Climate Change and implications in the marine ecosystems, with special attention to marine toxins as contaminants in seafood.

Institut de Recerca i Tecnologia Agroalimentàries
Marine and Continental Waters
Jorge DIOGÈNE FADINI
jorge.diogene@irta.cat

IRTA RECERCA I TECNOLOGIA AGROALIMENTÀRIES

Generalitat de Catalunya

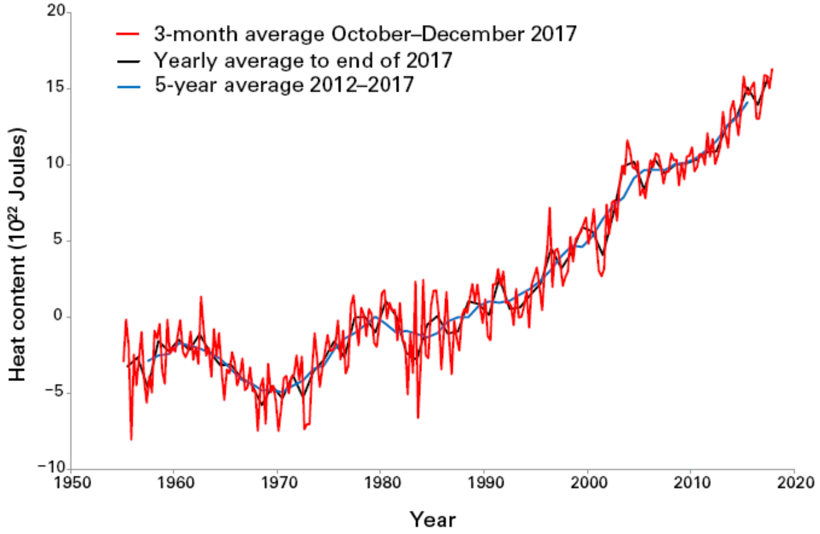
efsa European Food Safety Authority

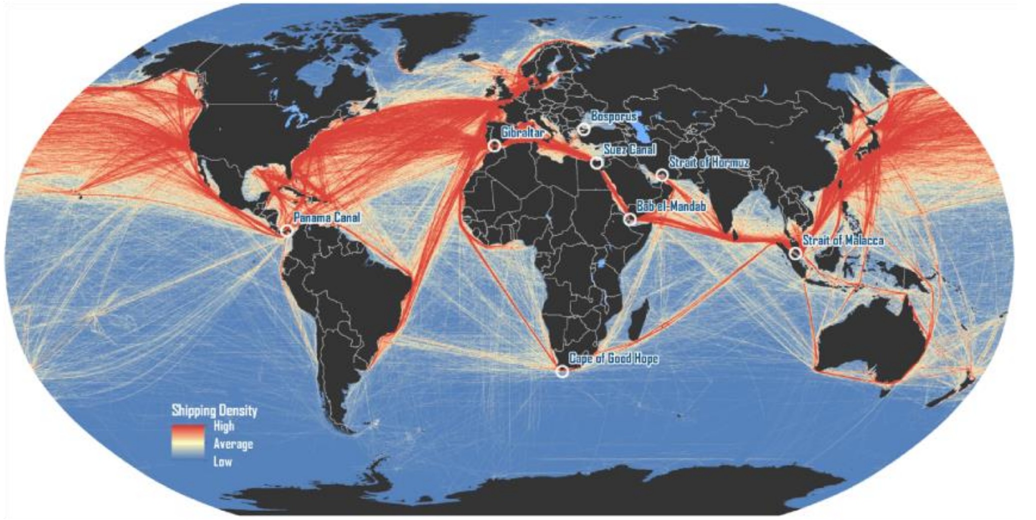
EUROPEAN UNION

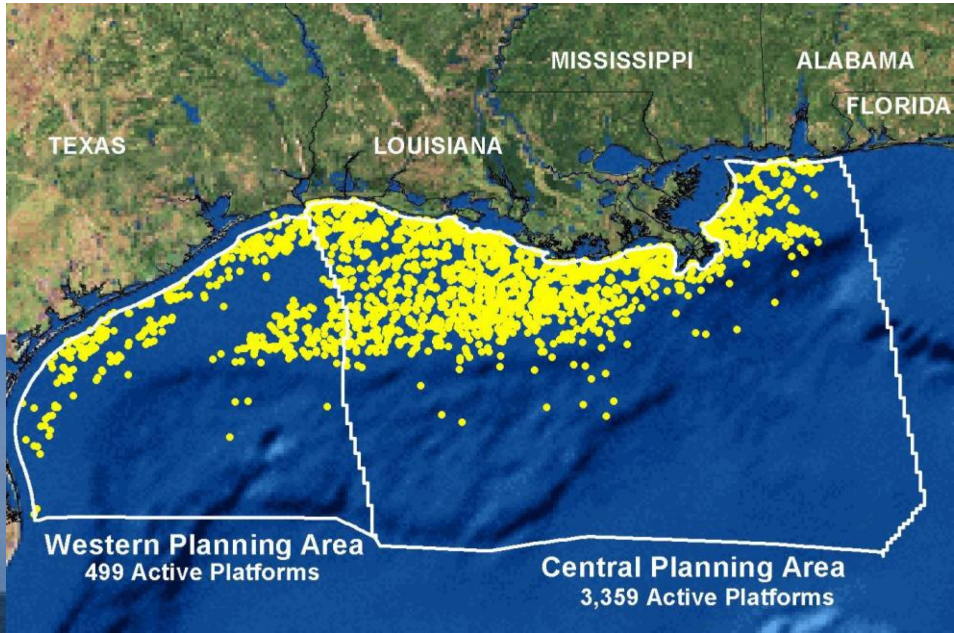
WEB, October 8th, 2020

EFSA: "Climate change as a driver of emerging risks for food and feed safety, plant, animal health and nutritional quality"

Global change / Climate change







Global change / Climate change

The Global Ocean Observing System

- Home
- Why A GOOS
- How We Work
- GOOS Framework
- Who We Are
  - Steering Committee
  - Panels
    - Physics & Climate Panel
    - Biogeochemistry Panel
    - Biology & Ecosystems Panel
  - GOOS Regional Alliances (GRAs)
  - JCOMM Observations Coordination Group
  - JCOMMOPS

Biology & Ecosystem Panel

Rationale

The ocean is changing in response to our increasing use. As changes occur, life within the ocean is being affected, with potential consequences for the valuable services it provides from food to the oxygen we breathe.

