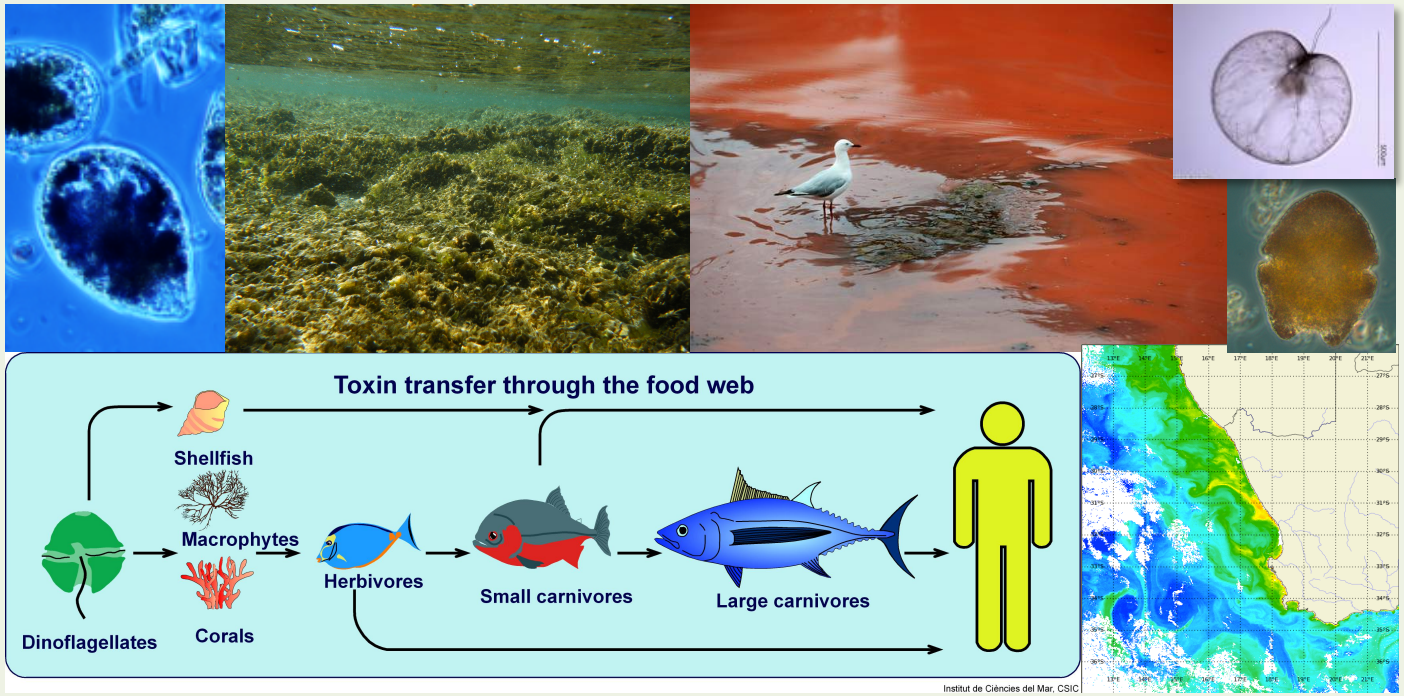
Multidisciplinary and coordinating initiatives to prevent and mitigate the impacts of Harmful Algal Blooms

Elisa Berdalet
Institut de Ciències del Mar (CSIC), Barcelona



Multidisciplinary and coordinating initiatives to prevent and mitigate the impacts of Harmful Algal Blooms (HABs)

1. Why to prevent and mitigate impacts of HABs?
2. How? Multidisciplinary initiatives.
3. Example 1. *Ostreopsis* blooms: Local and Regional scale – Mediterranean
4. Example 2. *Karenia brevis* blooms: Regional Case 1 – US
5. International Coordination: GEOHAB & GlobalHAB

