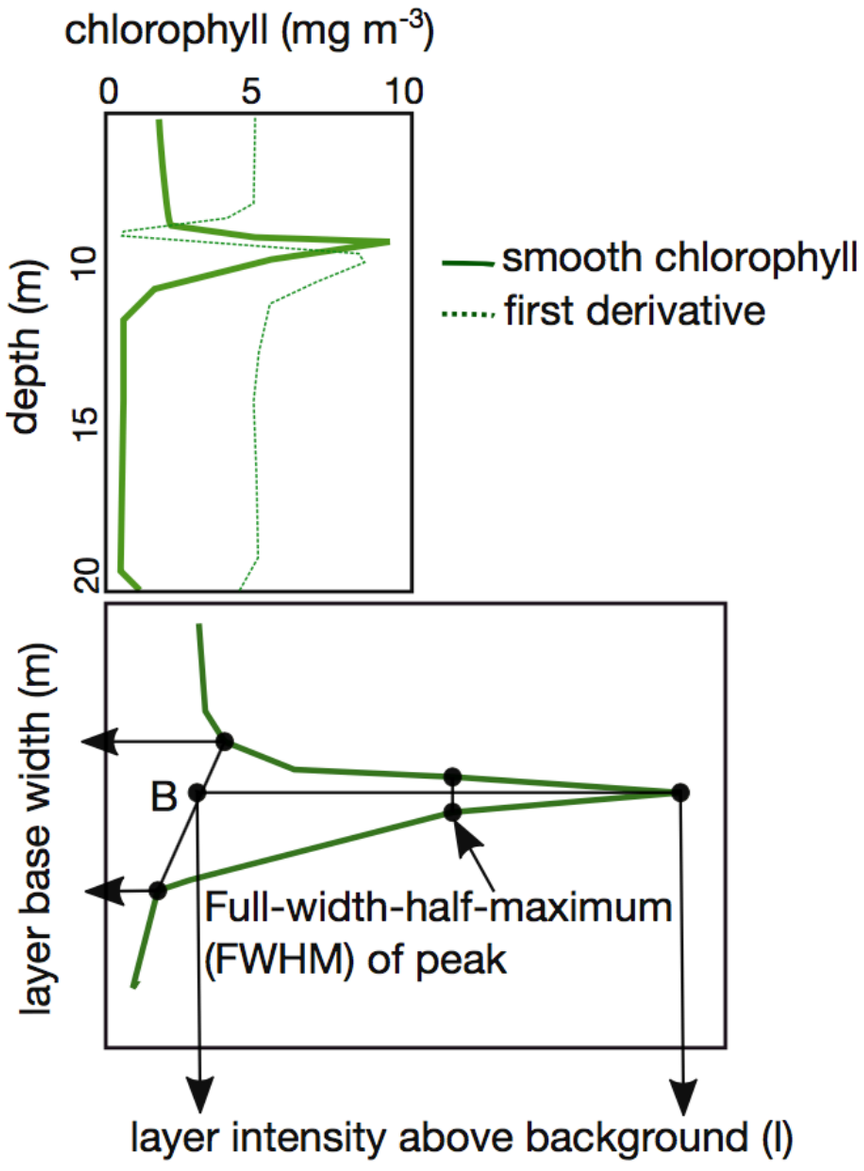


UNAM, 2015
www.dgcs.unam.mx

- Dinoflagellates:
  - *Alexandrium minutum*
  - *Gymnodinium catenatum*

Harmful phytoplankton speies are able to proliferate in thin layers (Dekshenieks *et al.*, 2001; McManus *et al.*, 2003, 2008; Velo-Suárez *et al.*, 2008; Ryan *et al.*, 2008; Rines *et al.*, 2010; Sullivan *et al.*, 2010; Díaz *et al.*, 2014)

What are thin layers of phytoplankton (TLP)?

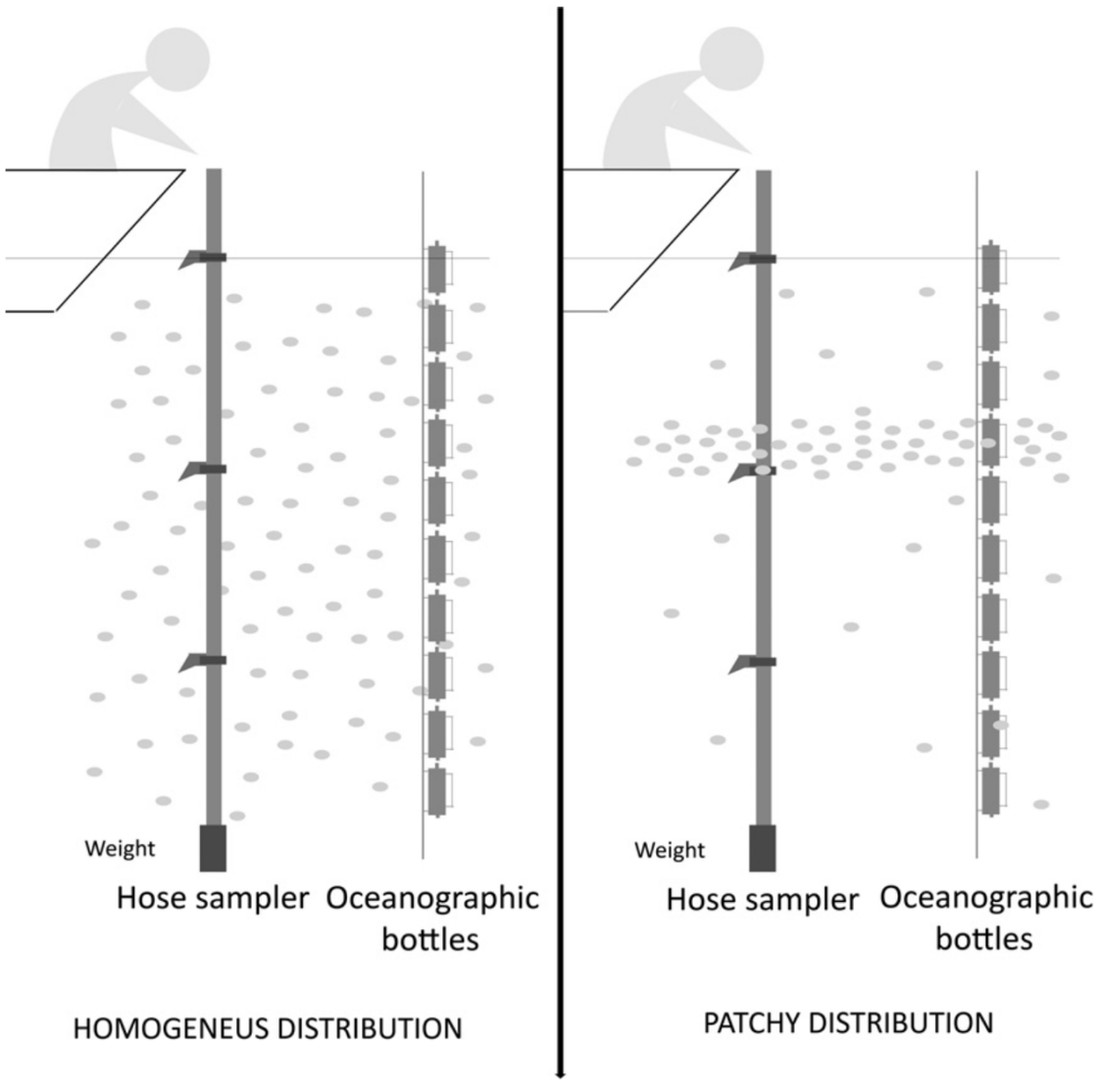


FWHM<3 m
I/B>2

Regular criteria:

1. Temporal persistance (present in 2 subsequent profiles at least)
2. Thickness < 3 meters (FWHM)
3. Fluorescence higher than a threshold (e. g. 2 times greater than background)