We need continuous, long-term observations to know if, and how, ocean life is responding to human use. These long-term observations will contribute to effectively mitigate or manage adverse changes, help predict potential future changes and plan accordingly. Relevant changes in marine biodiversity, ecosystem function, and the services they provide can be detected by monitoring some of their essential variables.

The Panel has proposed nine biological essential ocean variables (EOVs) based on:

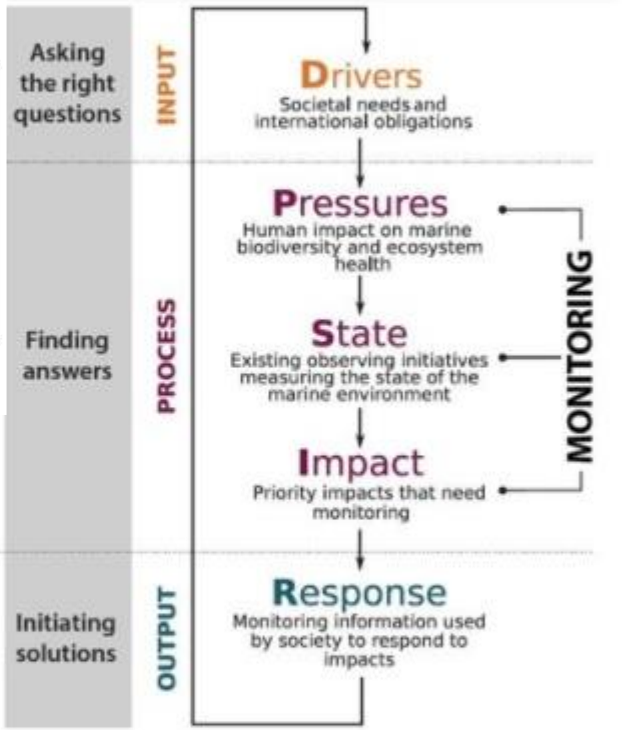
1. Their relevance in helping to solve science questions and addressing societal needs
2. Their contribution to improving management of marine resources
3. Their feasibility for global measurement in terms of cost, available technology, and human capabilities

Biology & Ecosystems Panel Links

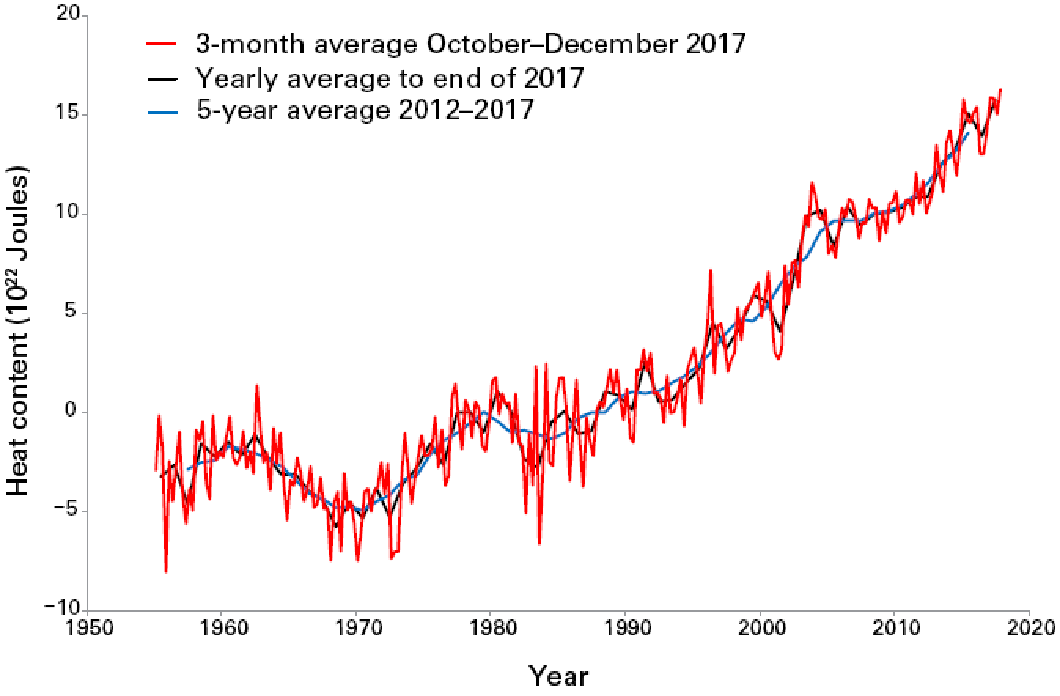
- Panel Home
- Contacts
- Calendar
- EOV Specification Sheets
- Collaborators & Sponsors

Sponsored by:

IOC · UNEP · INTERNATIONAL COUNCIL FOR SCIENCE



Ocean Heat



Ocean Heat

Global Ocean Heat Content Change (x 10^{22}J) for the 0-700 metre layer: three-monthly means (red), and annual (black) and 5-year (blue) running means, from the US National Oceanic and Atmospheric Administration (NOAA) dataset. Credit: Prepared by WMO using data from the NOAA National Centers for Environmental Information. Source: WMO Statement on the state of the global climate in 2017.