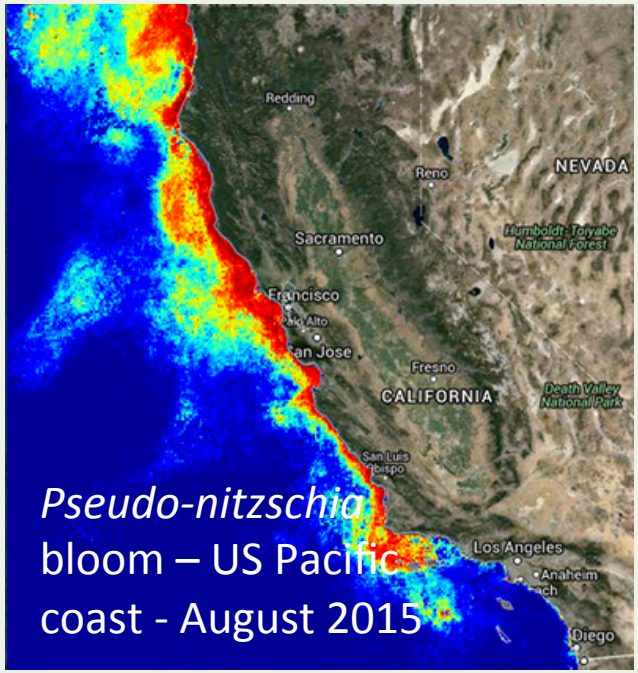
Definition of HABs

- **HAB definition:** Discrete event associated with a “bloom” (proliferation) of microalgae, cyanobacteria or macroalgae **that is perceived by humans as harmful to their health or ecosystem services**.

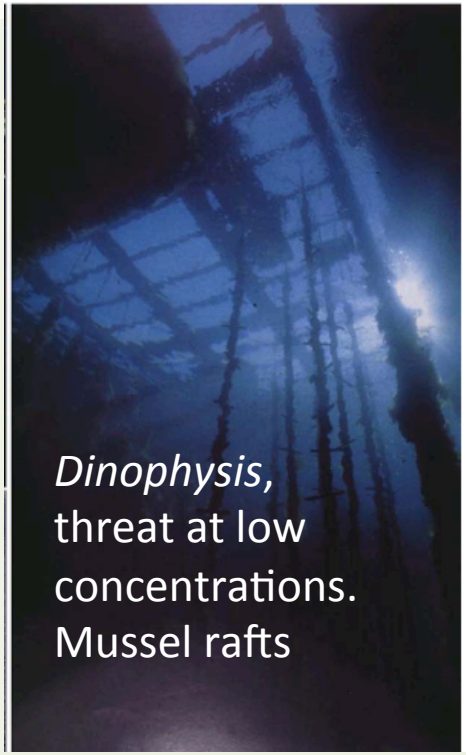
- ‘**Bloom**’: **an increase in abundance relative to a normal background** level that may be low or high, depending on the organism.

- HABs are **present in nearly all aquatic environments** as naturally occurring phenomena.

Noctiluca
Grove, Galicia, July 2008



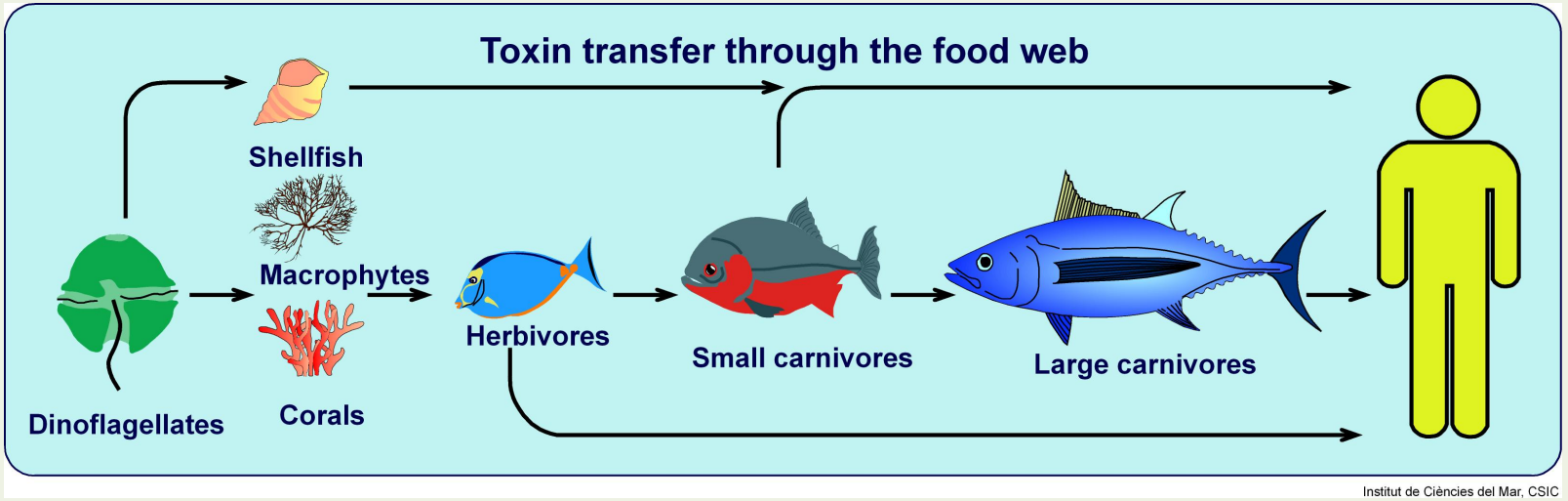
Pseudo-nitzschia bloom – US Pacific coast - August 2015