Traditional monitoring methods

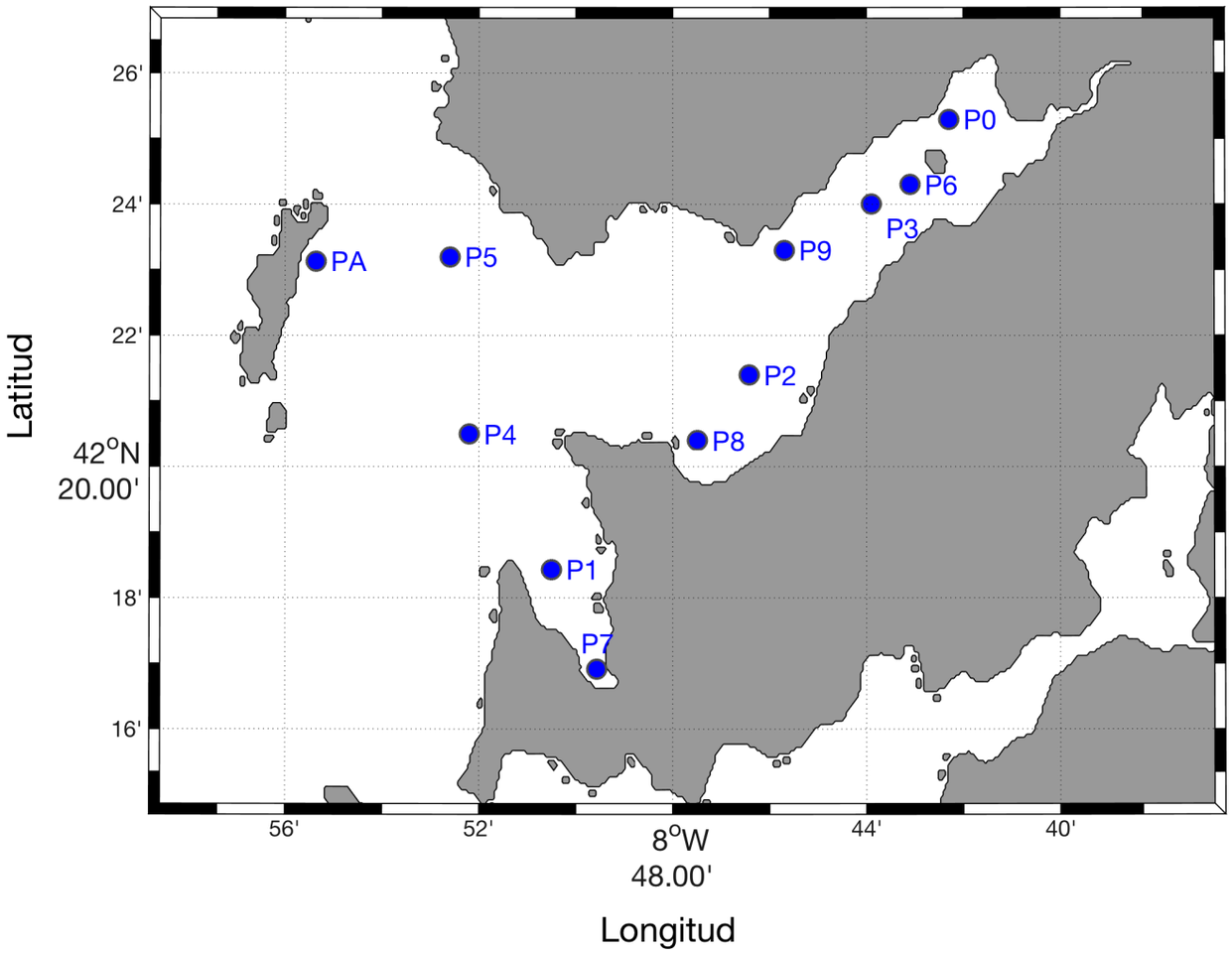


Escalera *et al.*, 2012
Marine Pollution Bulletin 64: 106–113

Distribution in water column is **NOT** homogeneous

Data sources

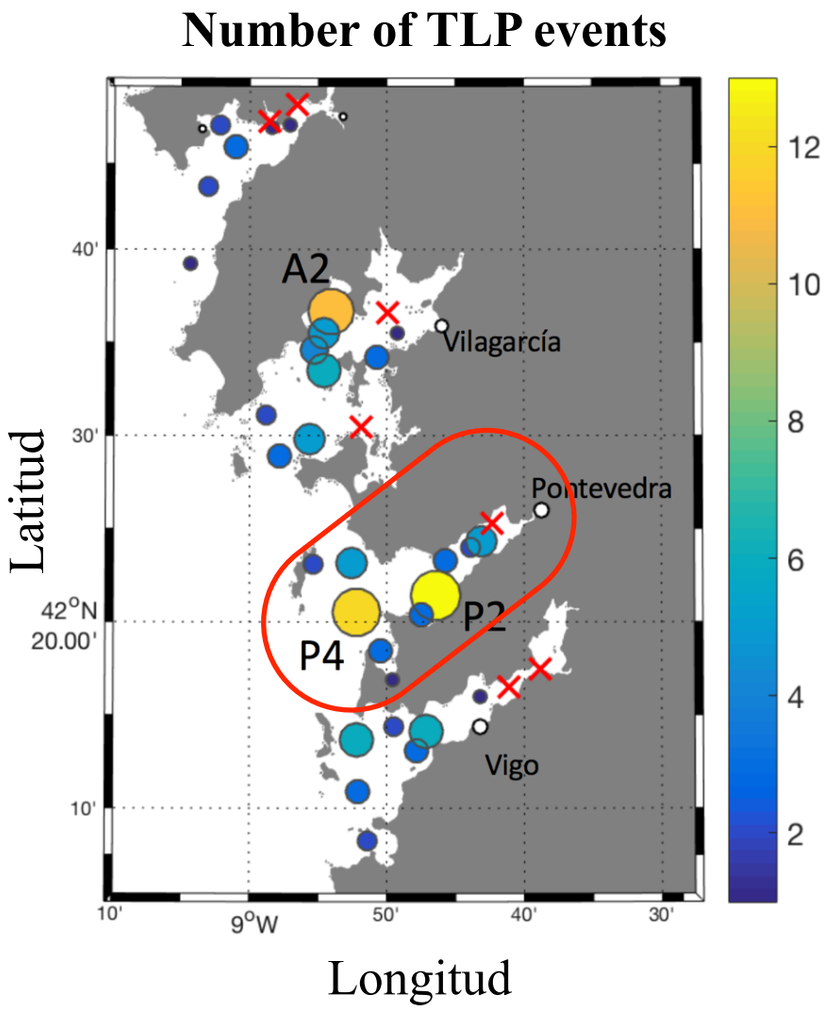
- Weekly data obtained from INTECMAR (www.intecmar.gal), 1992-2015
- 11 stations
- 8 phytoplankton groups quantified:
  - *Dinophysis acuminata*
  - *Dinophysis acuta*
  - *Dinophysis caudata*
  - *Dinophysis diegensis*
  - *Dinophysis spp*
  - *Pseudo-nitzschia* spp.
  - *Gymnodinium catenatum*
  - *Alexandrium* spp.



- Depth-integrated water-column samples

Data sources

- Period: 2012-2015
- INTECMAR CTD fluorescence profiles (weekly data obtained)



- 47 TLP events were detected in Ría de Pontevedra applying the criteria explained before

