



Ocean observing and forecasting of jellyfish swarms associated to extreme marine events

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Consequences on goods and services

- Negative effects on the tourism industry



- Competition and depredation in the food web: impact on fisheries and biodiversity



- Increasing clog fishing nets: negative impact on fisheries industry

Three cases studies:

1) The Balearic observation system

2) *Physalia* blooms in the Mediterranean Sea

3) Decades of social impact of jellyfish
blooms in a coastal lagoon

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Balearic Islands
Coastal Observing
and Forecasting
System



The Balearic observation system

- There are many historic data and a lot of “know how” but with low systematic characteristics
- Therefore there is few opportunity to related inter-annual variability of the jellyfish episodes and its potential relation with the variability of environmental conditions



- A new tool was developed to compile systematic and periodic jellyfish occurrence





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The Balearic observation system

It is a co-creation between stakeholders and scientists
(not just transfer, but bidirectional) !

Goal:

Establishment protocols and a tool to
obtain a:

systematic,
periodic,
routine monitoring





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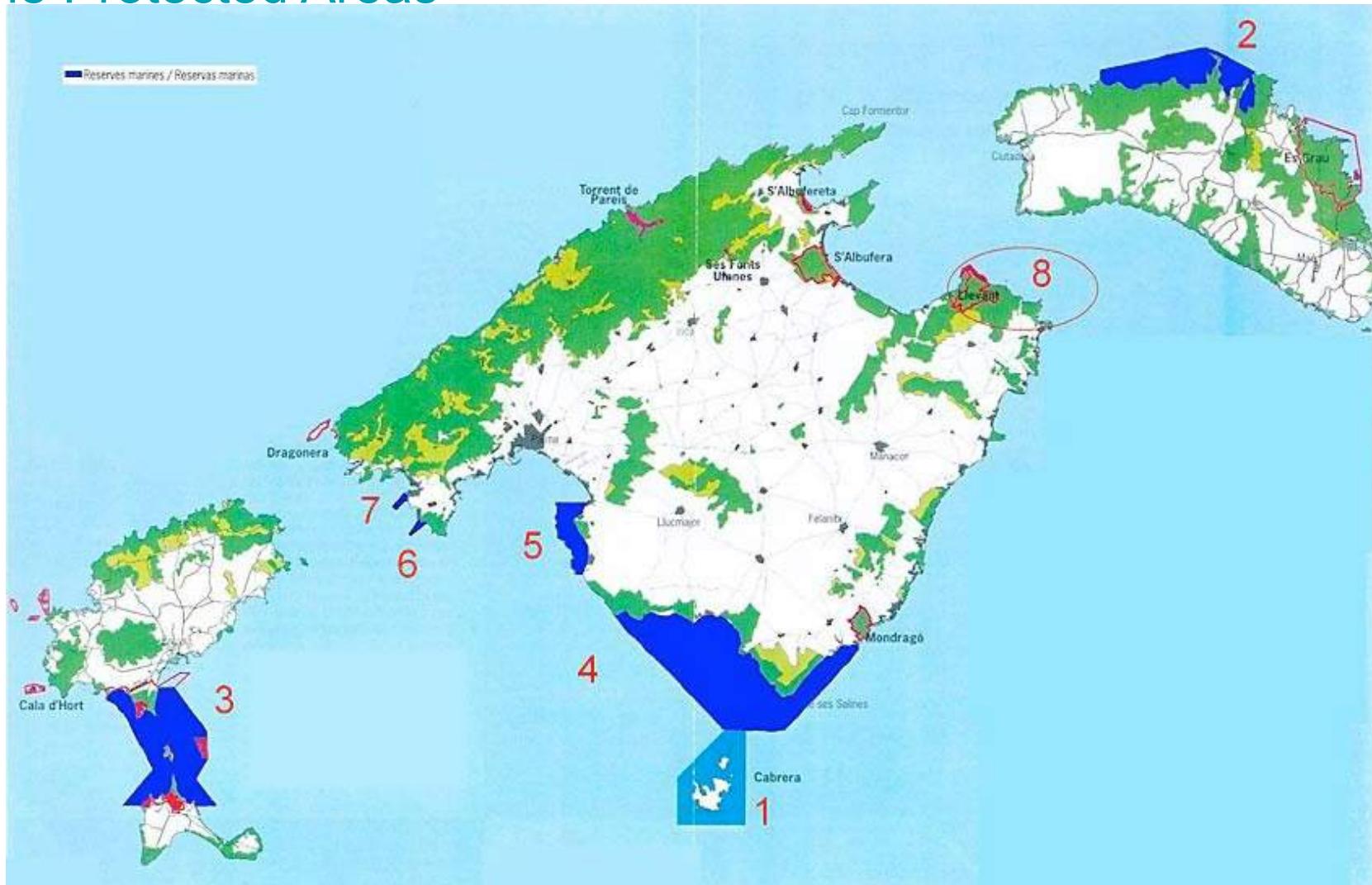


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The Balearic observation system

Marine Protected Areas





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The Balearic observation system

Boat Cleaning Services





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SOCIB

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CSIC
CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS

The Balearic observation system

Life-guards at the beaches





Daily sightings from:

Grumers Observations Observation routes Beach list Administration ▾ [Laura.prieto](#) ▾ Change language ▾

Observation Map

Species

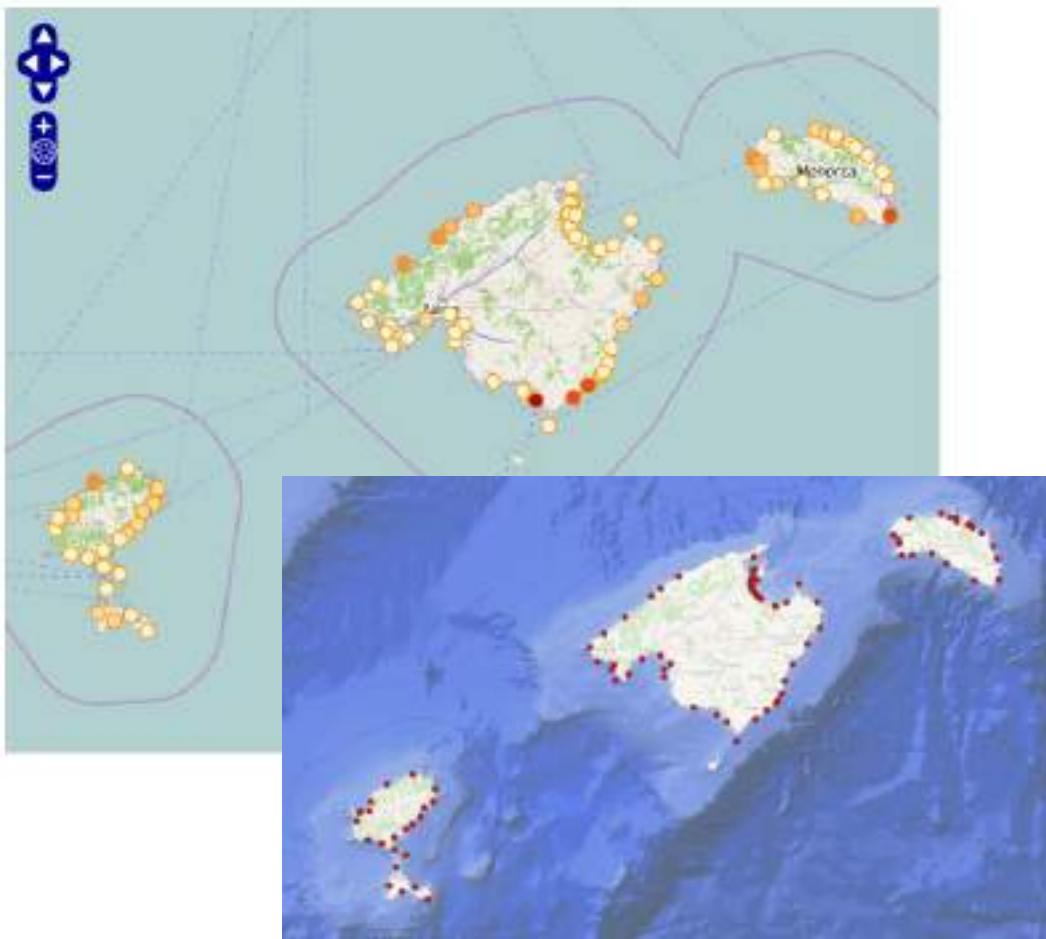
Created by

Observation route

Observation station

Source

From date



- 5 Marine Protected Areas (9 observations points)

- 33 routes of boat cleaning services (66 obs. points)

- 120 beaches (DG Emergency)



Maps of the observations

Grumers Observations Observation routes Beach list Administration laura.prieto Change language