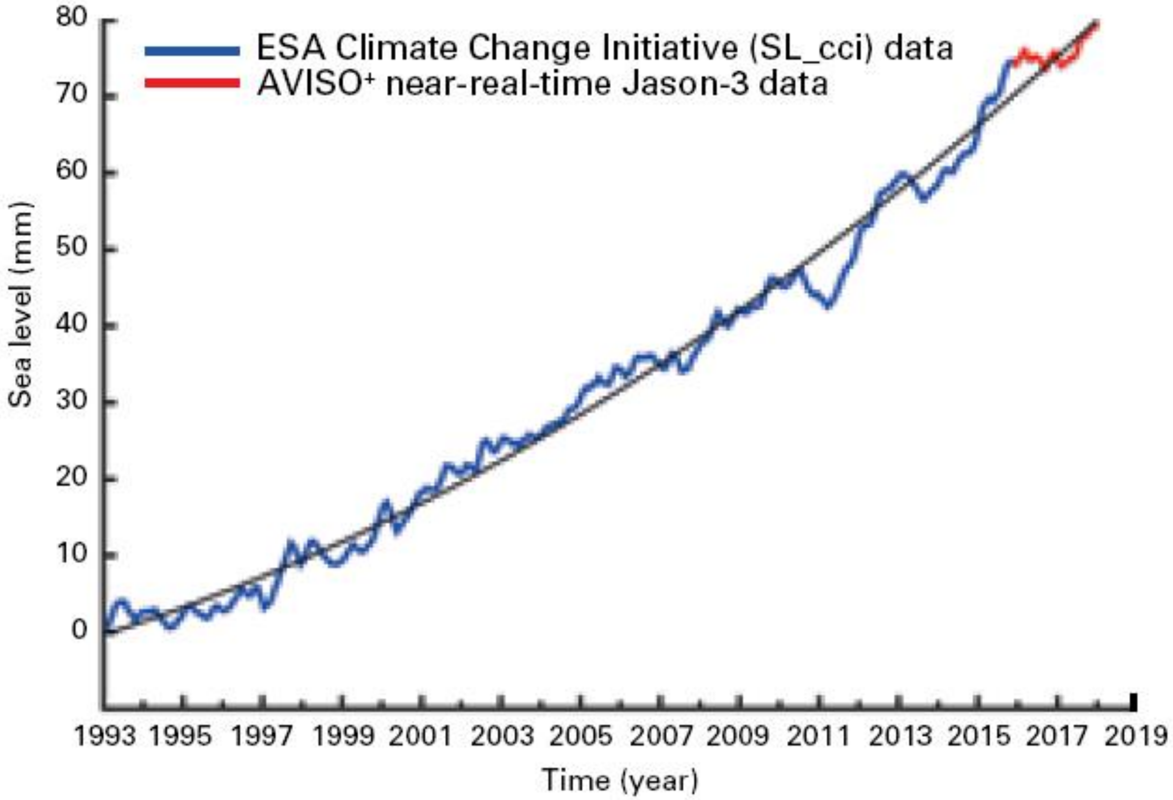
Sea Level

WORLD METEOROLOGICAL ORGANIZATION
Weather · Climate · Water

English

Our mandate | Programmes | Projects | Resources | Media | Events | About us | Extranet | Search

Home — Programmes — Global Climate Observing System — Global Climate Indicators



Sea Level

Daily global-mean mean sea level without annual and semi-annual signals for January 1993 to May 2017. The data has been adjusted for glacial isostatic adjustment. Data source: CMEMS Ocean Monitoring Indicator based on the C3S sea level product. Credit: Copernicus Climate Change Service/ECMWF/Copernicus Marine Environment Monitoring Service

Ocean Acidity

WORLD METEOROLOGICAL ORGANIZATION
Weather · Climate · Water

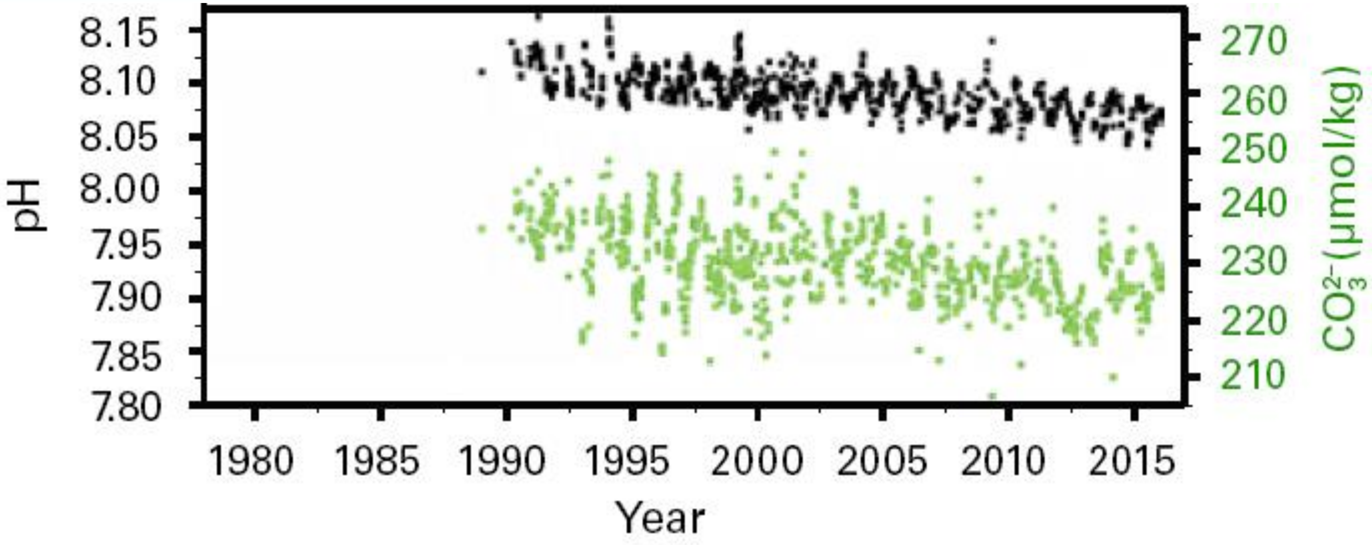
English

Our mandate | Programmes | Projects | Resources | Media | Events | About us | Extranet | Search