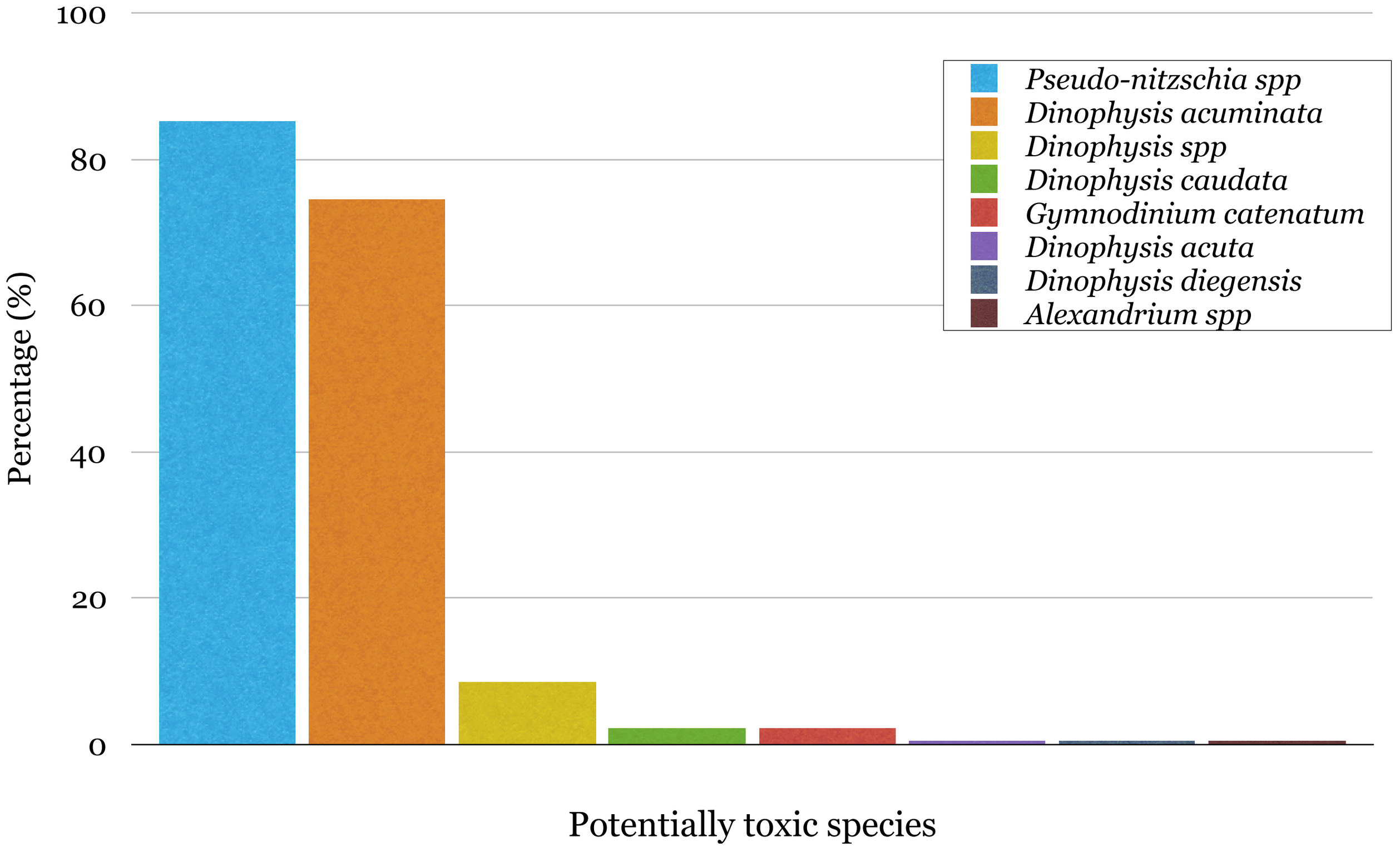
Main goals

1. To describe the **seasonal variability** of the **main phytoplankton groups** co-occurring with TLP

2. To investigate the **relationship** between the occurrence of **TLP** and **harmful phytoplankton** densities

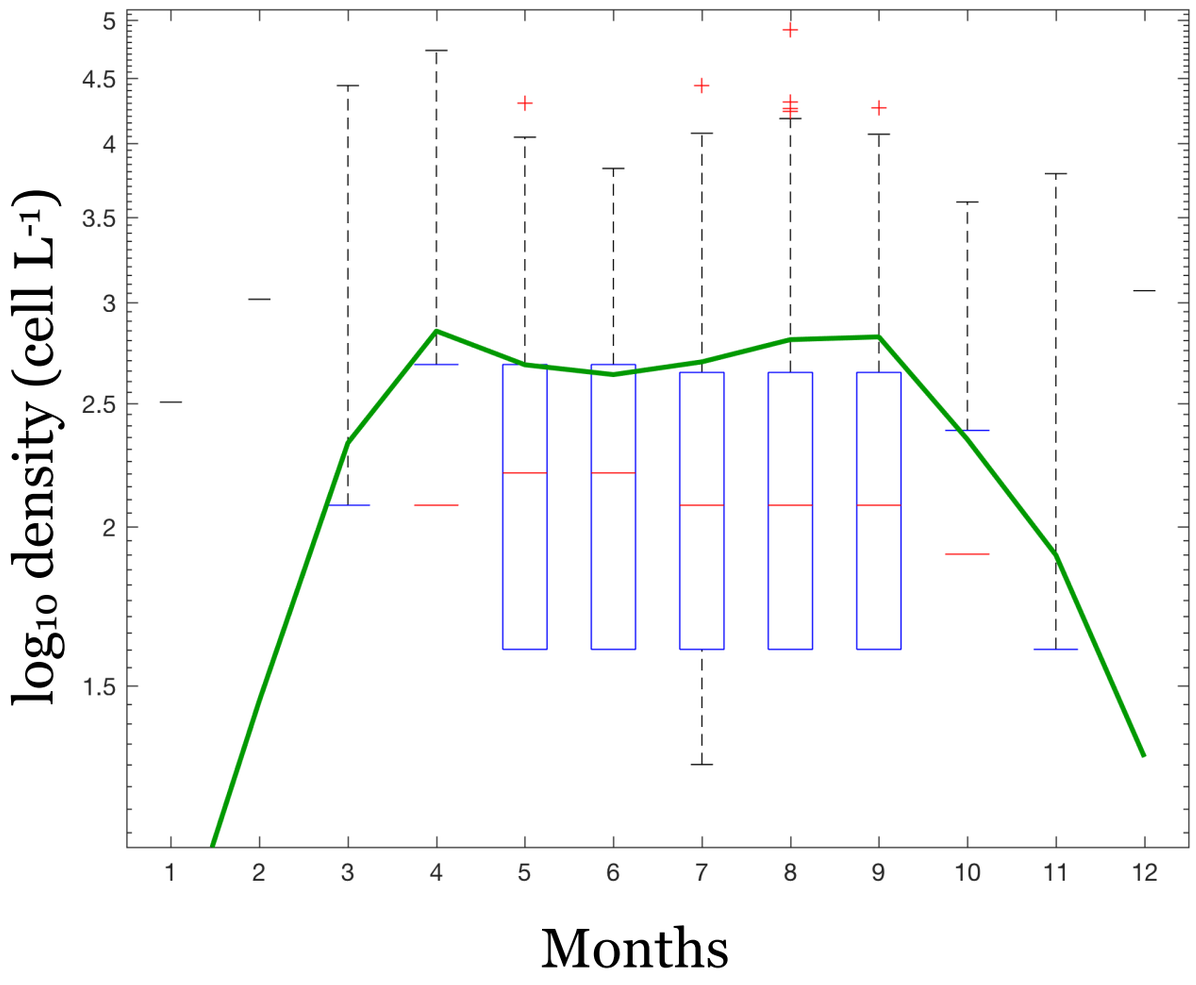
Which harmful species co-occur with the detection of TLP?

Presence of toxin-producing species/genera co-occurring with TLP during 2012-2015

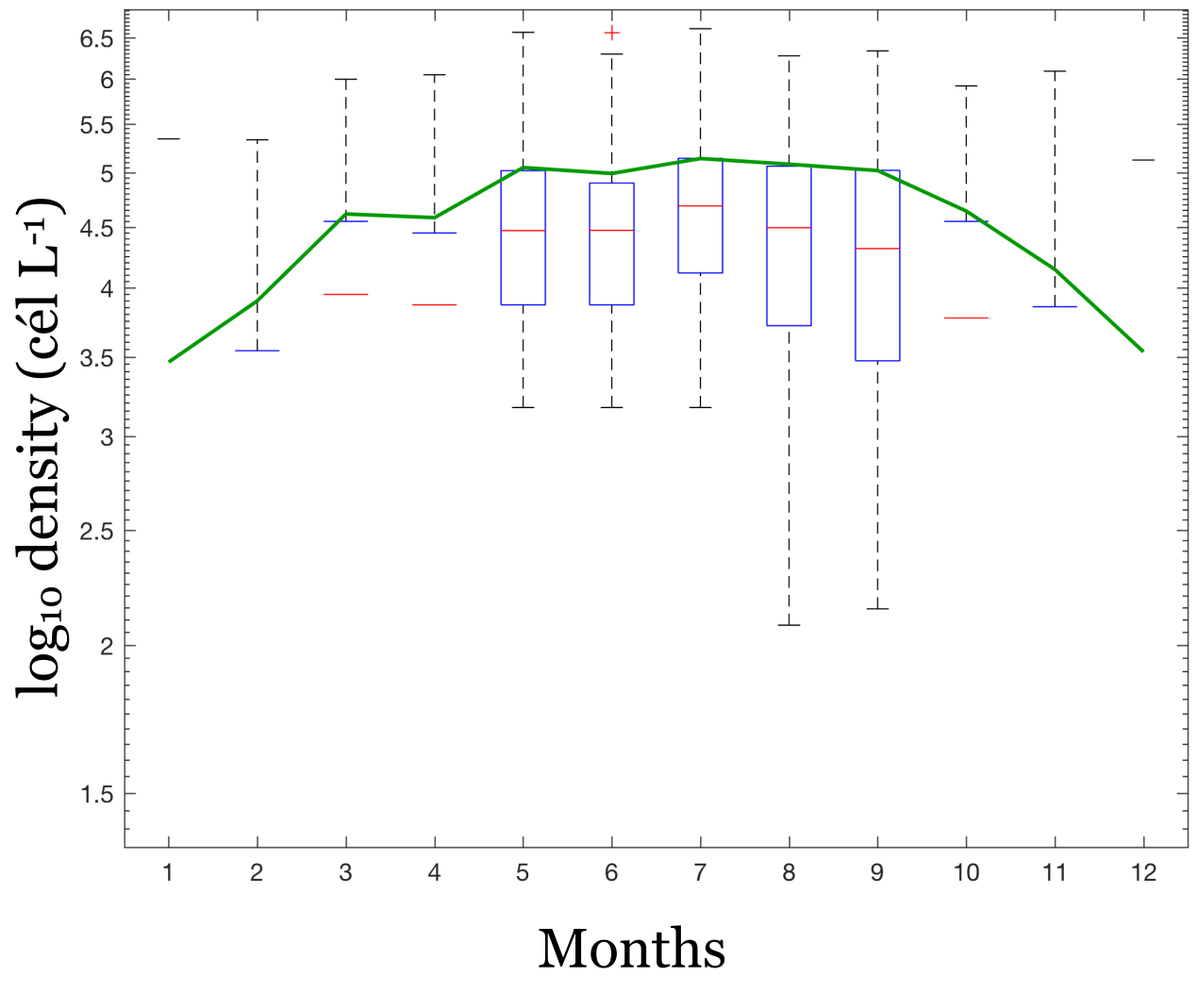


Seasonal variability in the Ría de Pontevedra (1992-2015)