Observation Heatmap

Specie

Species: all

Created by

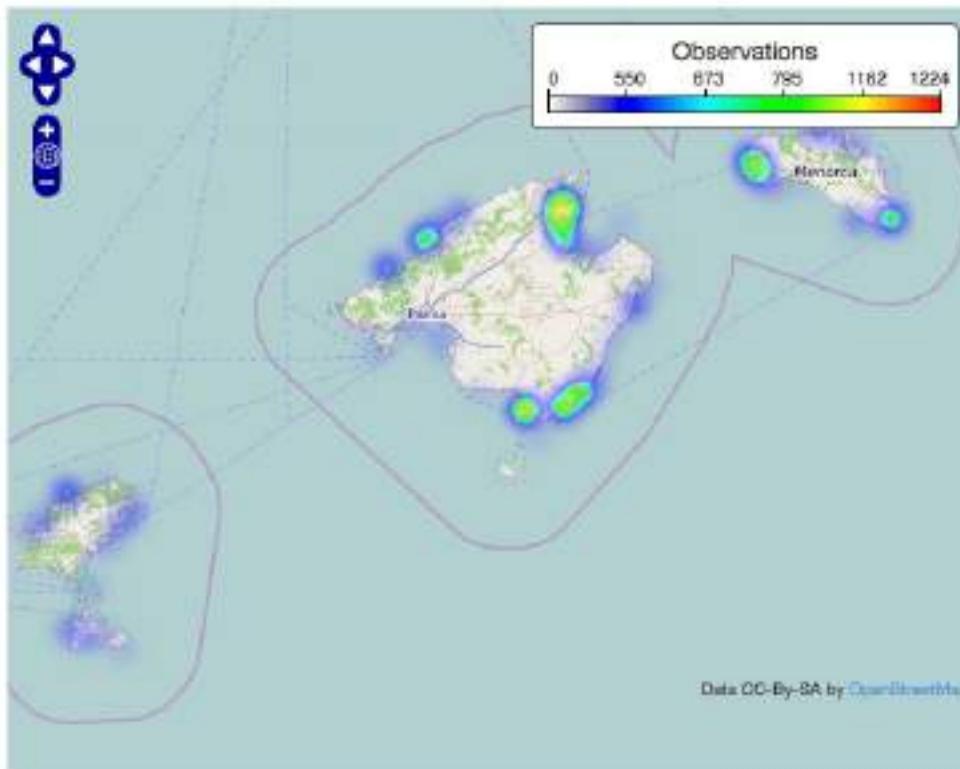
User: all

Observation route

Route: all

Observation station

Station: all

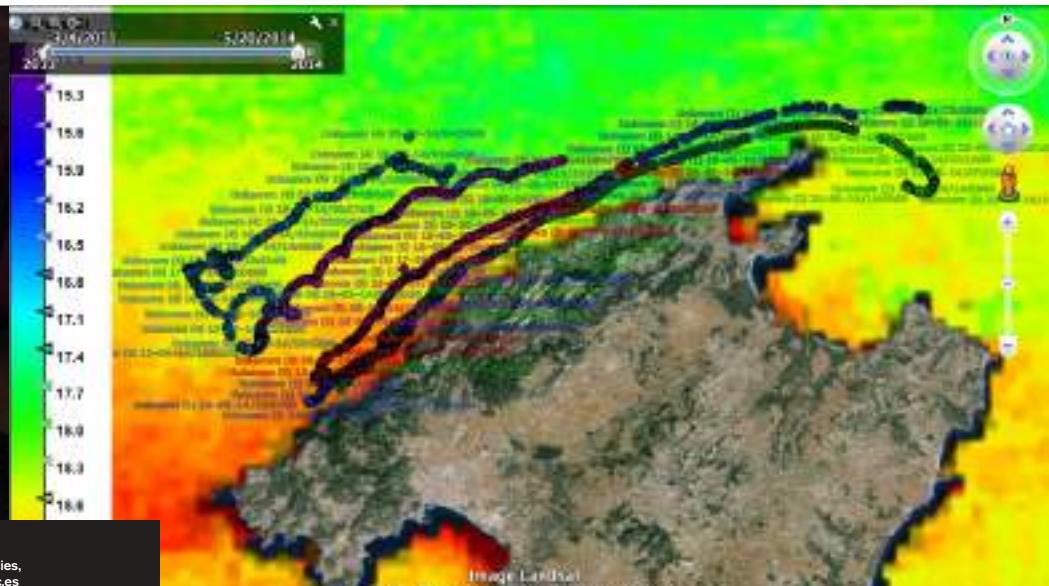
Source**From date****Filter****Export****Show observation list****Show observation map**



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Have you seen jellyfish?

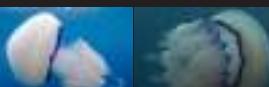
If you see any of these species,
send your record to l.p@csic.es
We count on your help!



Pelagia noctiluca
Mauve Stinger
5-15 cm
Stinger



Cotylorhiza tuberculata
Fried Egg Jellyfish
20-35 cm
Mild stinger



Rhizostoma pulmo
Barrel Jellyfish
20-60 cm
Stinger



Carybdea marsupialis
Sea Wasp
5-6 cm
Stinger



Physalia physalis
Portuguese Man-of-war
10-15 cm
Very powerful stinger



Chrysaora hysoscella
Compass Jellyfish
10-30 cm
Stinger



Velella velella
By-the-wind sailor
5-8 cm
Harmless



Mnemiopsis leidyi
Comb Jellies
5-10 cm
Harmless



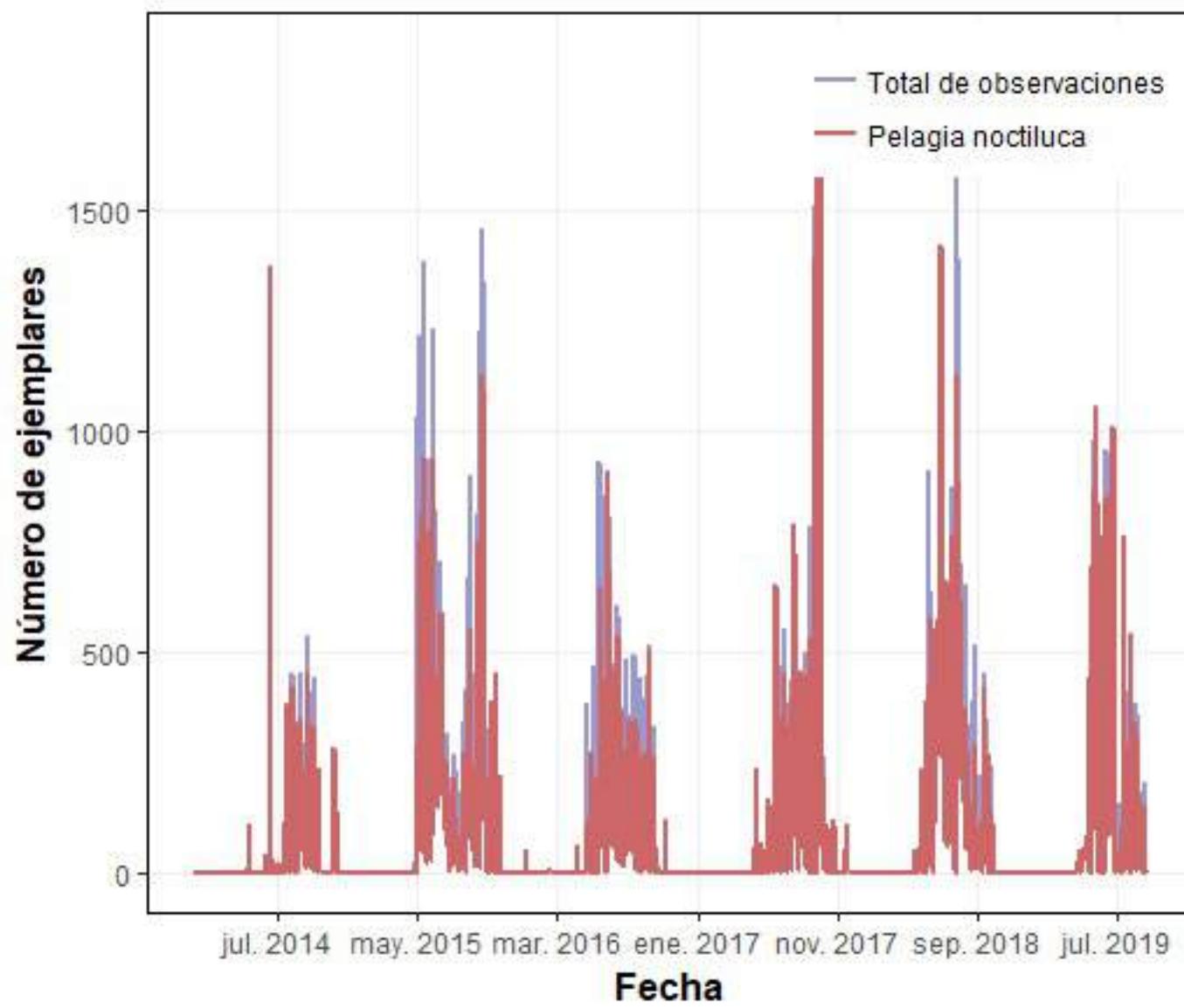
Send a message, if possible with a photo,
including the following information:

NAME OF JELLYFISH: see poster

LOCATION (name and/or geographic coordinates):
coastal water, stranded, offshore

NUMBER OF JELLYFISH SEEN: 1 individual,
2 to 5 individuals, 6 to 10 individuals, 11 to 99 individuals,
more than 100 individuals





Three cases studies:

1) The Balearic observation system

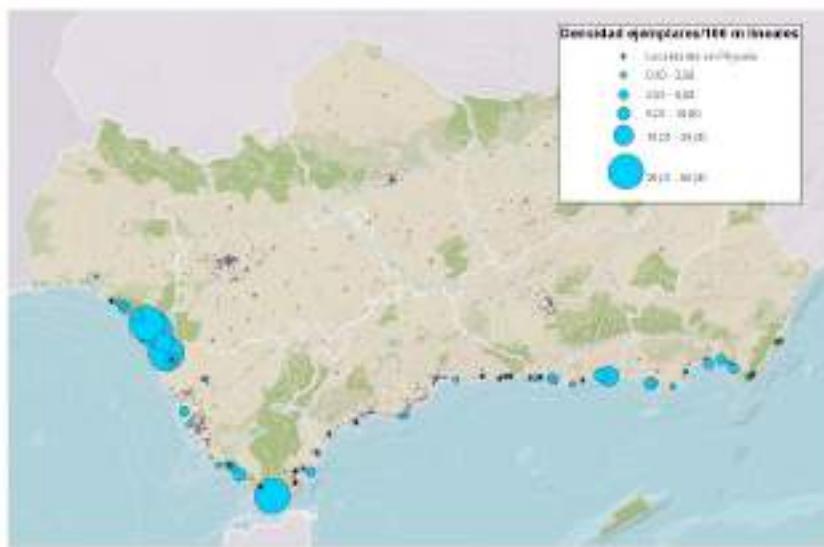
2) *Physalia* blooms in the Mediterranean Sea

3) Decades of social impact of jellyfish
blooms in a coastal lagoon

Physalia bloom of 2010



Physalia bloom of 2010



Mapa 1. Presencia de *Physalia physalis* en Andalucía por localidades. Los círculos azules significan presencia de la especie en el arribazón mientras que los asteriscos indican que no se detectó la especie. Los círculos mayores corresponden a una densidad más elevada de ejemplares/100 metros lineales de costa. Datos de marzo de 2010, excepto los del frente del Parque Nacional de Doñana que son de febrero (CMA, 2010).