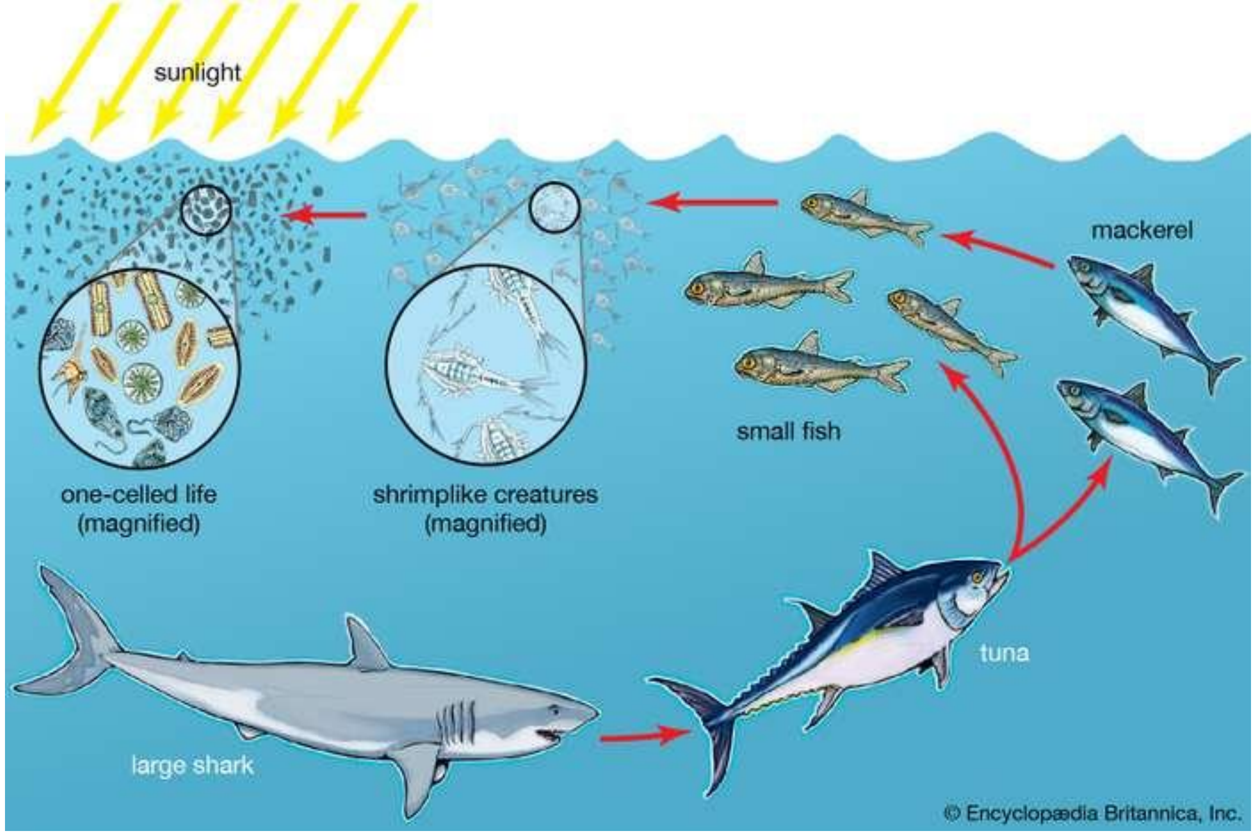
Home — Programmes — Global Climate Observing System — Global Climate Indicators

Ocean Acidity

Trends in surface (< 50m) ocean carbonate chemistry calculated from observations obtained at the Hawaii Ocean timeseries (HOT) Program in the North Pacific over 1988-2015. The panel shows a decline seawater pH (black points, primary y-axis) and carbonate io concentration (green points, secondary y-axis). Credit: Ocean chemistry data were obtained from the Hawaii Ocean Timeseries Data Organization & Graphical System (HOT-DOGS). US National Oceanic and Atmospheric Administration (NOAA), Jewett and Romanou, 2017. Source: WMO Statement on the state of the global climate in 2017.