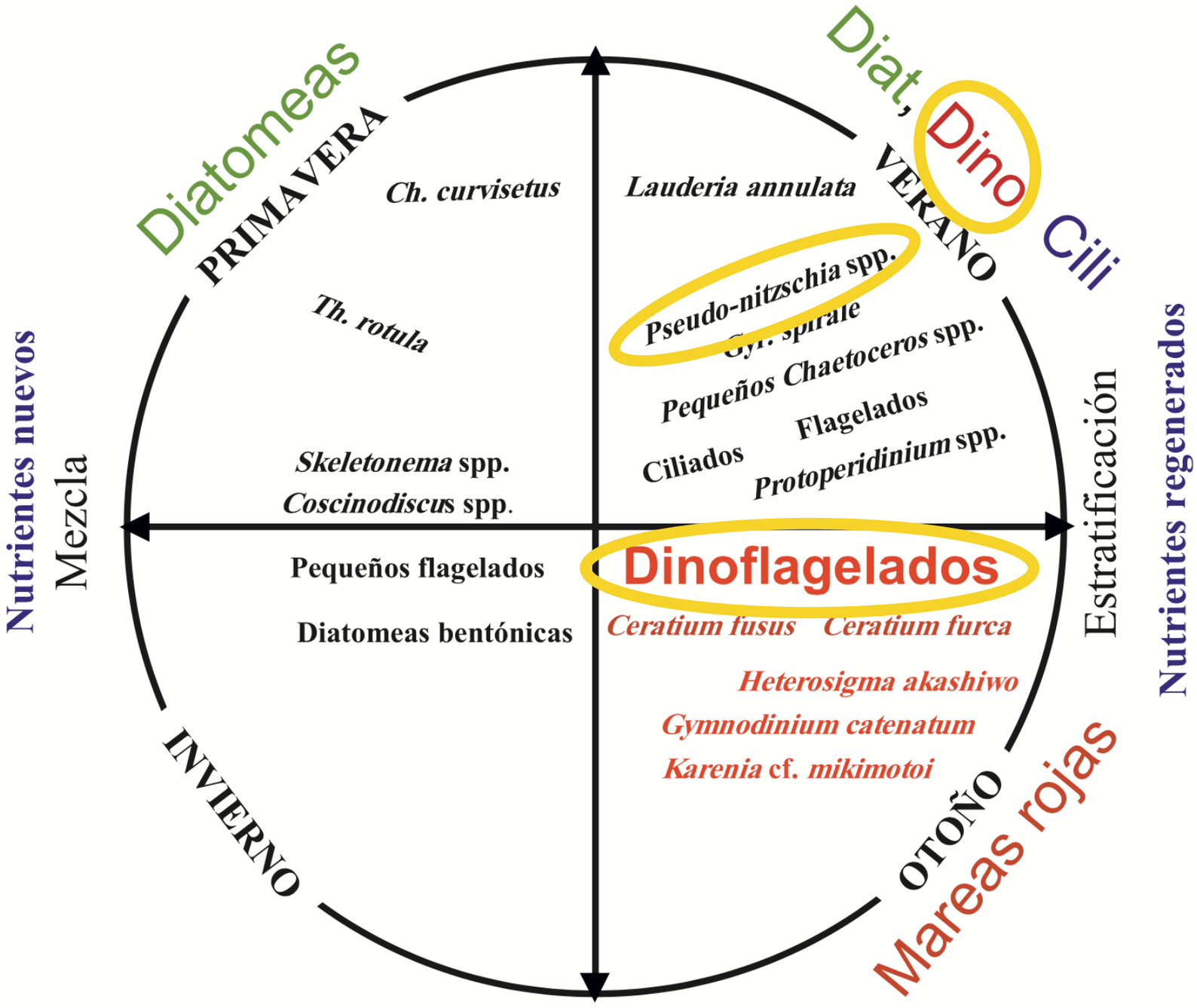
D. acuminata



Pseudo-nitzschia spp.



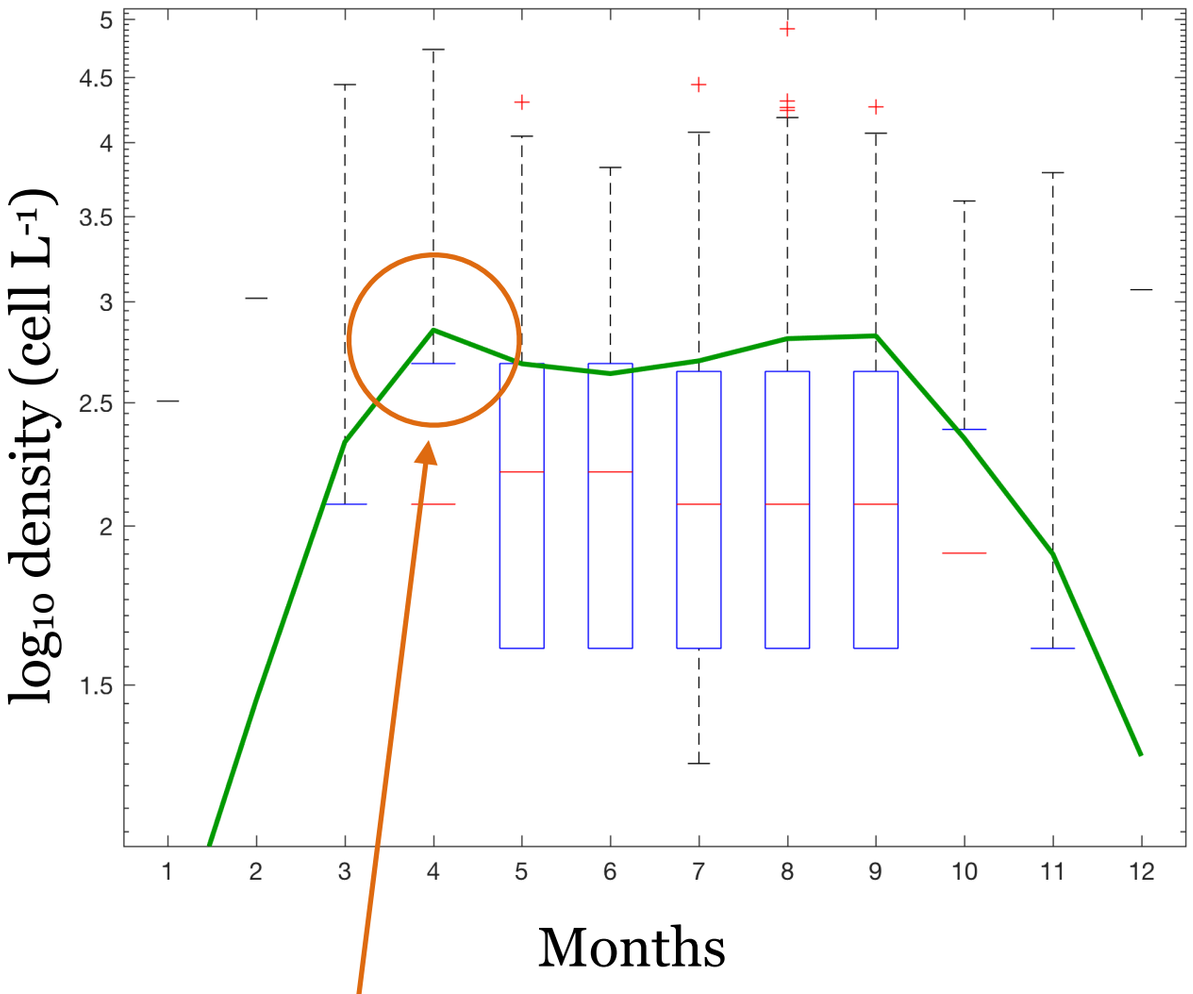
Seasonal variability in the Ría de Pontevedra