In 2010, the Mediterranean basin suffered a Portuguese Man-of-War explosion: was it a permanent jellyfish invasion?

Physalia bloom of 2010

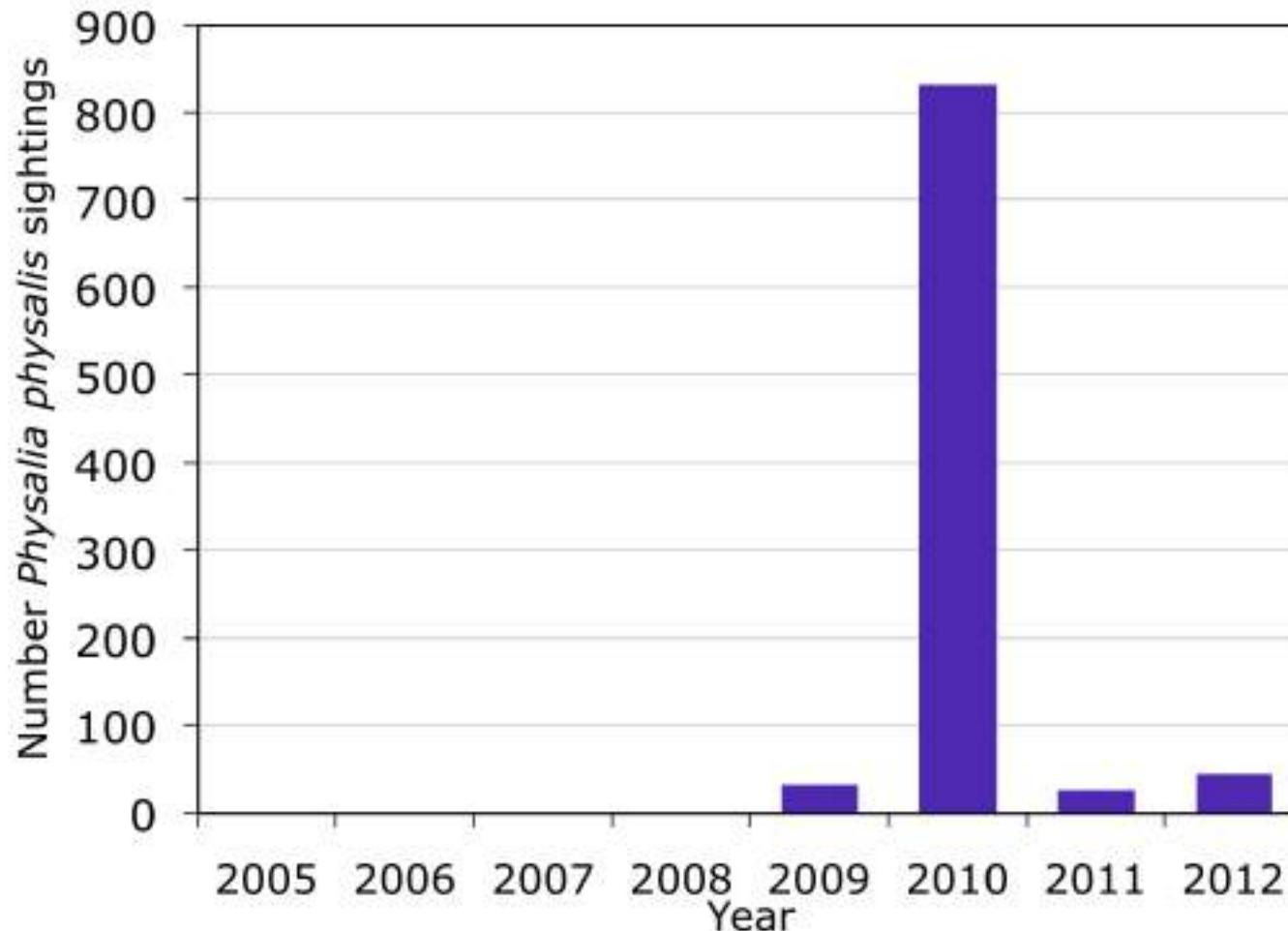
Camposoto beach,
San Fernando (Cádiz)
February 5th 2009



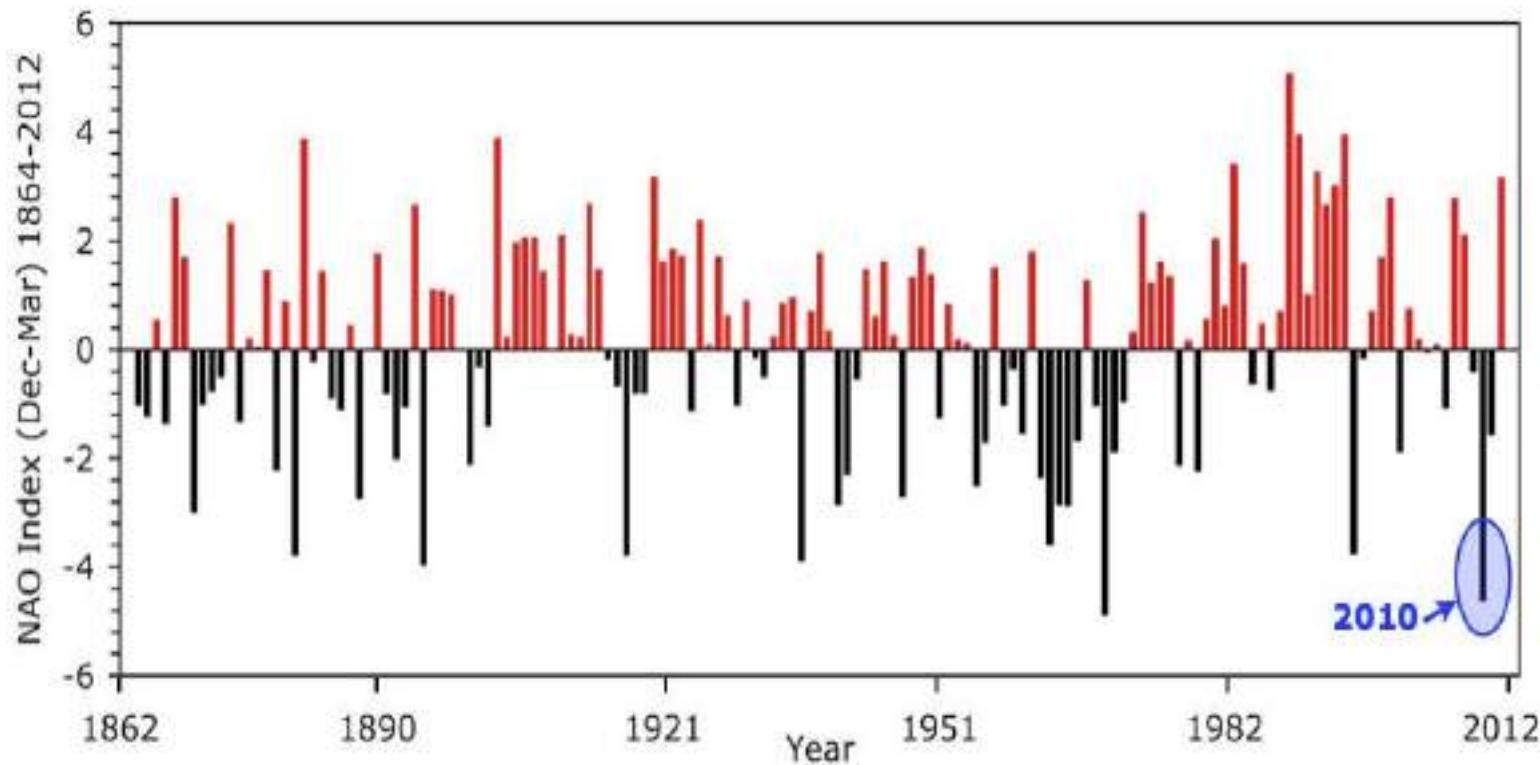
Victoria beach
Cádiz city
March 5th 2010