Dinophysis, threat at low concentrations. Mussel rafts

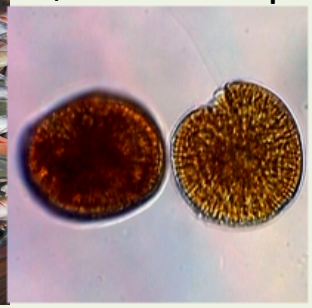
Impacts of HABs

Some microalgae produce toxic substances to humans and aquatic organisms



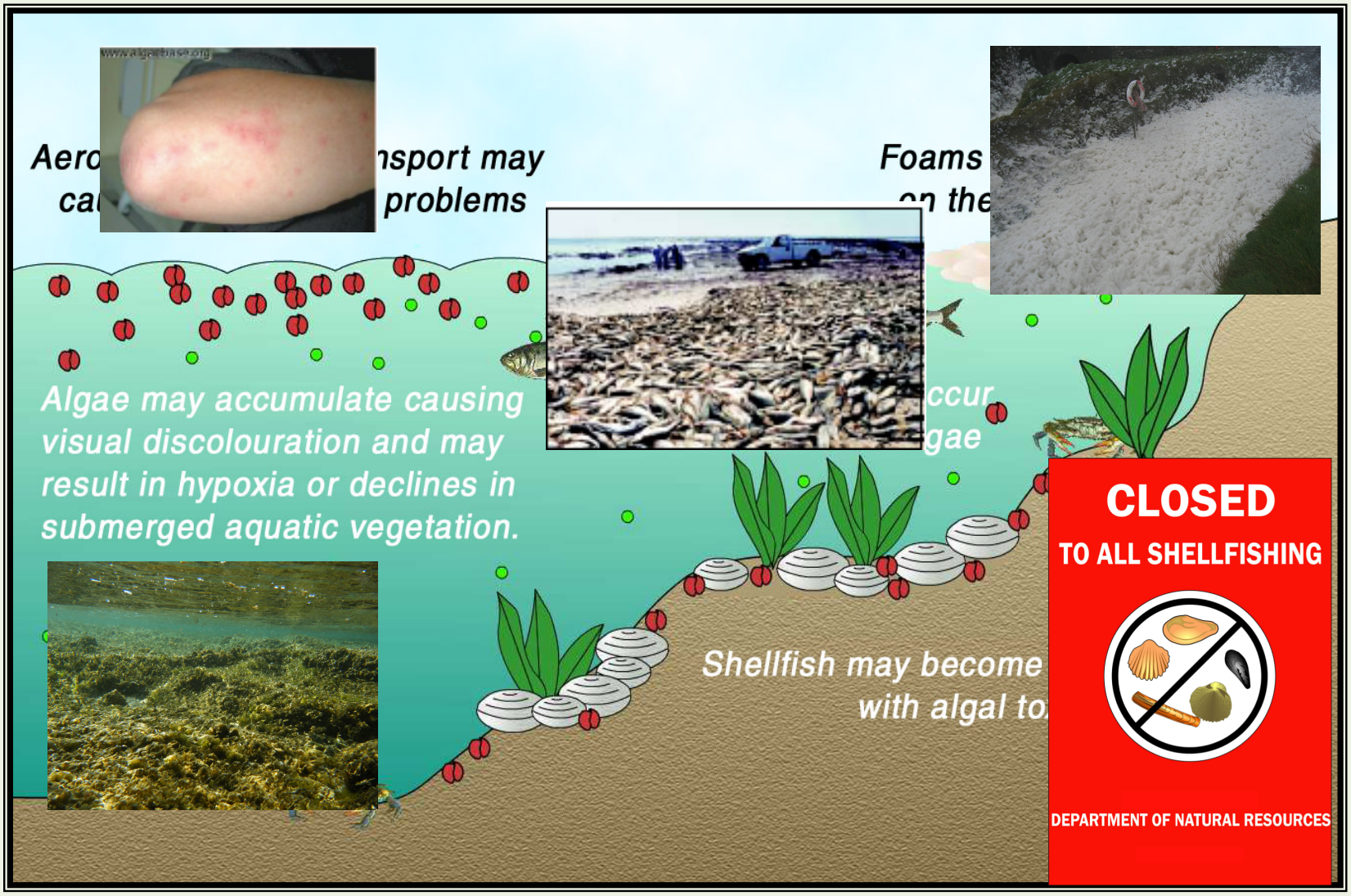
Dinophysis,
Diarrheic Shellfish Poisoning,
Closure of shellfish harvesting