Figueiras *et al.*, 2008
El plancton en la Ría de Vigo, 111-152

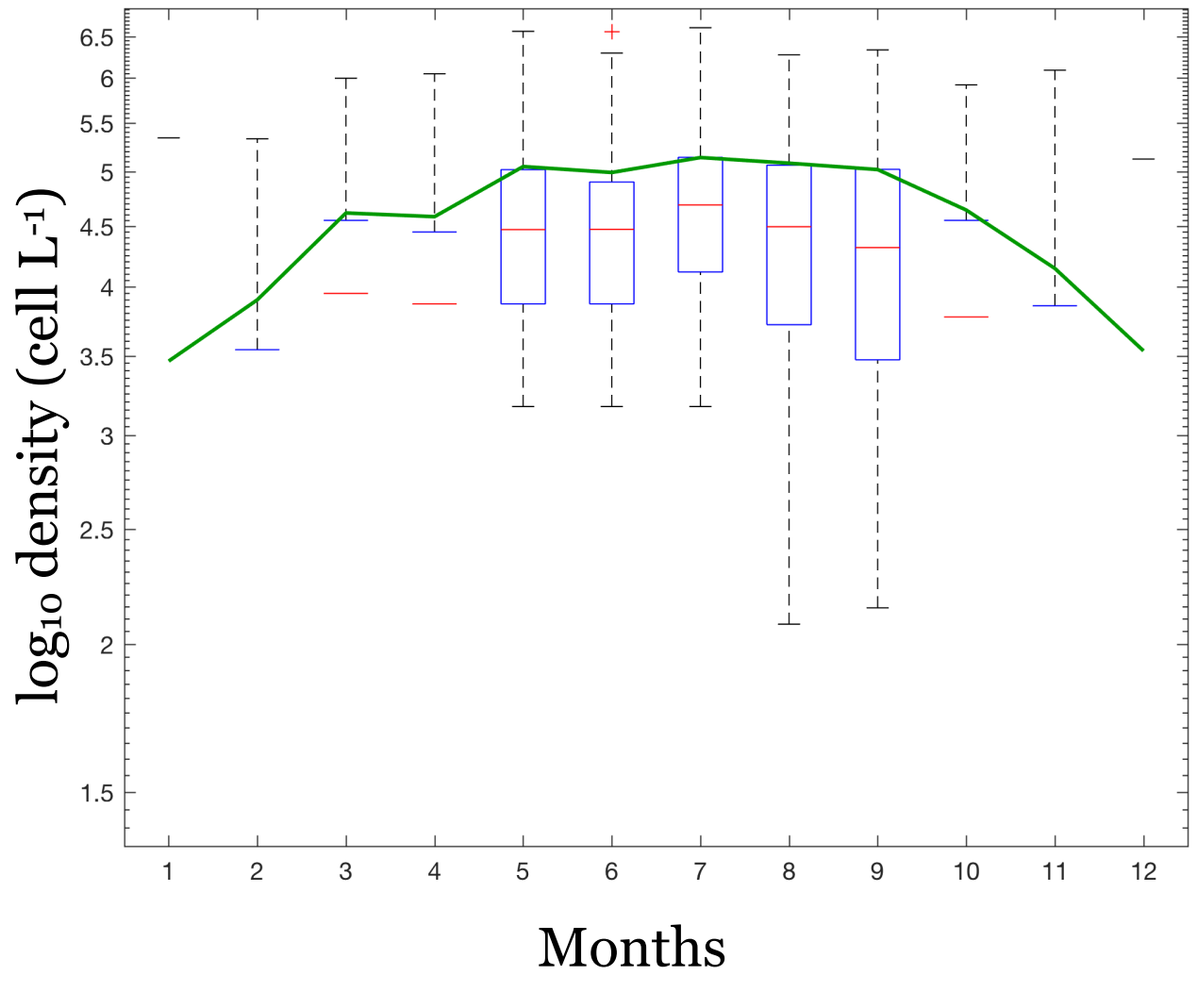
Seasonal variability in Ría de Pontevedra (1992-2015)

D. acuminata



Anomalous years due to northerly winds predominance in winter (Díaz *et al.*, 2014)

Pseudo-nitzschia spp.