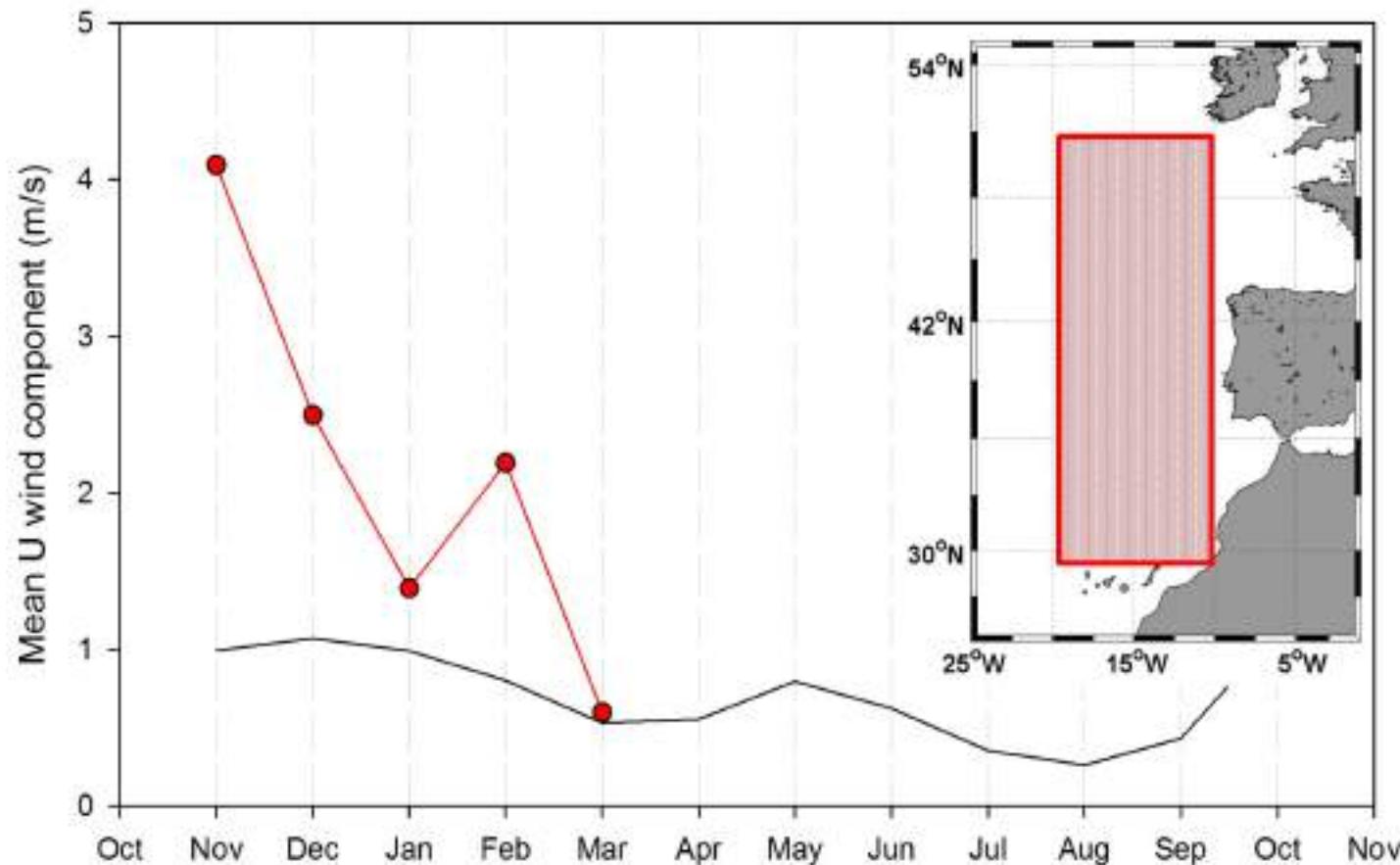
Physalia bloom of 2010

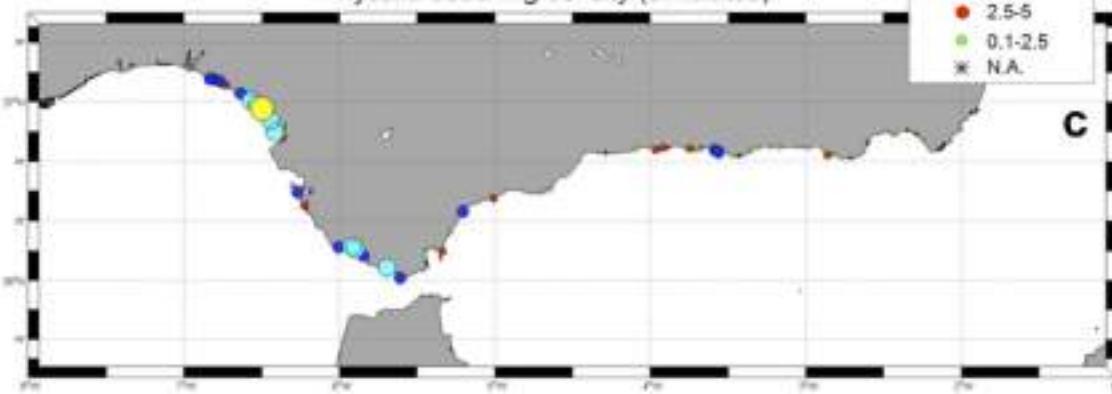
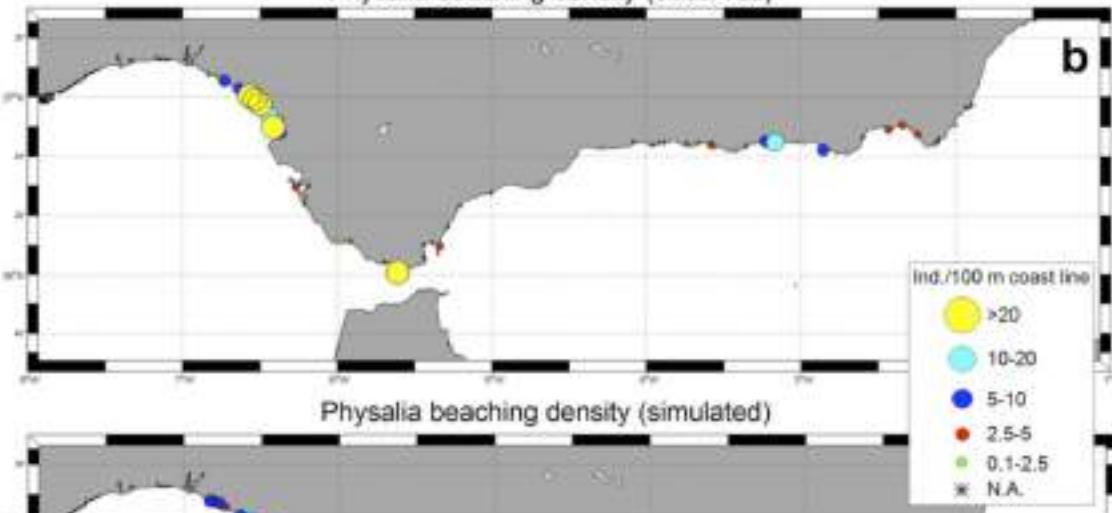
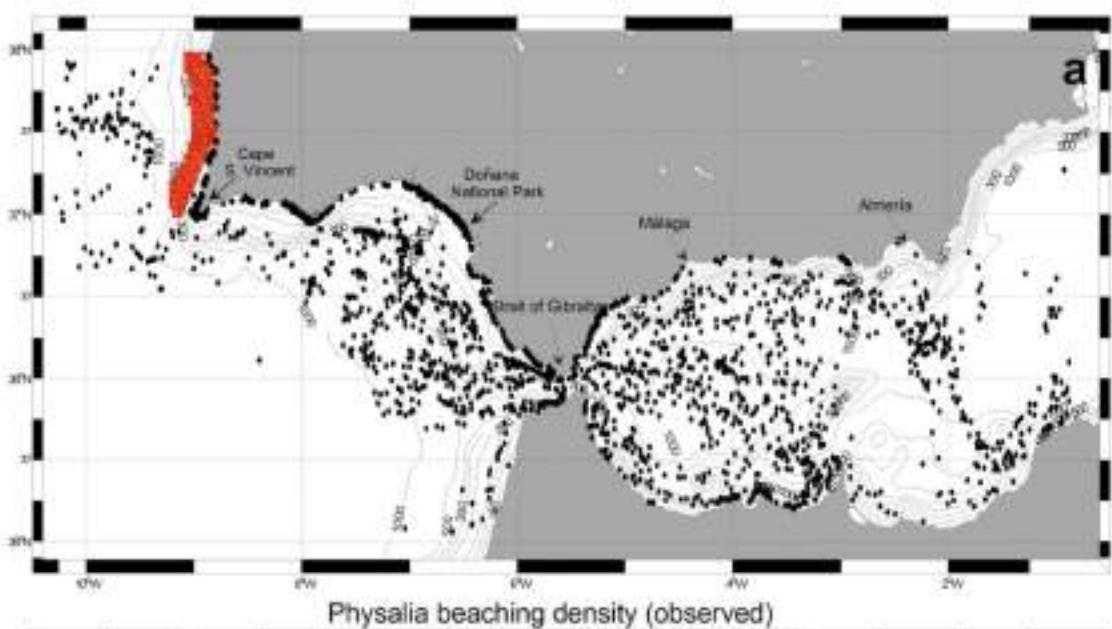


Physalia bloom of 2010



Physalia bloom of 2010





Physalia bloom of 2010

Conclusions:

The most important episode of *P. physalis* appearance in the Mediterranean can only be explained by the water circulation nearby the Strait of Gibraltar in conjunction with exceptional meteorological conditions in the NE Atlantic.