Gambierdiscus,
Ciguatera fish poisoning
Endemic in the tropics
Incidence 1:4 people
$20 M loss p.a.



Impacts of HABs

HABs events have different impacts on human health and wellbeing

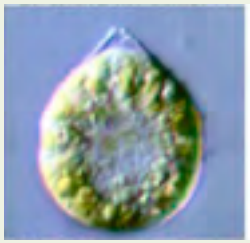


Some HABs causing organisms

Ichtyotoxic, high biomas

Cochlodinium polykrikoides

Karenia mikimotoi

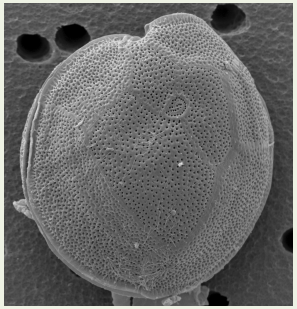


Heterocapsa circularisquama

Diarrheic Shellfish Poisoning (DSP)

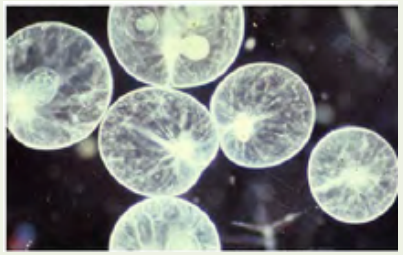
Dinophysis spp.

Ciguatera Fish Poisoning (CFP)



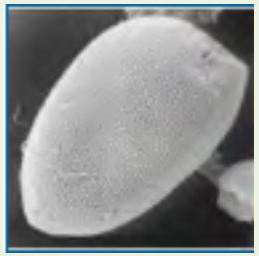
Gambierdiscus

High biomass, hypoxia, non toxic



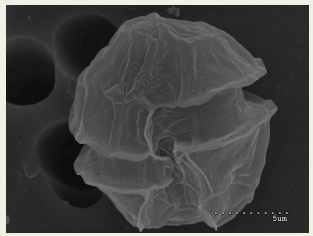
Noctiluca scintillans

Scrippsiella trochoidea

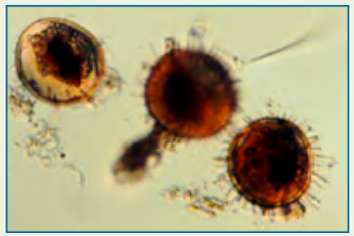


Prorocentrum donghaiense

Paralytic Shellfish Poisoning (PSP)