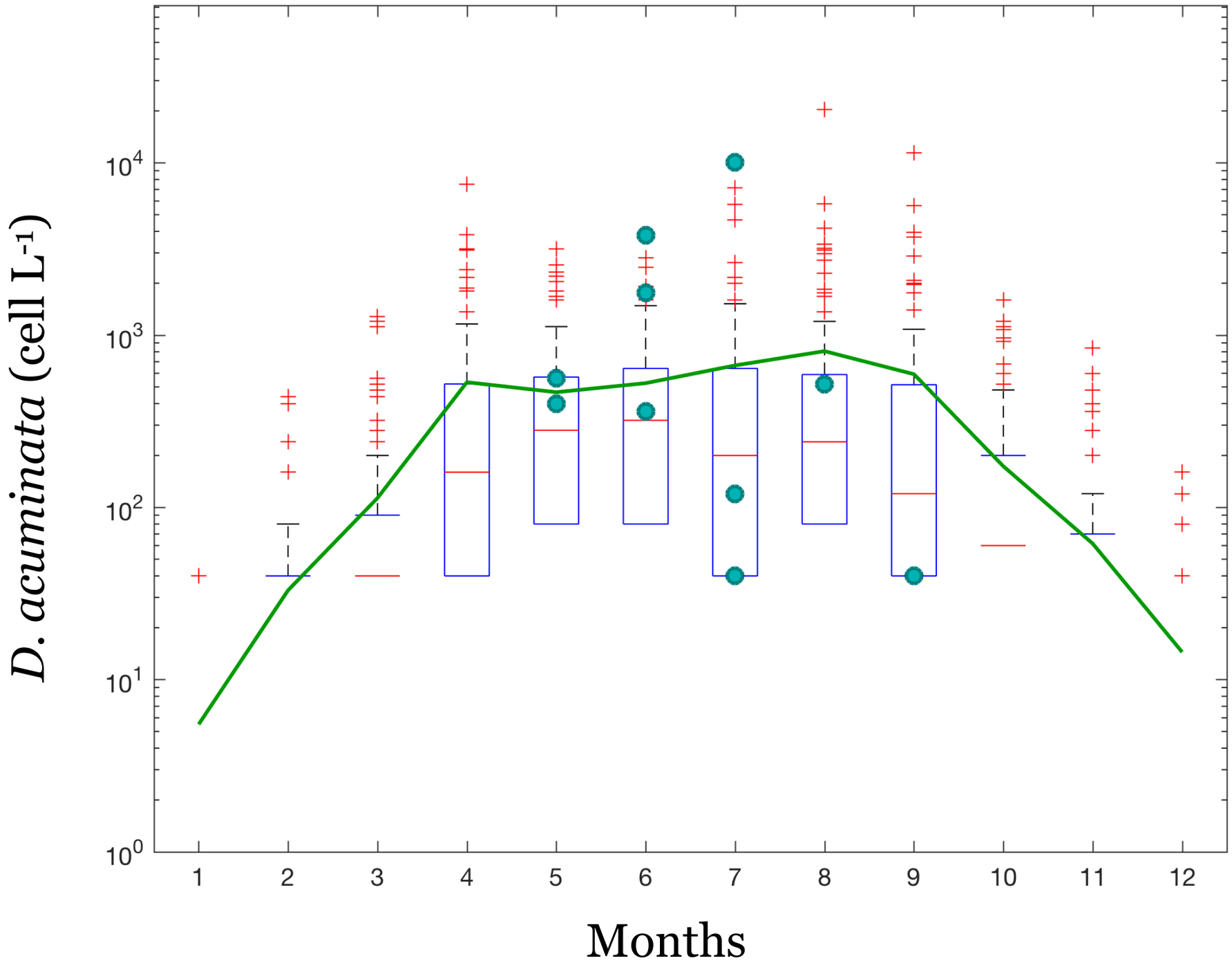
Main goals

1. To describe the **seasonal variability** of the **main phytoplankton groups** co-occurring with TLP

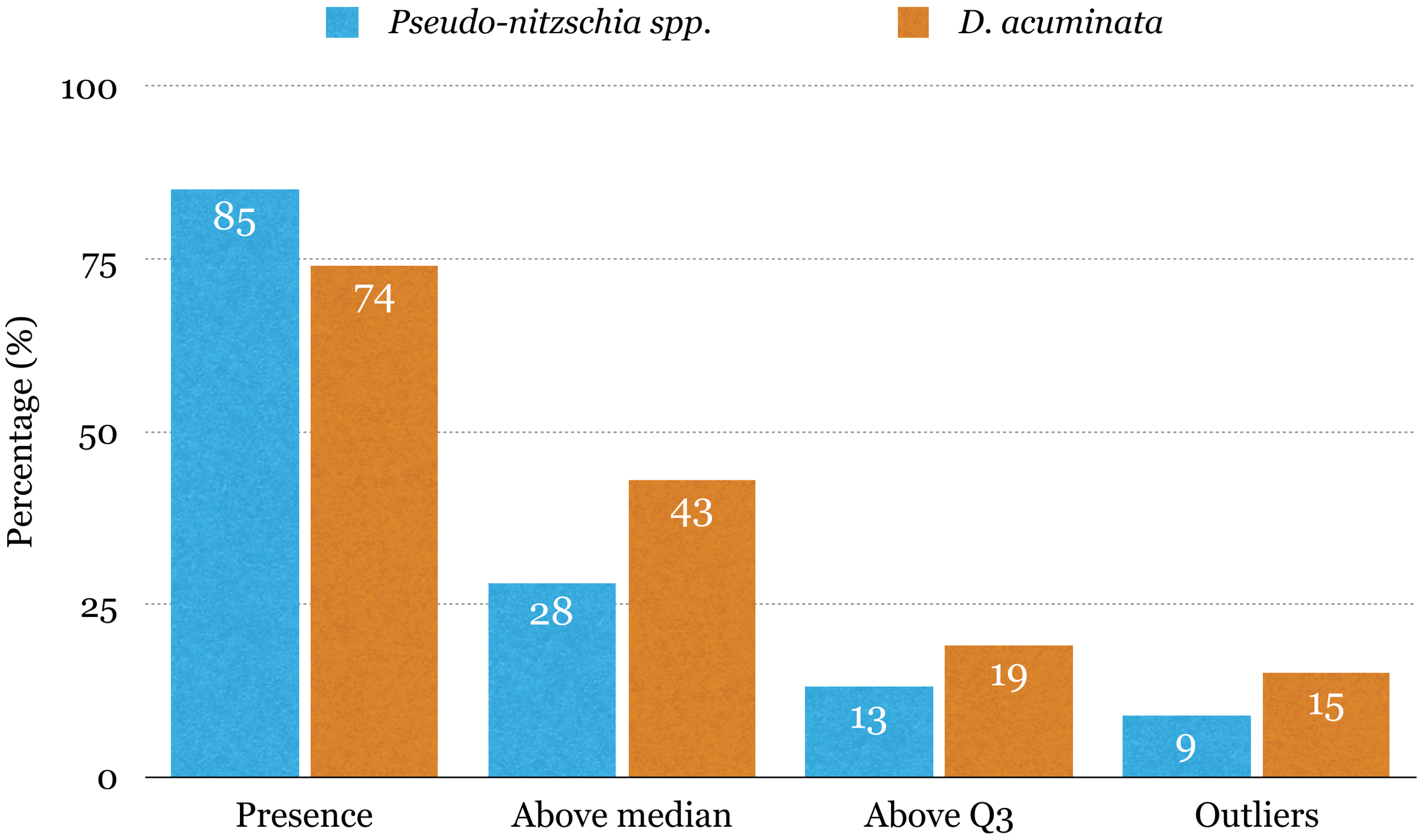
2. To investigate the **relationship** between the occurrence of **TLP** and **harmful phytoplankton** densities

Do TLP coincide with high densities of toxic species in the Rías?

Example P4 station, *D. acuminata*



Cell densities associated with TLP



Conclusion

Objective 1: To describe the **seasonal cycles** of the **main phytoplankton groups** presents at the same time in TLP samplings

High densities during the upwelling season: *D. acuminata* from April to September, *Pseudo-nitzschia* spp from July to August

Conclusion

Objective 2: To investigate the **relationship** between the occurrence of **TLP** and **toxic phytoplankton** densities

19% of TLP were associated with *D. acuminata* values above third quartile, whereas for *Pseudo-nitzschia* spp. this value was 13%

Hypothesis

In Ría de Pontevedra there is a relationship between the occurrence of TLP and toxic phytoplankton blooms

Aknowledgments

To the Spanish Ministry of Economy and Competitiveness for granting the project CTM2016-75451-C2-1-R to B. Mouriño-Carballido.

More information about the project

A PSEUDO-LAGRANGIAN TRANSFORMATION TO STUDY THE SPATIAL STRUCTURE OF A FLUORESCENCE PATCH IN THE RÍA DE VIGO (NW IBERIAN PENINSULA)

Marina Villamaña, Peter J.S. Franks, Bieito Fernández-Castro, Miguel Gilcoto and Beatriz Mouriño-Carballido. EOF 2018. Comunicación oral: 21 Junio 18:15 h.

SEARCHING FOR THIN LAYERS OF PHYTOPLANKTON IN THE UPWELLING REGION OFF NW IBERIA

Beatriz Mouriño-Carballido, Esperanza Broullón, Paloma Chouciño, Bieito Fernández, Marta López, Miguel Gil Coto, Enrique Nogueira, Yolanda Pazos, Rosa Reboreda, Beatriz Reguera, Carlos Souto, Marina Villamaña. ISMS2018 (Vigo). Póster: 21 de Junio

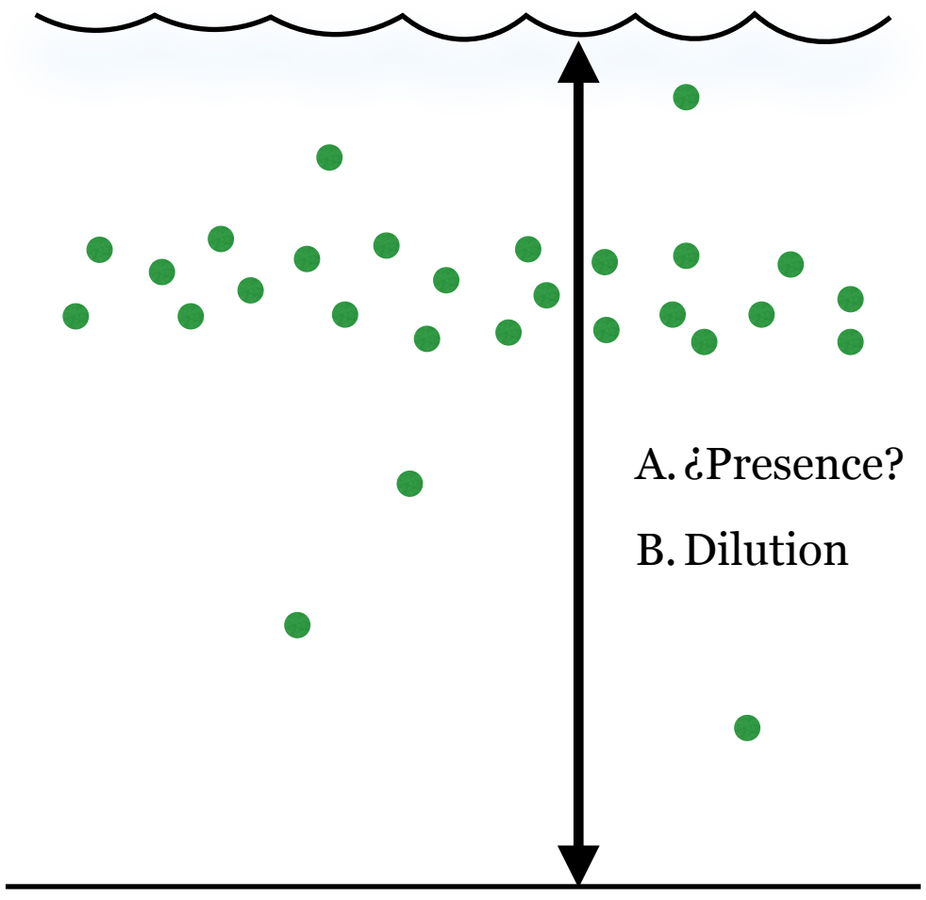
INVESTIGATING THE ENVIRONMENTAL CONDITIONS FAVORABLE FOR THE OCCURRENCE OF THIN LAYERS OF PHYTOPLANKTON IN THE GALICIAN RÍAS

Marta López, Beatriz Mouriño-Carballido, Miguel Gilcoto, Paloma Chouciño, Rosa Reboreda, and Carlos Souto. ISMS2018 (Vigo). Póster: 22 de Junio