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Physalia bloom of 2018: an extreme event



Physalia bloom of 2018: an extreme event

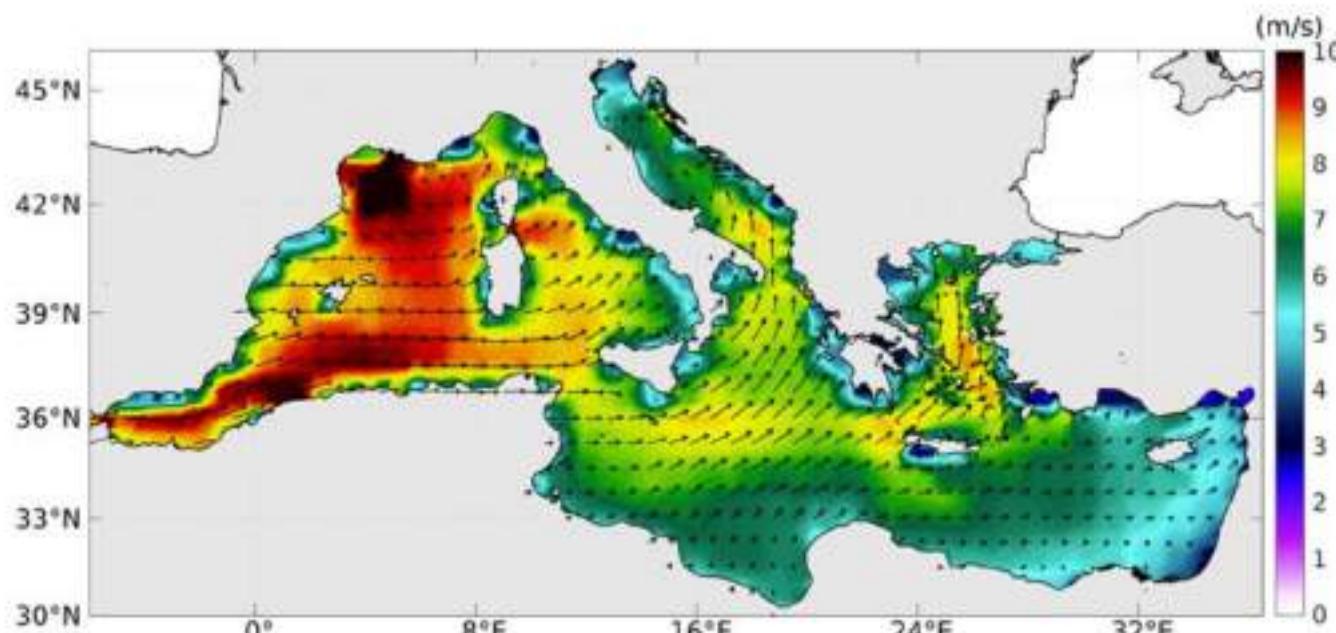


Figure 3.3.1. Monthly wind speed (m/s) and direction (at 10 m) in the Mediterranean Sea during March 2018 (CMEMS Product Ref. No. 3.3.2.).

Physalia bloom of 2018: an extreme event



Figure 3.3.2. Locations of all the sightings of *Physalia physalis* colonies in the Western Mediterranean Sea during April 2018 (Product Ref. No. 3.3.3).

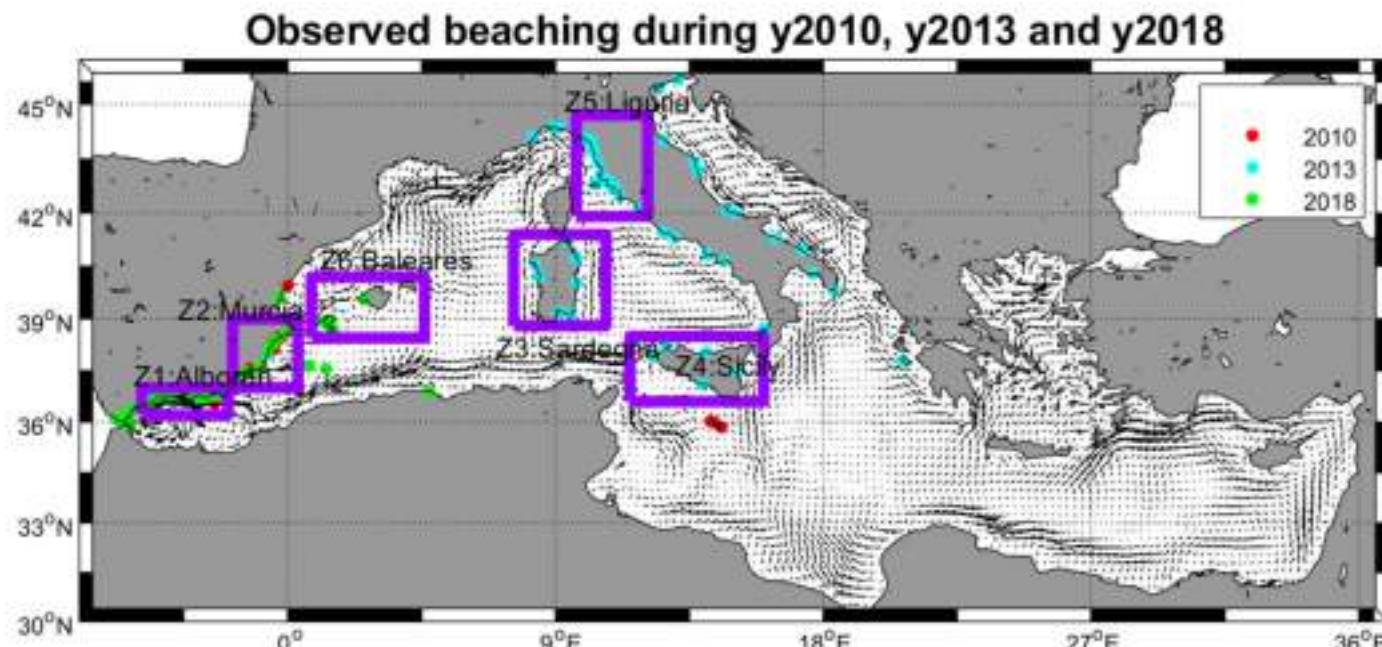


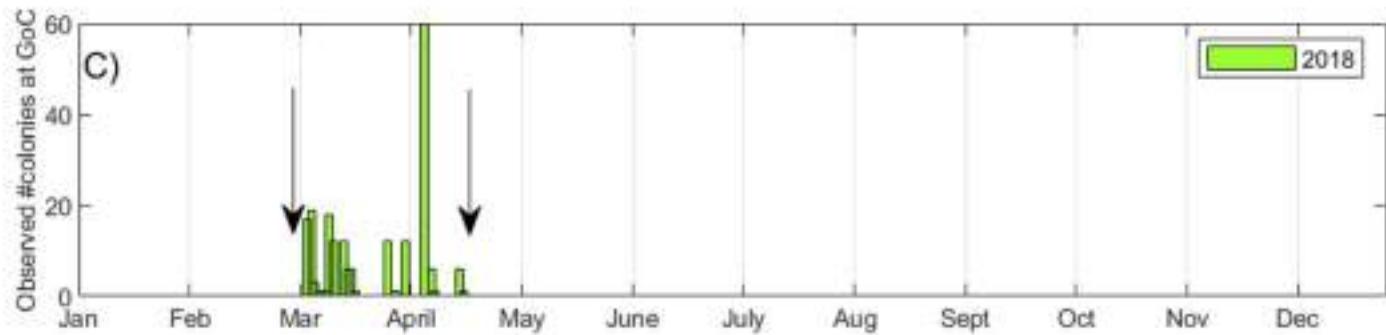
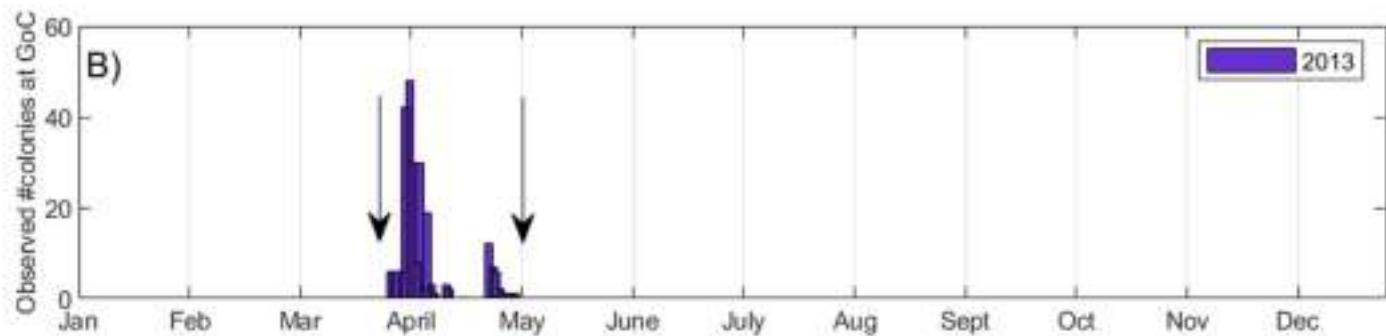
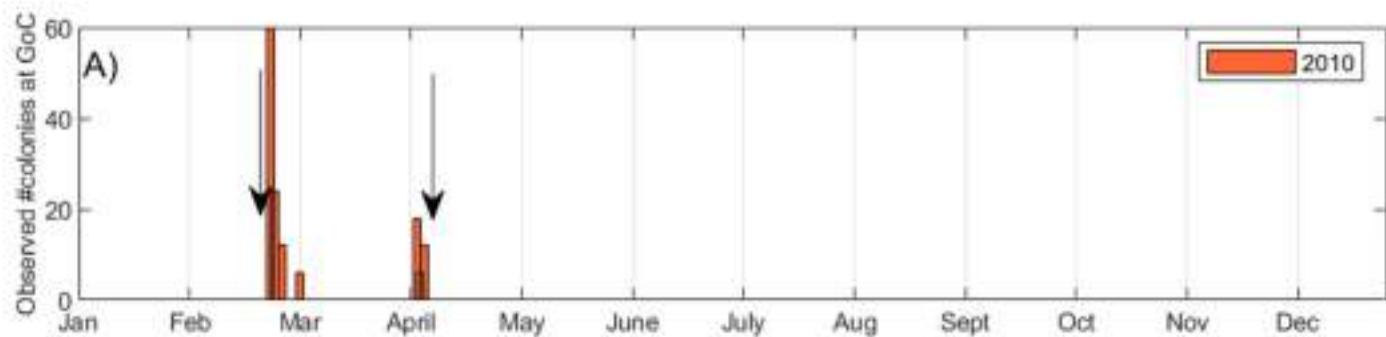
A model-based management tool to predict the spread of *Physalia physalis* in the Mediterranean Sea. Minimizing risks for coastal activities