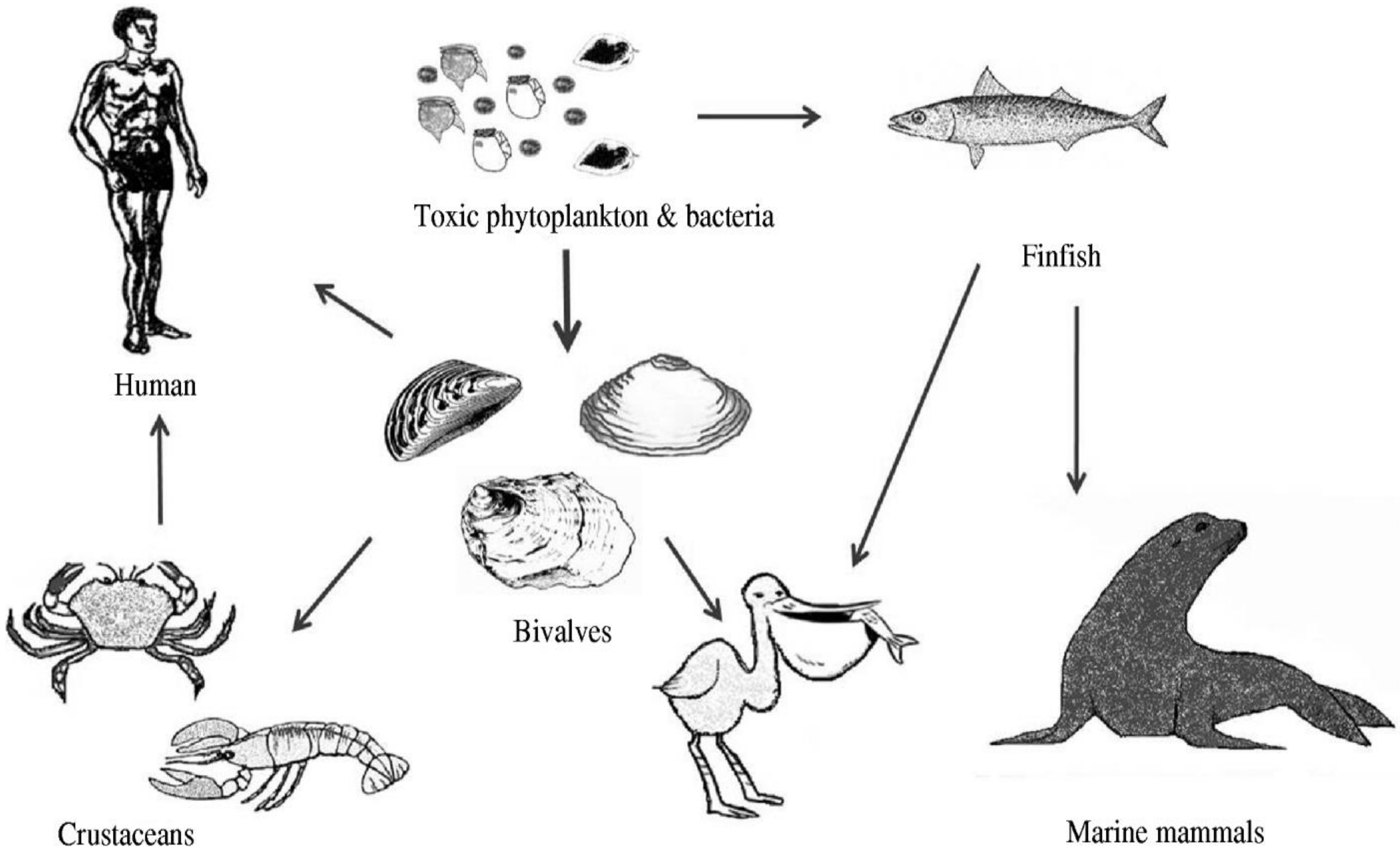


Phytoplankton in the food webs



Harmful Algal Blooms
HABs

Harmful Algal Blooms



Samplings in the Mediterranean Sea

Materials for sampling

PLACE	Macarella
DATE	03/09/2017
HOUR	17:50
TEMPERATURE (Cº)	26,44
SALINITY	36,22
DISSOLVED OXYGEN %	93,7
DISSOLVED OXIGEN mg/L	6,18
PH	7,69
GPS Lat	39º 56' 25.20"
GPS Long	3º 56' 4.72"
DEPTH (m)	0,5

Filtering water from the scraping of rocks (200 µm)

Filtering water from the algal sample

Filtered water with particles (including microalgae) in suspension

Fixed sample with lugol solution is collected

Harmful Algal Blooms, *Ostreopsis* cf *ovata*

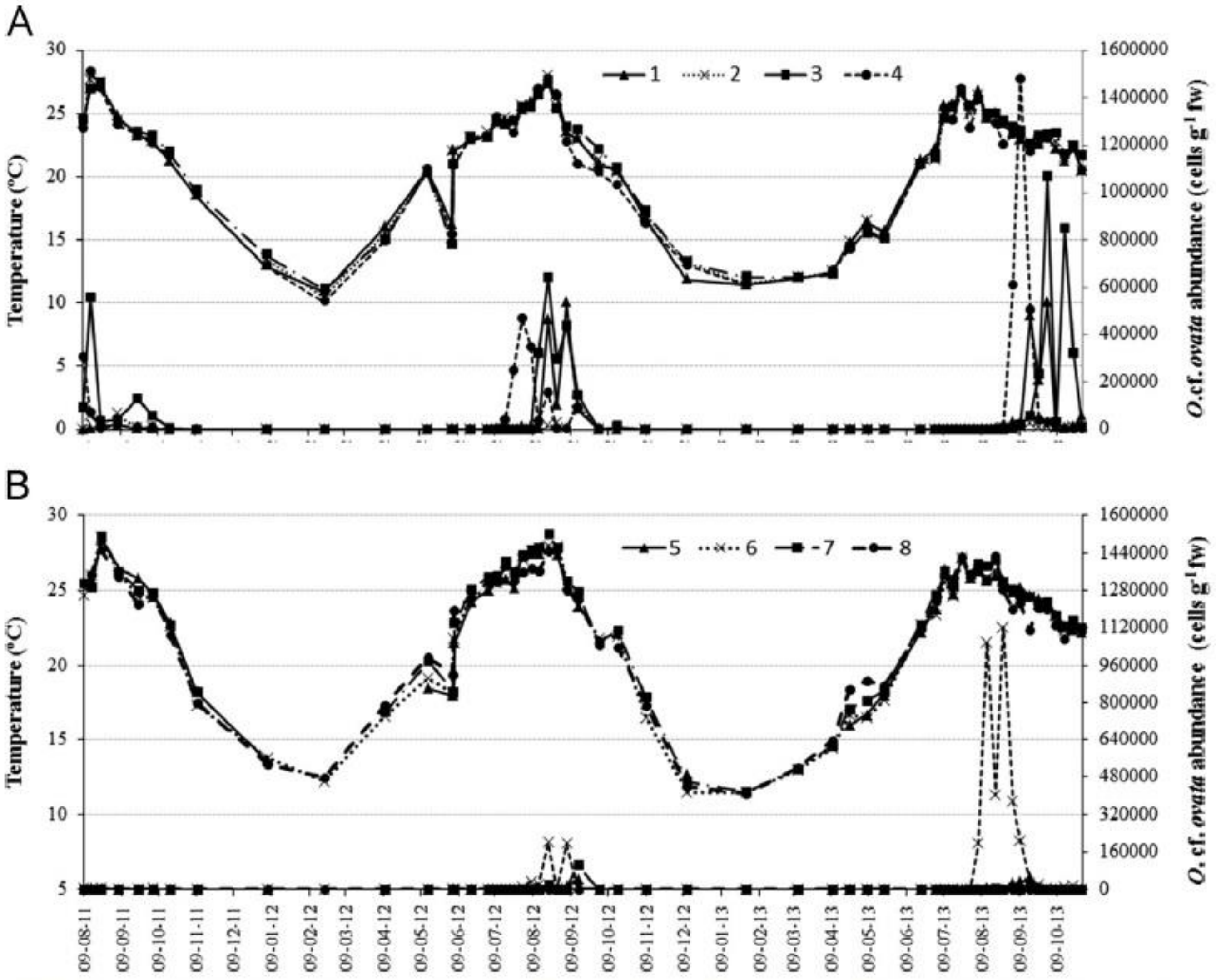


Fig. 5. Temporal variation of temperature and epiphytic cell abundance in A. northern sites and B. southern sites.