Limitations

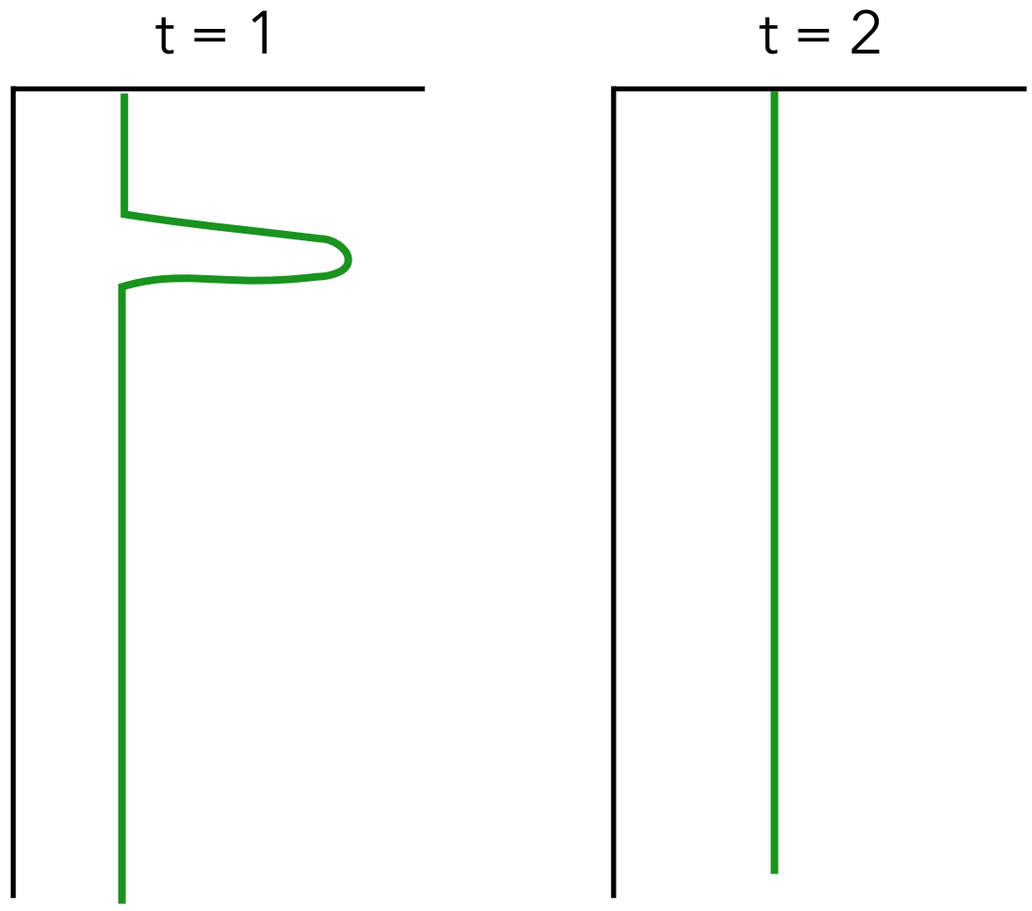
1. Integrated samples

Velo-Suárez, *et al.*, 2008 and Díaz *et al.*, 2014

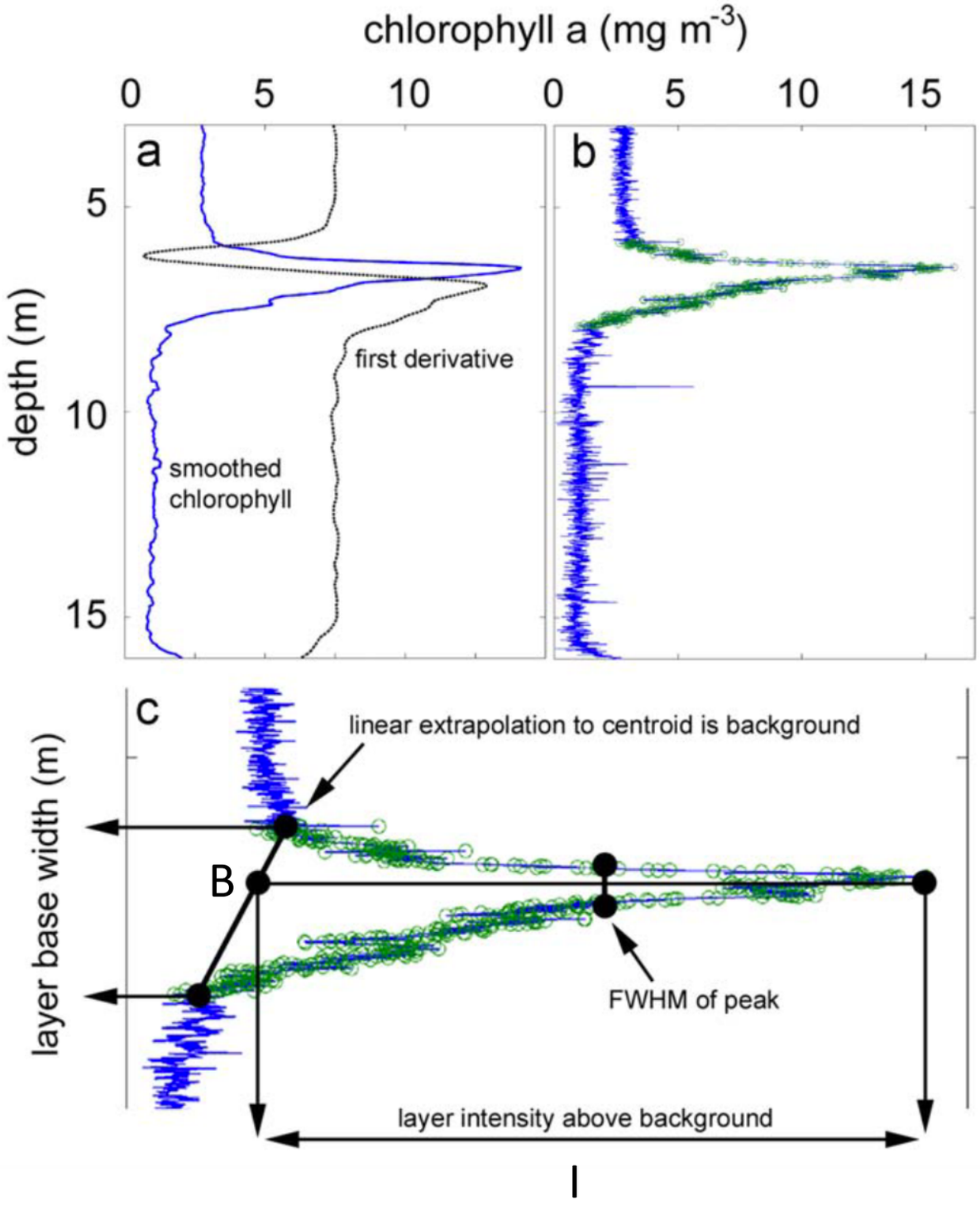


2. High temporal variability

Díaz *et al.*, 2014



Detection of TLP



B=Background

I=Intensity

FWHM=Full-width-half-maximum

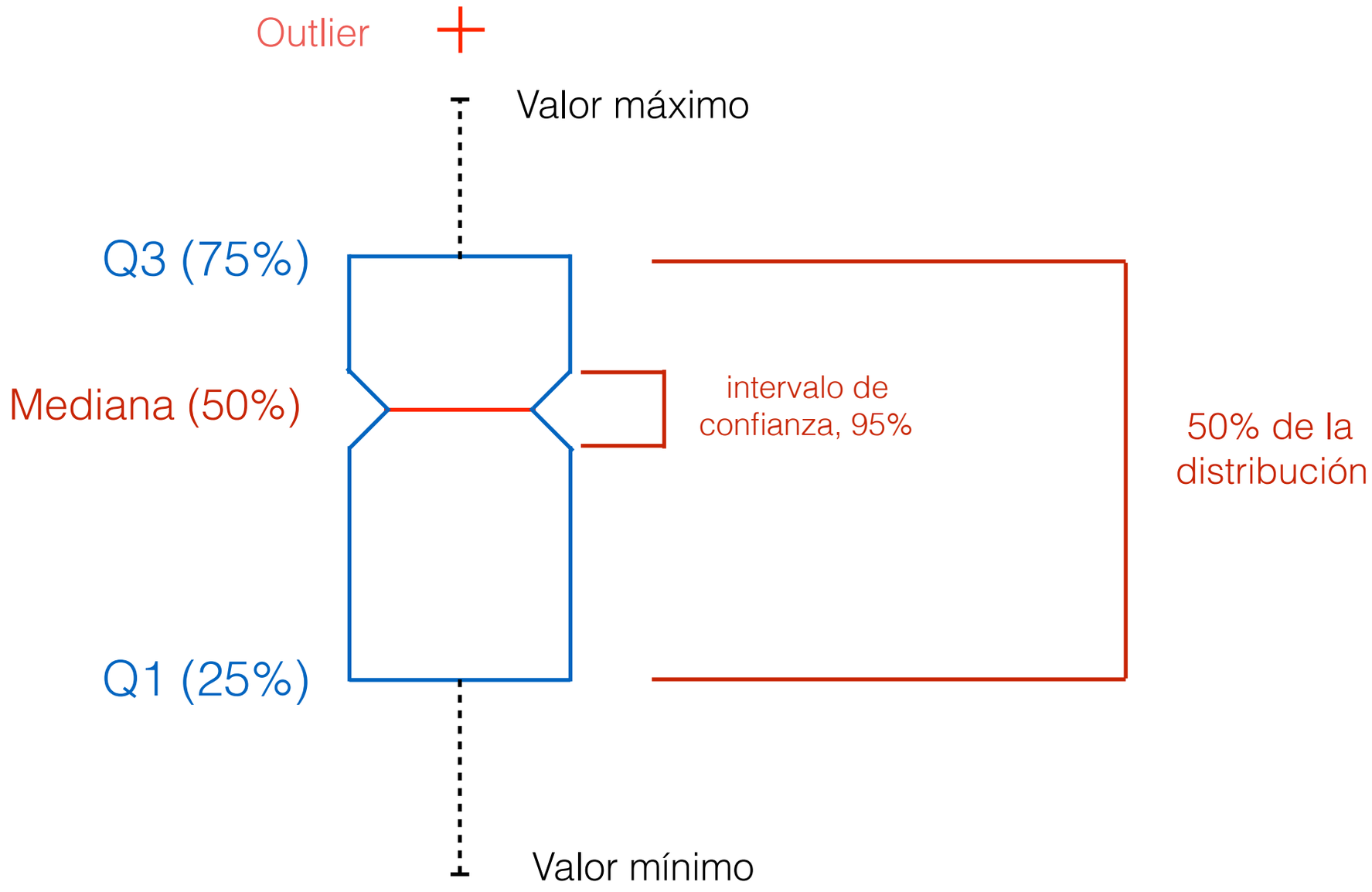
I > 2xB

FWHM < 3 m

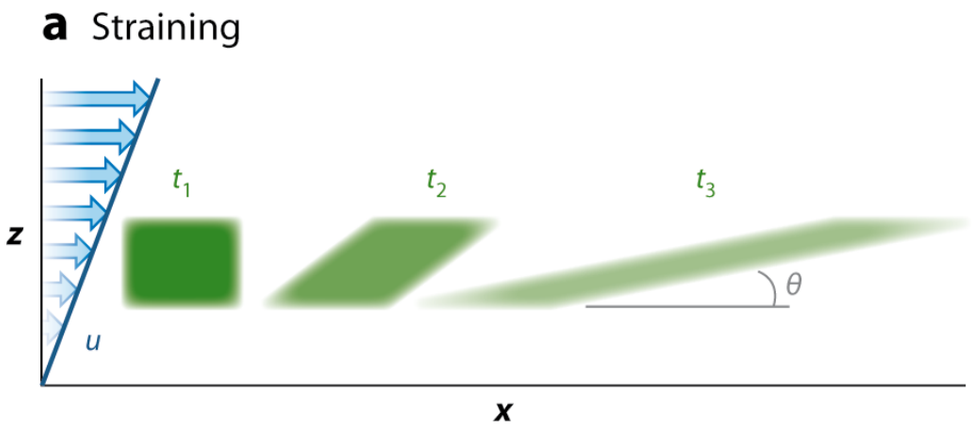
Sullivan *et al.*, 2010
Continental Shelf Research 30 (1): 50-65