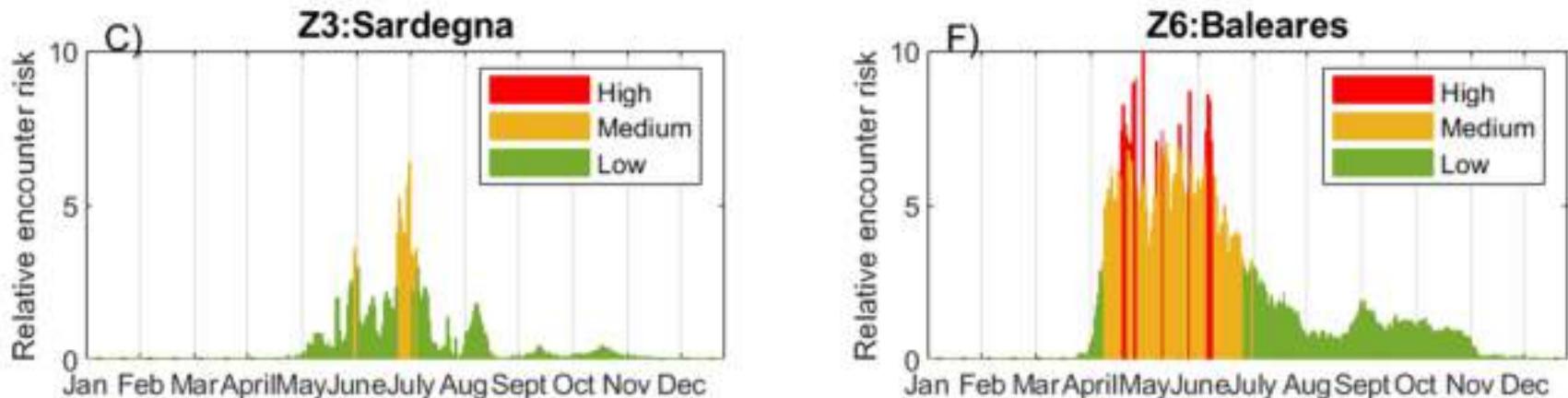
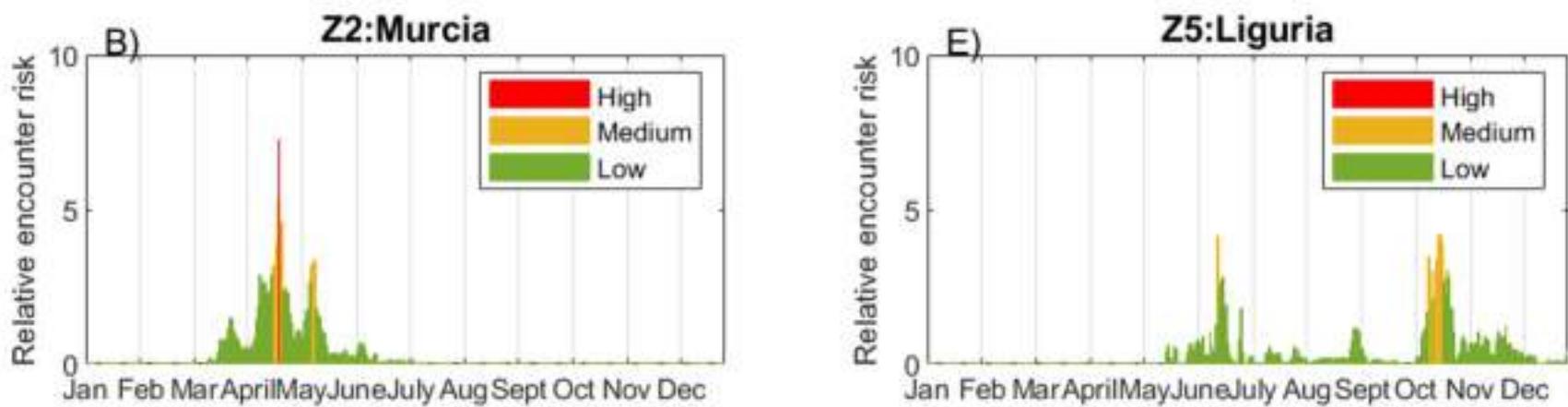
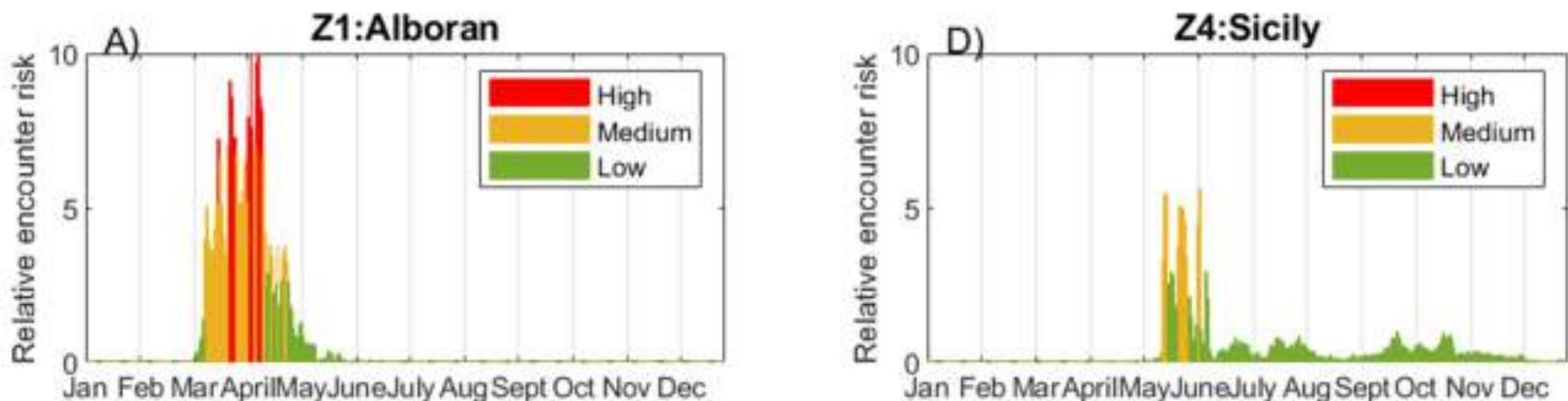
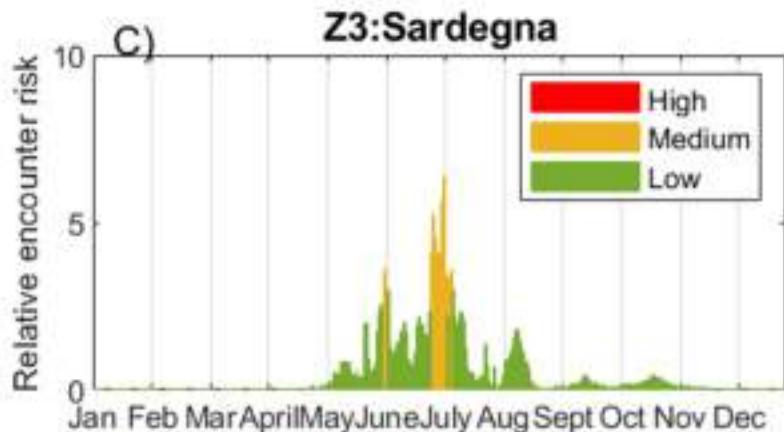
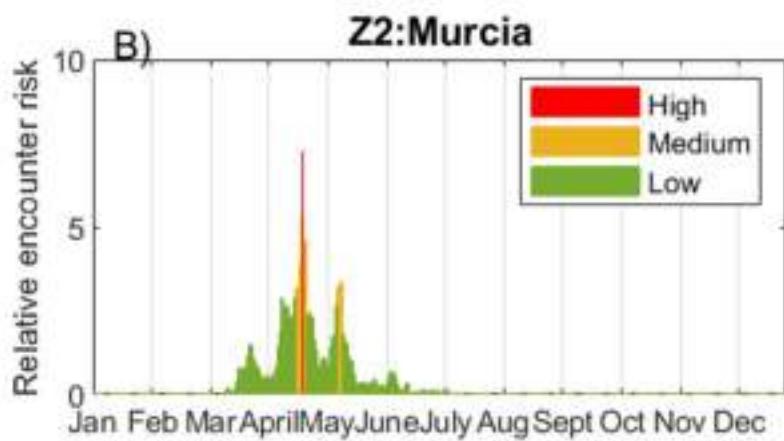
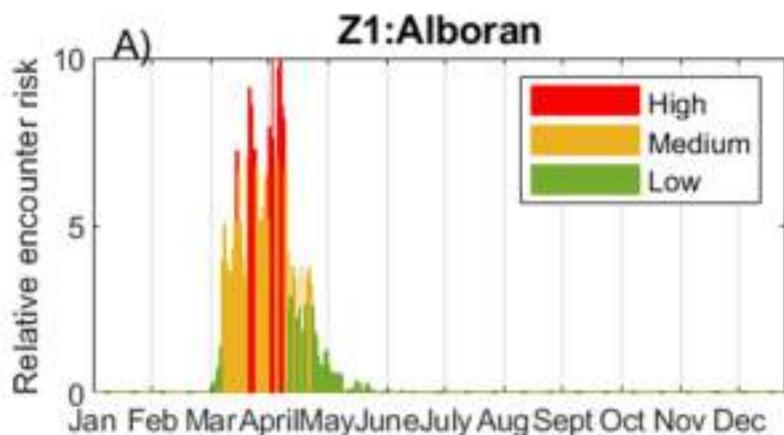
Diego Macías ^{a,*}, Laura Prieto ^a, Elisa García-Gorriz ^b