Harmful Algal Blooms, *Gambierdiscus* spp.

★ Presence of ciguatera: poisoning, CTXs in fish

☆ Presence of *Gambierdiscus* spp.

HABs and Climate Change

- Uncertainty on the magnitude of the impact CC may present on HABs.

- Several communities / species of phytoplankton and benthic microalgae (HAB related and not HAB related) can be affected by factors affected by CC: Temperature, pH, sea rise, precipitation and freshwater runoff (including nutrient balance) for example.

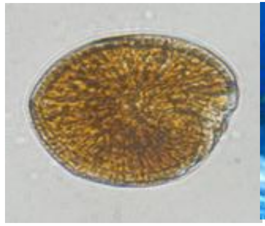
- Additional influence of Global Change

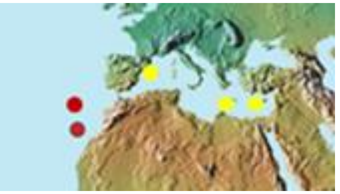
RISK CHARACTERIZATION OF CIGUATERA FOOD POISONING IN EUROPE (EUROCIGUA)

MINISTERIO DE SANIDAD, SERVICIOS SOCIALES E IGUALDAD
aecosan agencia española de consumo, seguridad alimentaria y nutrición
efsa European Food Safety Authority
isc Instituto de Salud Carlos III
UNIVERSIDADE DE VIGO
IRTA RECERCA I TECNOLOGIA AGROALIMENTÀRIES
Generalitat de Catalunya
Gobierno de Canarias
Consejería de Agricultura, Ganadería, Pesca y Aguas
Dirección General de Pesca
Servicio Canario de Salud
UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA
iusa
ASAE Autoridade de Segurança Alimentar e Económica
ipma
ARISTOTLE UNIVERSITY OF THESSALONIKI
Região Autónoma da Madeira Governo Regional
Instituto Nacional de Saúde Doutor Ricardo Jorge
ΓΧΚ SGL STATE GENERAL LABORATORY
BfR Bundesinstitut für Risikobewertung
Ifremer
University of Thessaly
Ministry of Health

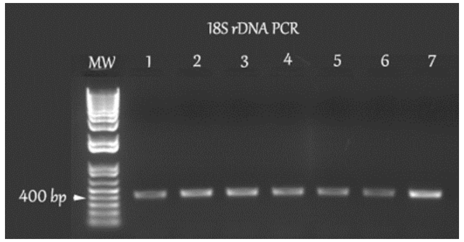
Sampling for *Gambierdiscus* spp. from the field and fish from the field and the market Environmental data:

Madeira
Canary Islands
Balearic Islands
Crete
Cyprus

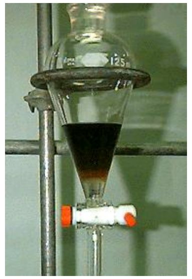




Isolation of *Gambierdiscus* spp, identification, establishment of cultures of *Gambierdiscus* spp. in the laboratory (low-scale and large-scale)

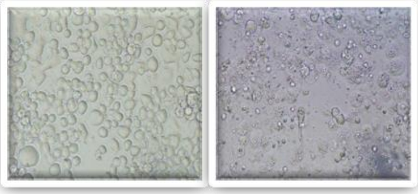


Extraction of *Gambierdiscus* spp., fish samples and purification of extracts



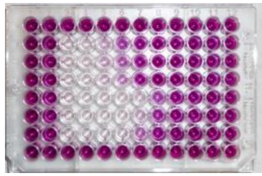
Toxicity evaluation with a cell-based assay

Neuro2a cells

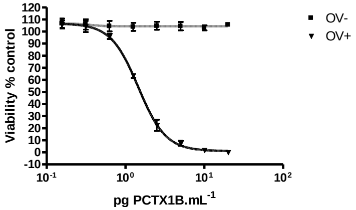


No toxicity Toxicity

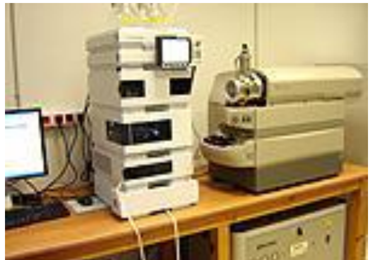
MTT viability assay



Quantification



Identification and quantification of CTXs with LC-MS/MS (In collaboration with GRANT 4)