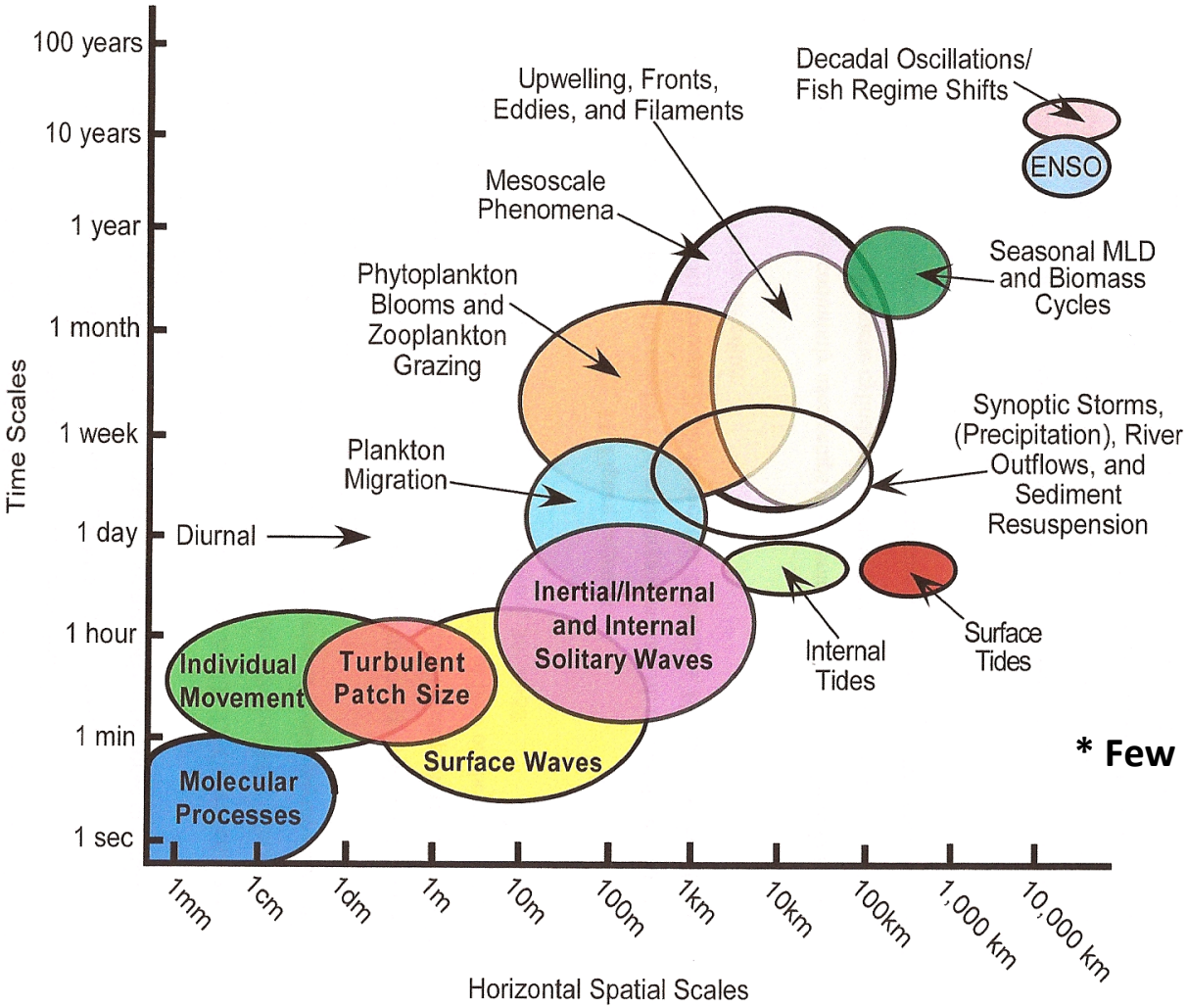
Alexandrium minutum



Pyrodinium bahamense v. *compressum*

Factors Controlling HABs

Phytoplankton blooms result from the interactions of physical, chemical, ecological and biological processes that occur at different scales.