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^b Joint Research Center, European Commission, Via E. Fermi, 2799, 21027, Ispra, Varese, Italy







Three cases studies:

1) The Balearic observation system

2) *Physalia* blooms in the Mediterranean Sea

3) Decades of social impact of jellyfish
blooms in a coastal lagoon

Decades of social impact of jellyfish blooms in a coastal lagoon



Decades of social impact of jellyfish blooms in a coastal lagoon

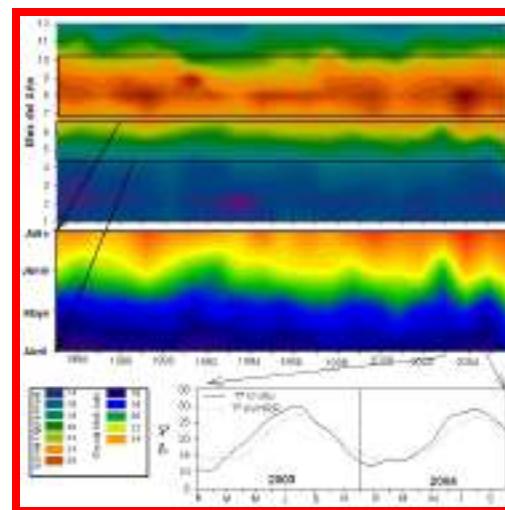


Decades of social impact of jellyfish blooms in a coastal lagoon

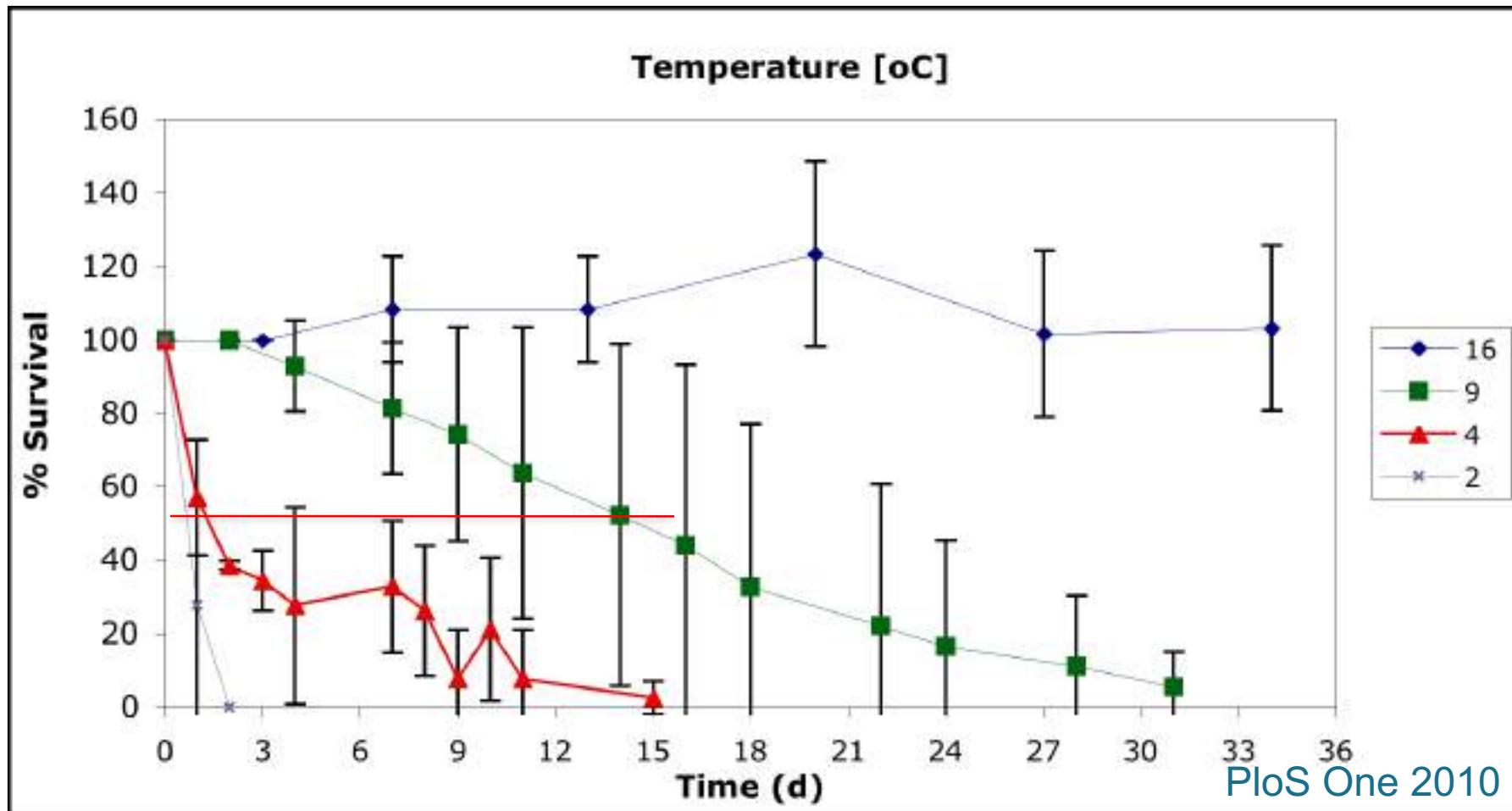
Laboratory experiments



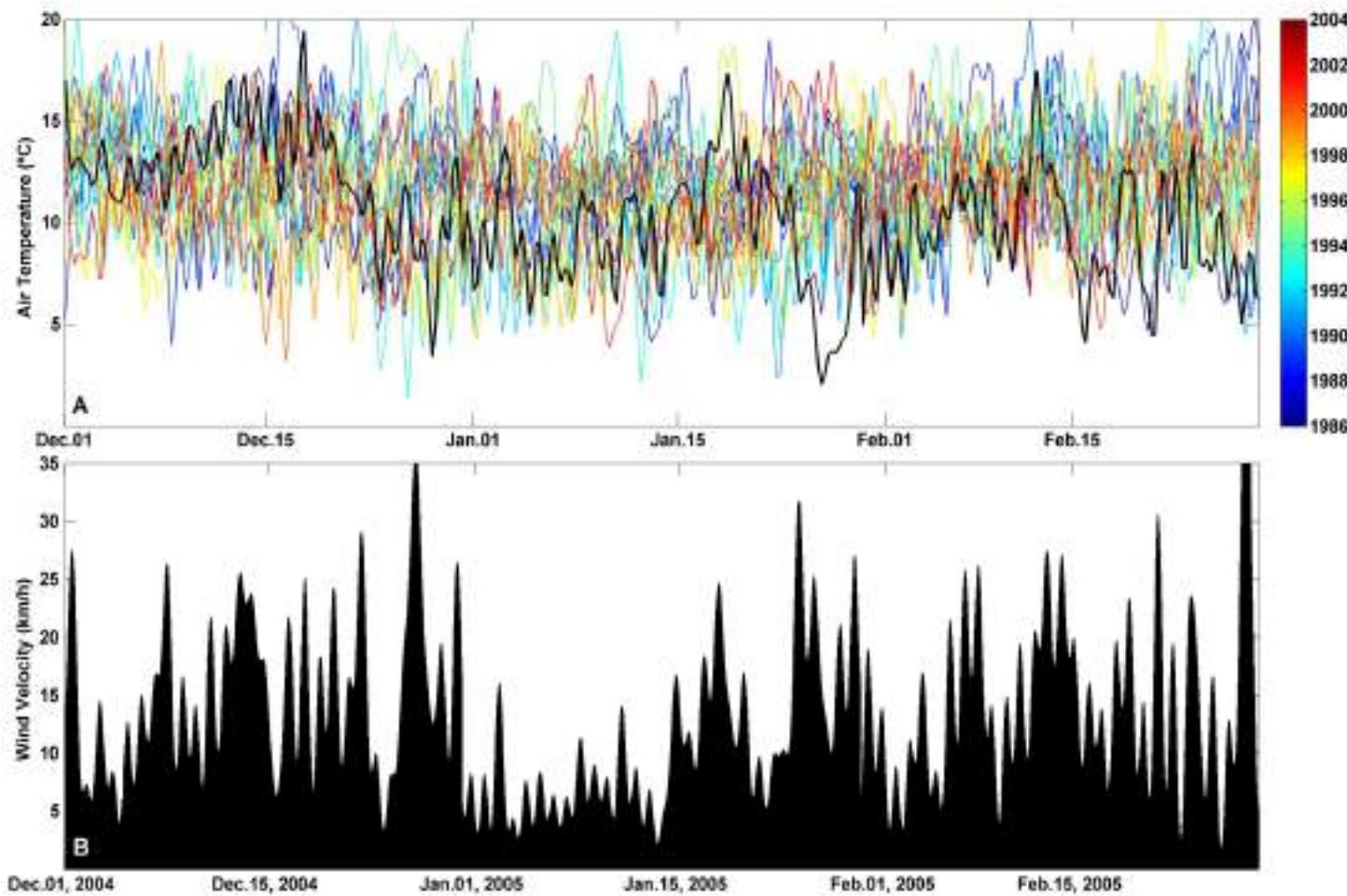
22 years of field data



Decades of social impact of jellyfish blooms in a coastal lagoon