Primary reference material

Literature and data search for future models and prediction

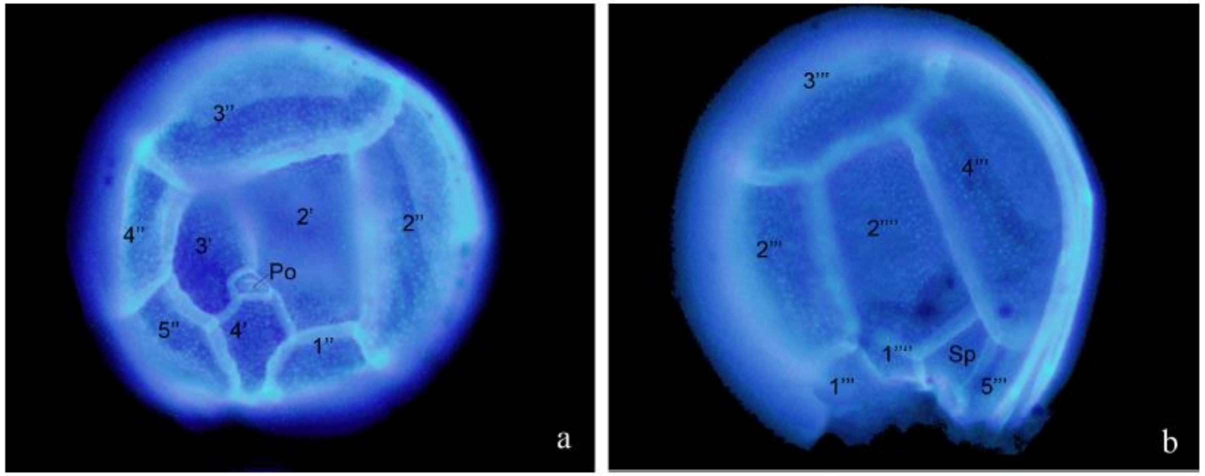


Fig. 1. Epitheca (a) and hypotheca (b) of Gambierdiscus australes cells stained with Calcofluor White.

First report of *Gambierdiscus* in the Western Mediterranean Sea (Balearic Islands)

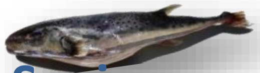
Gambierdiscus (Dinophyceae) species are benthic dinoflagellates living in marine littoral zones of circumtropical areas and have recently been described in temperate waters [1]. Some species are producers of potent neurotoxins: cigua-

Mediterranean Sea. The present study confirms the presence of *G. australes* in the two Balearic Islands of Majorca and Minorca, and this constitutes the first report of *Gambierdiscus* genus in the western Mediterranean Sea.

ranged from 64.1 to 90.8 µm (mean of 78.6 µm). The original description [9] described a length range of 76-93 µm and a cell width of 65-84 µm. Further morphological analysis will be performed using electron microscopy.

To facilitate molecular identification to species level, DNA was extracted from individual or a few clonal cells using the Arcturus™ PicoPure™ DNA Extraction Kit (Applied Biosystems, CA, USA). Afterwards, the domain D8-D10

Puffer fish and tetrodotoxins



Since 2005: Egypt, Israel, Turkey, Cyprus… Spain

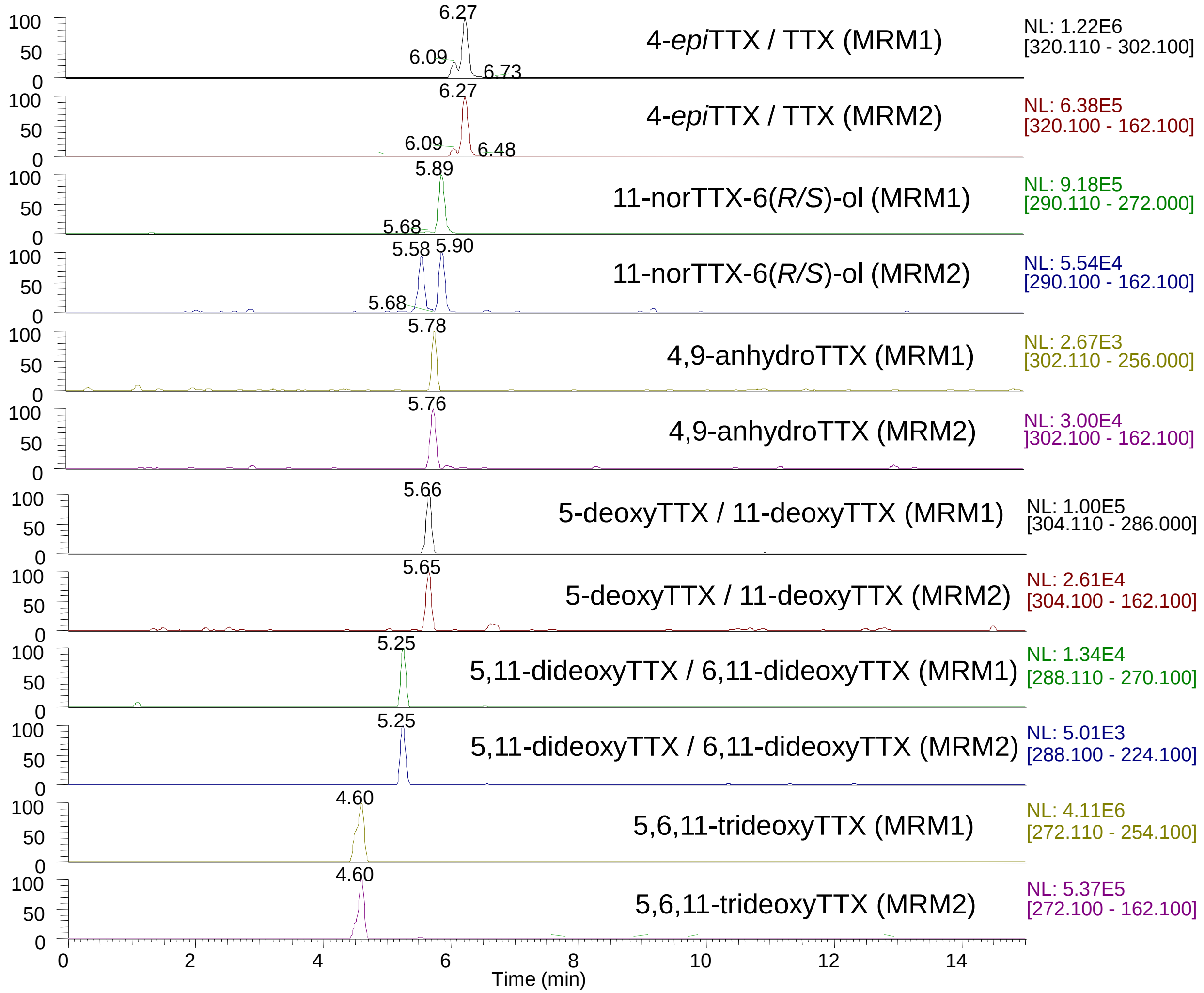


Figure 3. Selected reaction monitoring chromatogram of transition monitored obtained following the analysis of TTX and its analogues in the *L. sceleratus* gonads by LC-MS/MS on HILIC XBridge Amide and TSQ Quantym system (Thermo).