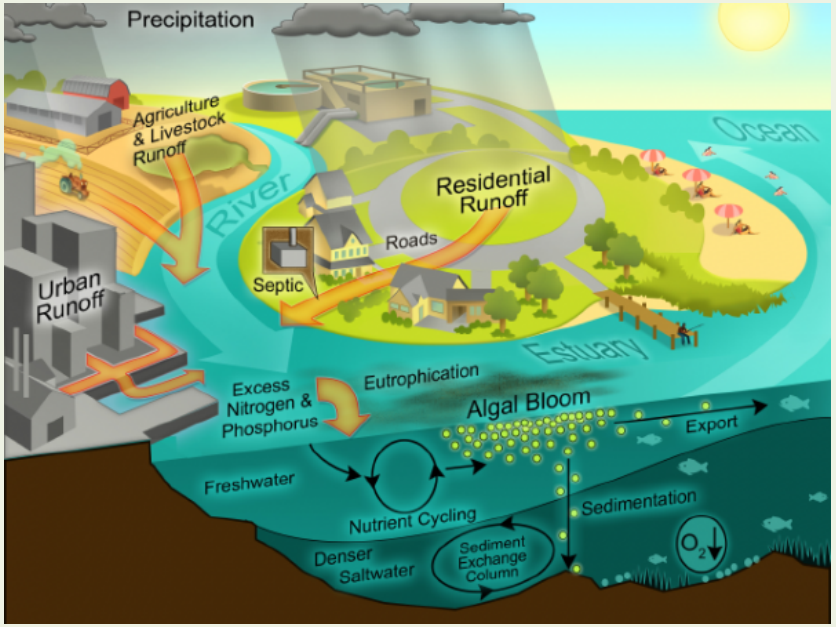


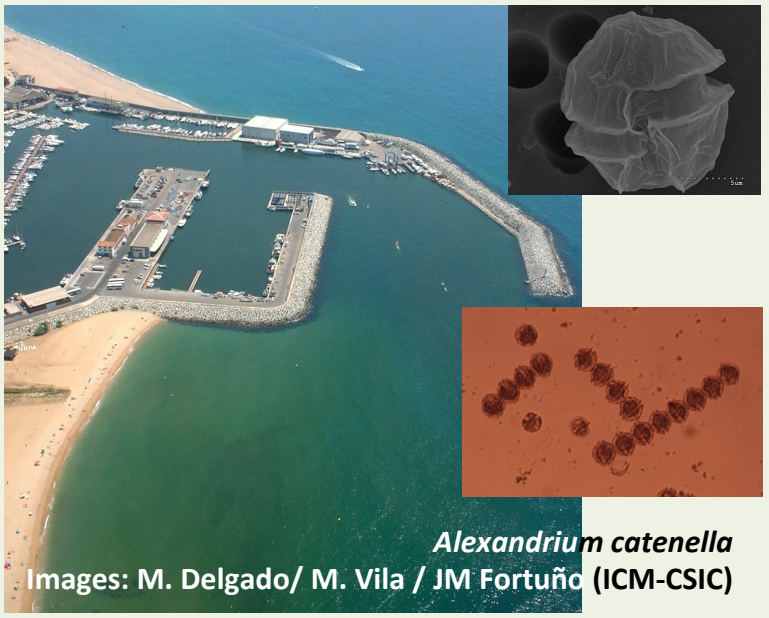
*** Light & nutrients**
*** Water stability**
*** Reproduction capacity**
*** Competition capacity**
*** Few losses (death, predation)**

What Causes HABs?

- **HABs are natural phenomena, controlled by the same factors than phytoplankton blooms.**

- **However, some human activities can favor them:**
  - **Eutrophication: anthropogenic nutrient enrichment** leading to **excess phytoplankton production** that can result in **undesirable disturbance to water quality** and the **balance of organisms.**
  - Alteration of **water circulation** patters by **harbors:** retention areas that favor **accumulation** of **vegetative** and **resting** cell life forms
  - **Spread of harmful organisms through ballast waters or transport of cultured organisms: blooms in areas not previously affected by** (certain) **HABs**





Alexandrium catenella

Images: M. Delgado/ M. Vila / JM Fortuño (ICM-CSIC)

Costs of HABs???

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Conservative annual direct cost*

Marine HABs

USA	± US$ 95 million
Europe	> US$ 850 million
Asia	> US$ 1 billion

Freshwater HABs

USA	± US$ 4,6 billion
China	± US$ 6,5 billion (1998, Lake Tai)
Australia	± US$ 150 million
UK	± US$ 150 million
South Africa	± US$ 250 million

Sources: *Bernard et al., 2014, Developing global capabilities for the observation and prediction of harmful algal blooms. Oceans and Society: Blue Planet. PICES Scientific Report, No. 47.*

- Excluding cost on human health care.

* A comprehensive **global HAB observing and forecasting system**:

± 100 million / year = 1/10 of the direct cost

We need to know more about this!!!