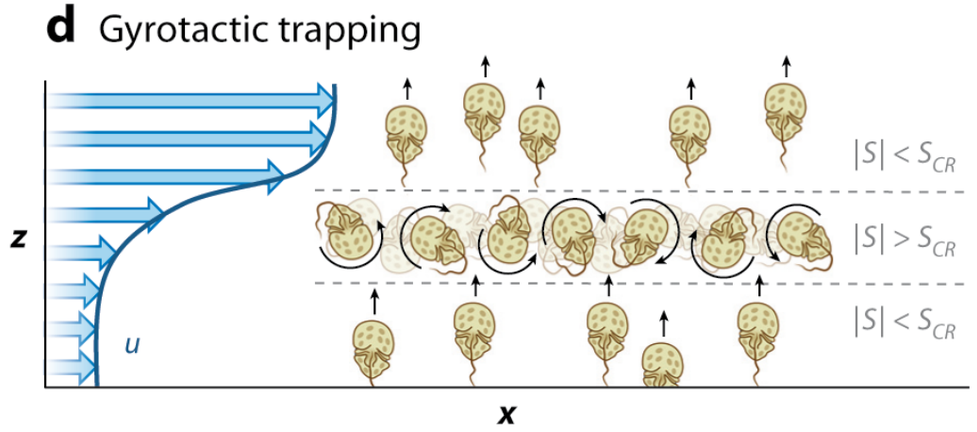
¿Cómo se realizó el trabajo?

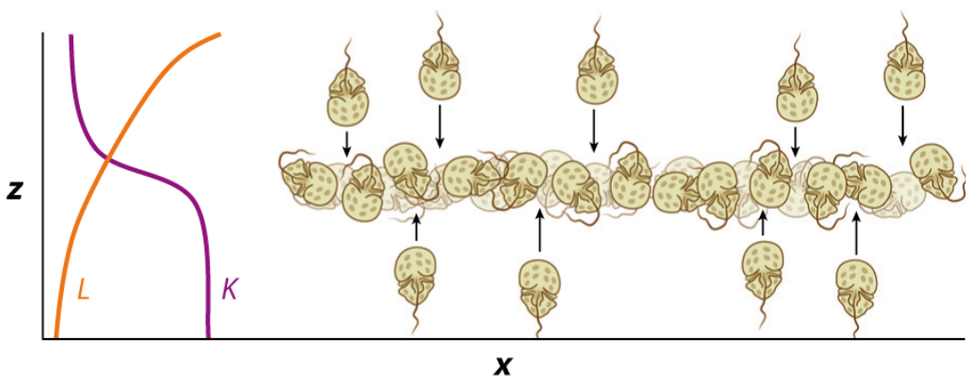
- Procesado de datos y representación en MATLAB: diagramas de cajas o BOX-PLOTS

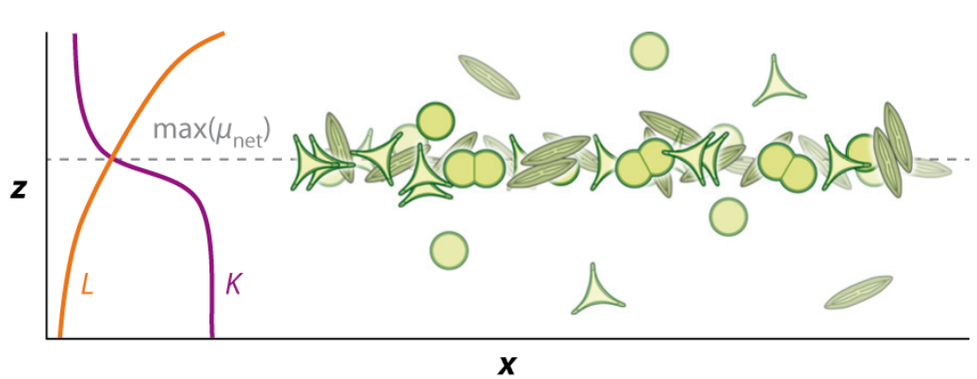


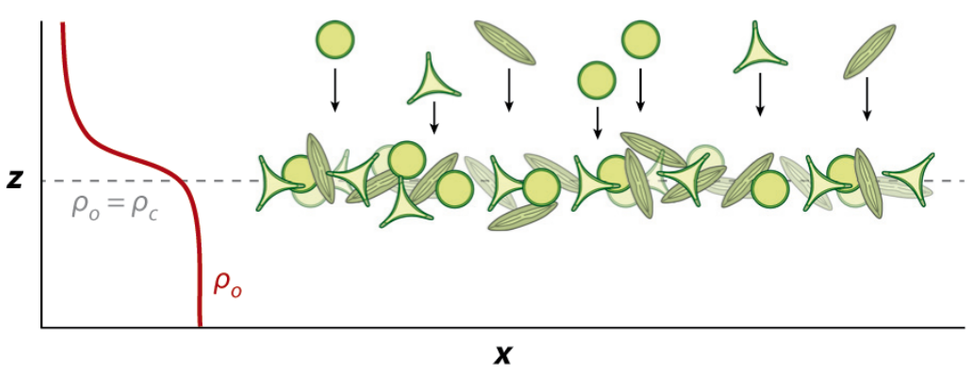
Thin layers of phytoplankton (TLP): Formation

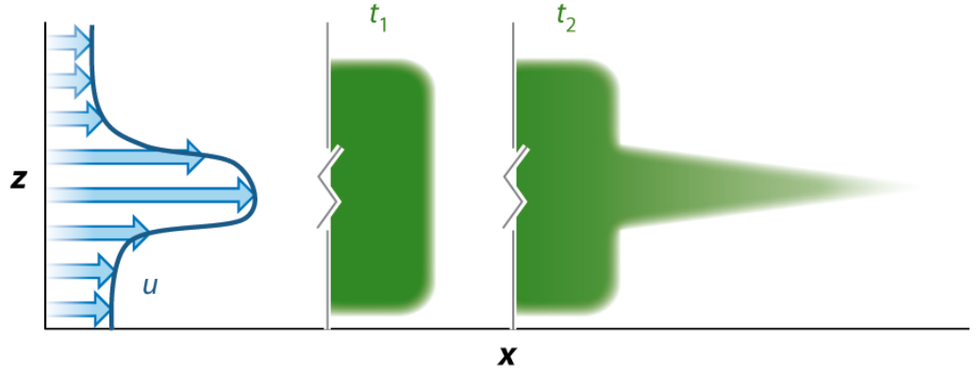












Durham & Stocker, 2012
Annual review of Marine Science 4: 177-207