Decades of social impact of jellyfish blooms in a coastal lagoon



SUMMER

YOUNG MEDUSA



ADULT MEDUSA



FALL

EPHYRA



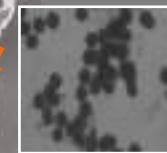
STROBILAE



SPRING

High T in June \Rightarrow
Earlier strobilation

PLANULAE



YOUNG POLYP

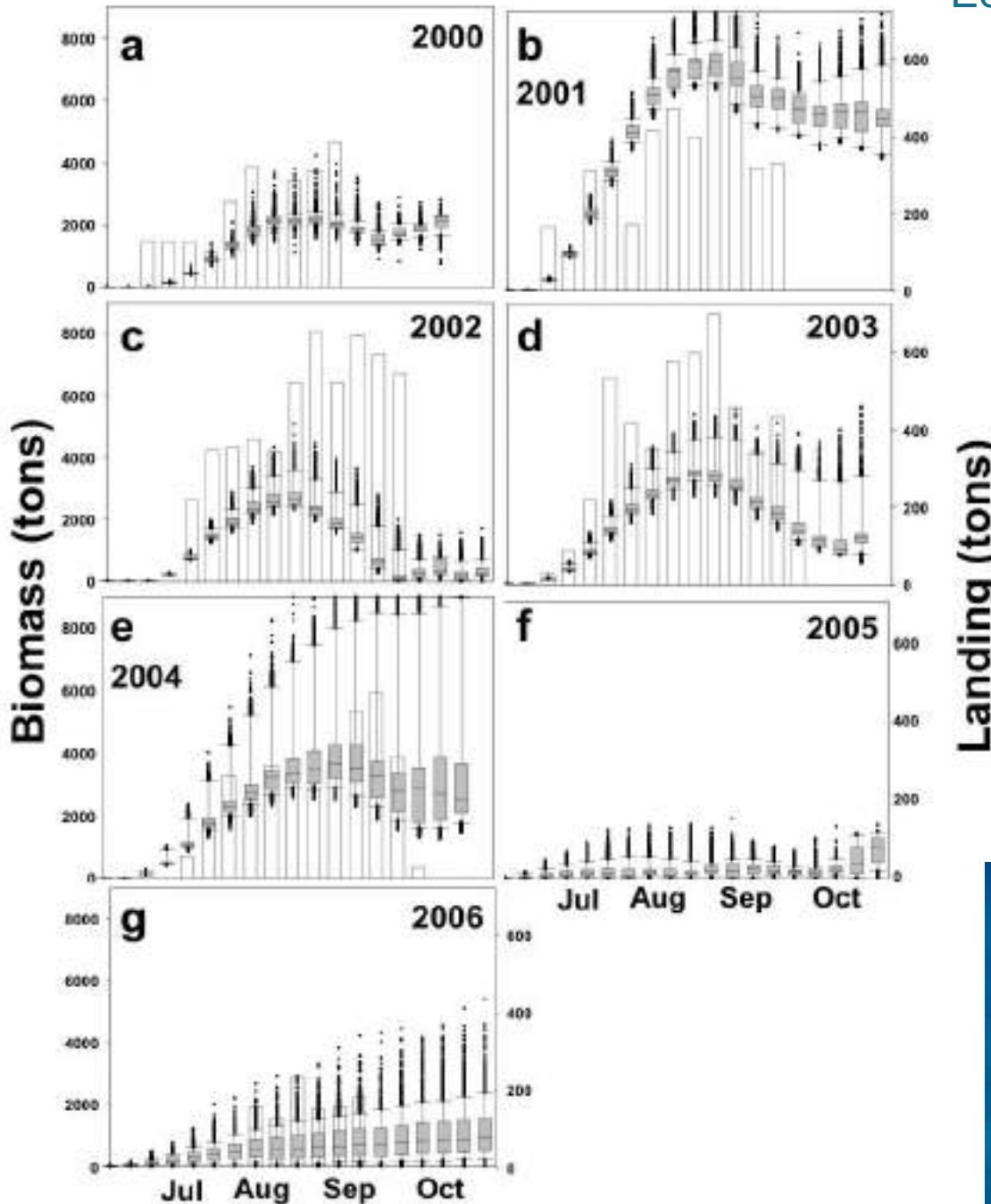


BUDGING



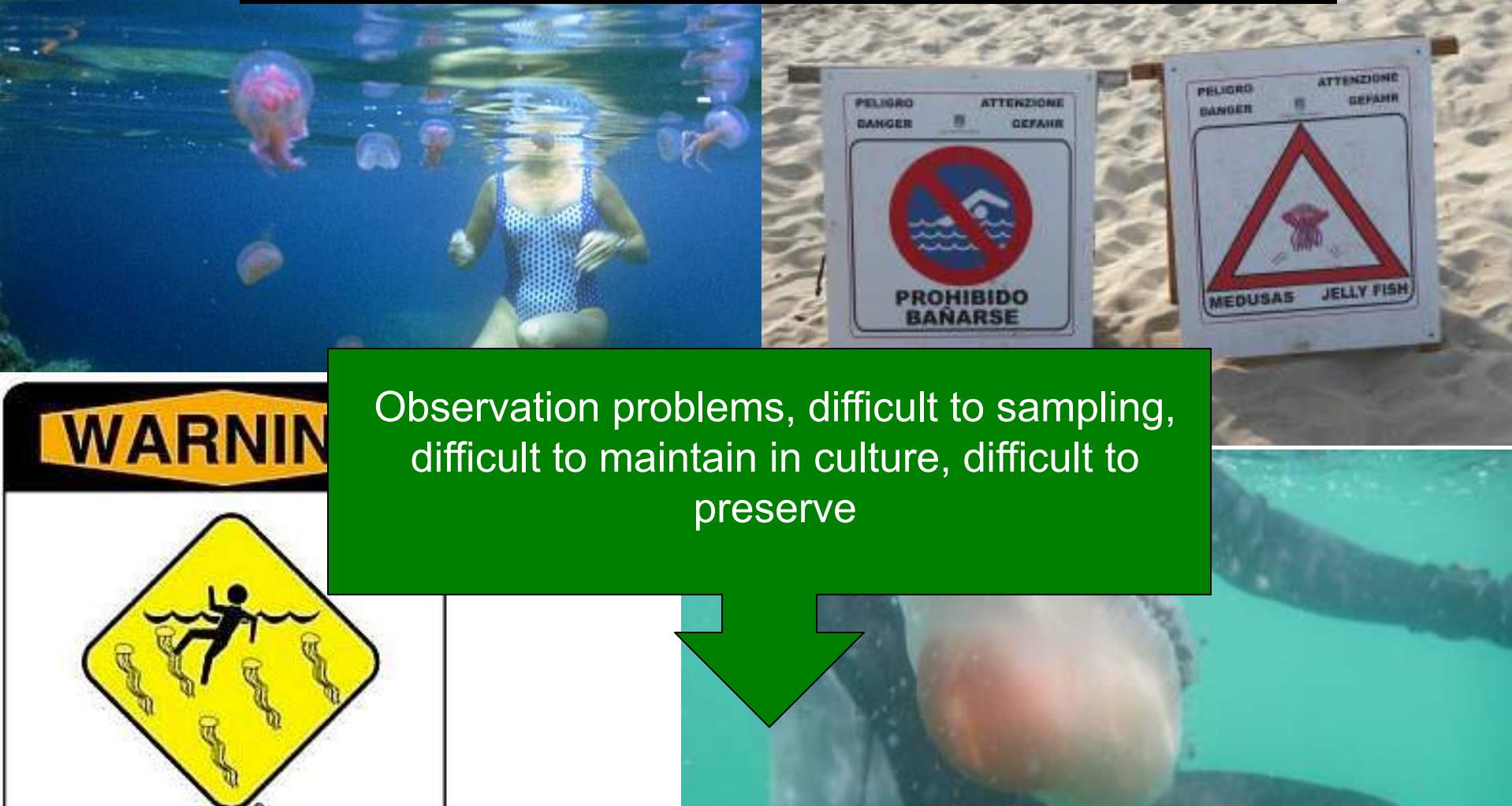
WINTER

Low T in winter \Rightarrow Higher
mortality of polyps



Cotylorhiza tuberculata

Implications at social, economic and ecologic levels



Observation problems, difficult to sample,
difficult to maintain in culture, difficult to
preserve

Necessity of **new technologies** and taking
advances of both **Citizens Science**
and **systematic, robust monitoring programs**.
Co-creation with stakeholders mandatory

Thank you!