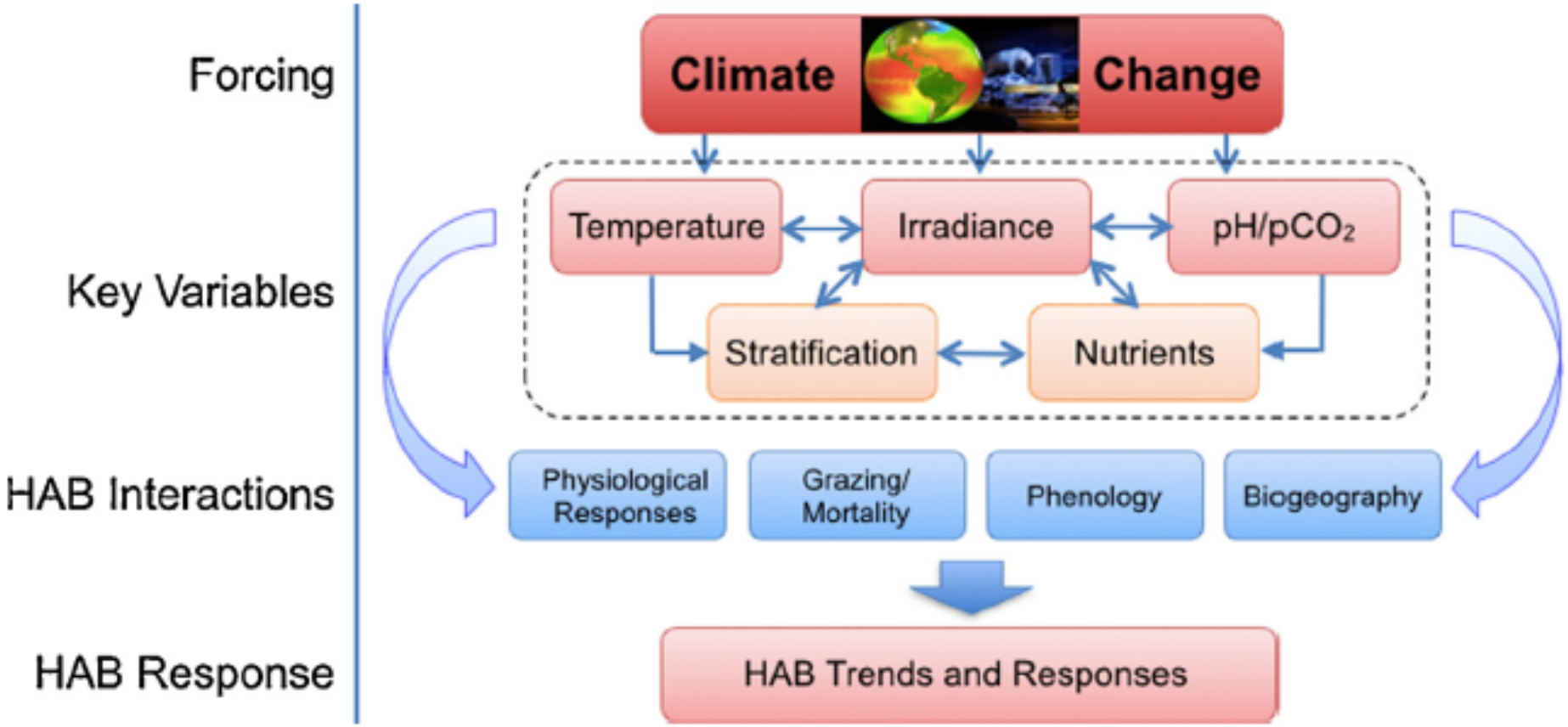
Expected trend in the near future:

HAB-related costs are going to increase because the problem will become more severe with GLOBAL CLIMATE CHANGE and increased EXPLOITATION of coastal RESOURCES.