ANALYSIS OF PUFFER FISH FROM CATALONIA AND VALENCIA

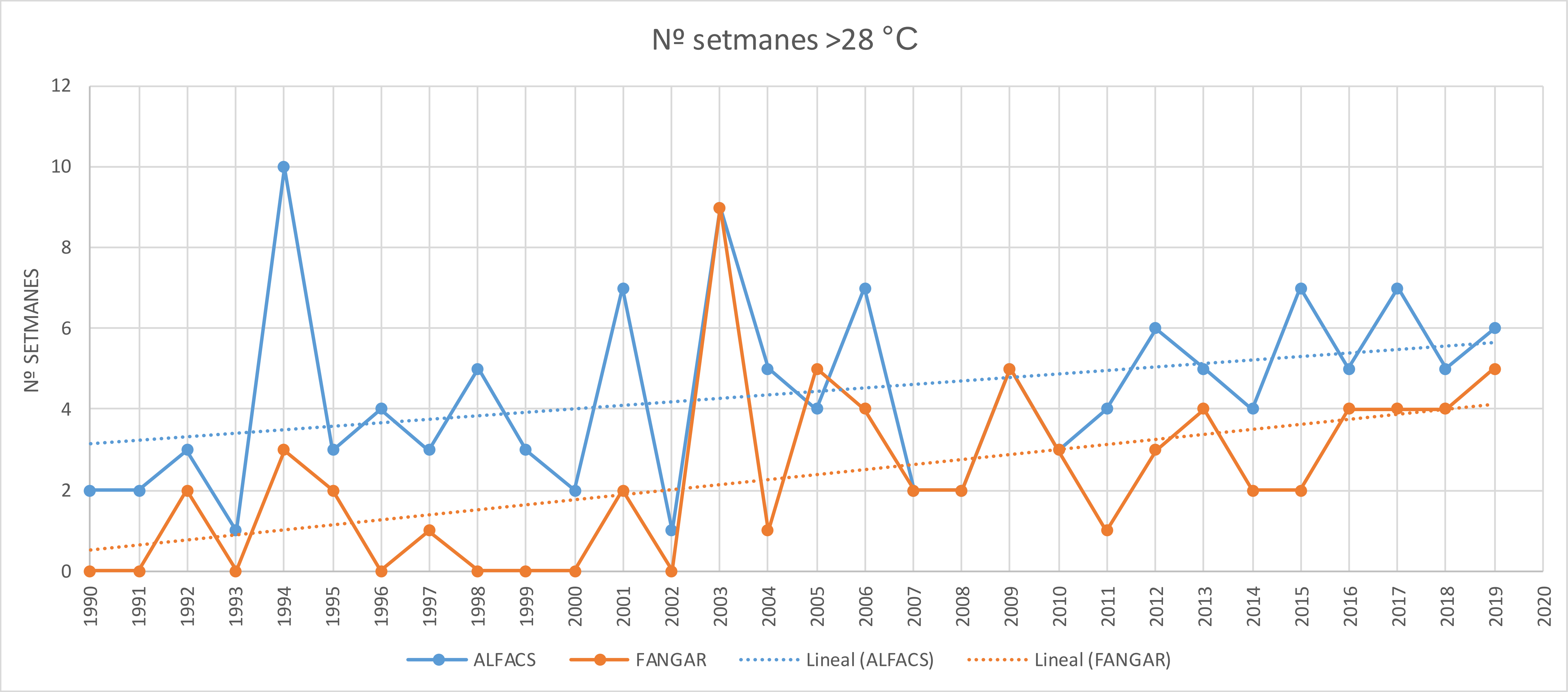
2014 *2015* *2016*

Lagocephalus sceleratus in Dènia!

Table 2
TTX equivalent contents (mg TTX equiv./kg tissue) in *L. sceleratus* by LC-MS/MS, LC-HRMS and mELISA.

	Σ LC-MS/MS	Σ LC-HRMS	mELISA
Gonads	25.95	25.22	33.55
Liver	3.08	5.36	28.30
Skin	1.65	2.08	3.50
Muscle	1.01	0.98	2.53

DELTA DE l'EBRE (NW Mediterranean):
Number of weeks in which water temperature has exceeded 28ºC



CLimate change and Emerging risks for Food SAfety: the CLEFSA project

- **Kick-off teleconference with the CLEFSA discussion group**

27 November 2017

European Food Safety Authority

How useful is the CLEFSA initiative for our insitution and for our field of work?

It focuses on an issue of great concern, CC, which has demonstrated evidence of having an impact on toxin production organisms and their population dynamics

The CLEFSA initiative focuses on identification, characterization and prioritization of emerging issues according to expert advise, and this is a unique source of information that will contribute to better focus on the relevant issues

It proposes a new approach and methodology that may be re-considered in different fields of work in order to evaluate the importance of merging risks

The CLEFSA project, addressing human-plant-animal health is a clear initiative that focuses on the ONE HEALTH approach, responding therefore to the wholistic perspective required to address global issues on food safety

Which is the potential synergy of the CLEFSA initiative with other projects?

The CLEFSA initiative, taking into consideration the topics addressed, provides a definite contribution to the following projects/activities:

- Monitoring program in shellfish harvesting areas
- Coastal processes, hazard characterization and risk assessment of diferent chemical contaminants involved in food safety
- Population dynamics of harmful phytoplankton and microorganisms responsable for contaminant and microbiological hazards

17 UN Sustainable Development Goals

Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture

Goal 3: Ensure healthy lives and promote well-being for all at all ages

Goal 14: Conserve and sustainably use the oceans, seas and marine resources

Thank you!