Future trends in HABs

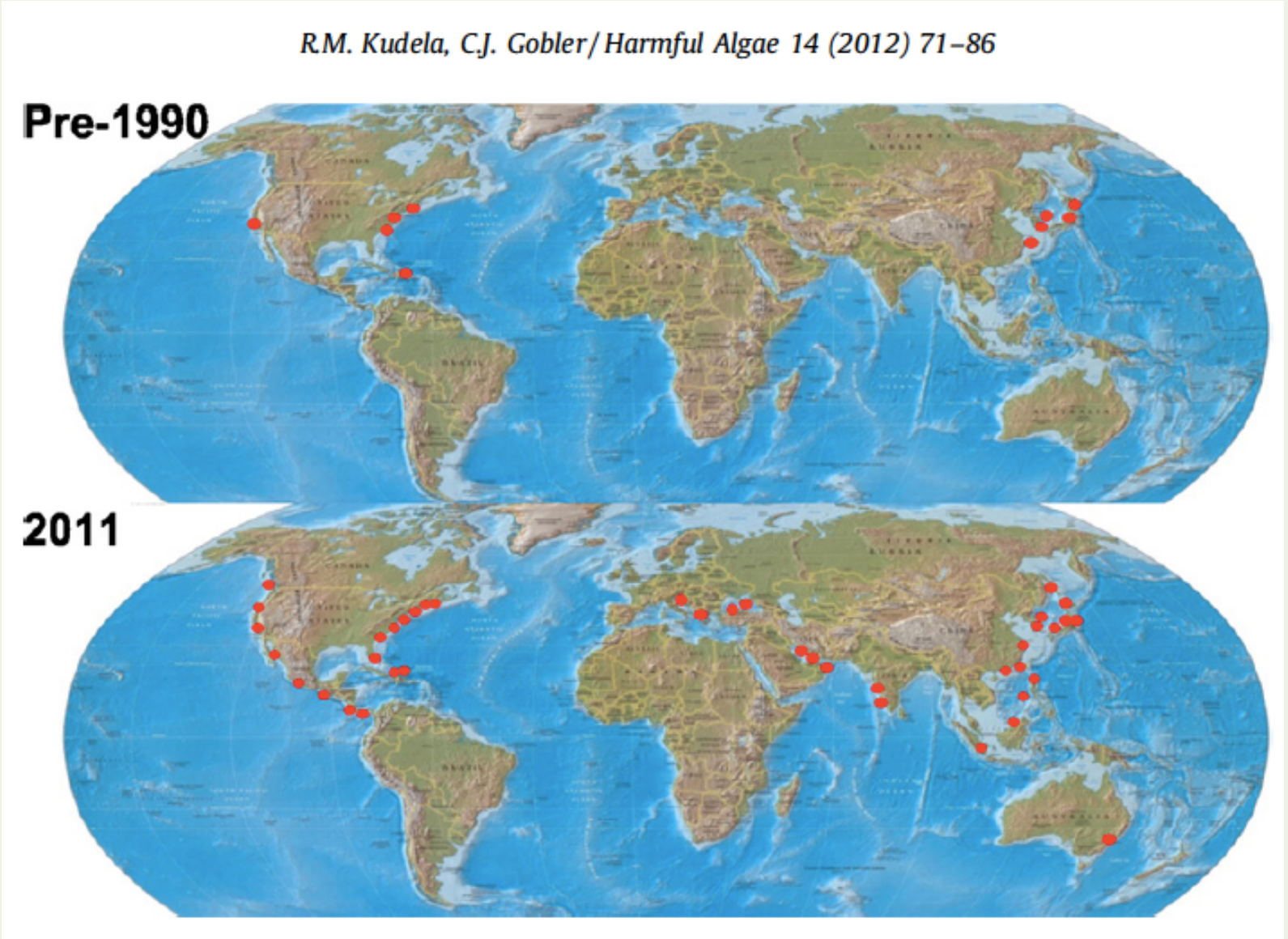
Many HABs are increasing in severity and frequency, and biogeographical range. Some of this expansion is attributed to climate change and global change… ***But many uncertainties!!!***

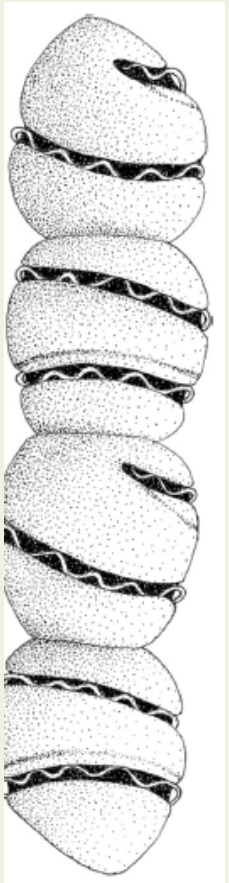
M.L. Wells et al. / Harmful Algae 49 (2015) 68–93



Global Expansion of Multiple HABs

… also related to ***better detection methods of monitoring***





Cochlodinium

New toxin-producing species and new toxins … but better techniques for toxin characterization

*Azaspiracid Shellfish Poisoning (AZP):

T: Azaspiracid and its derivatives

O: Amphidomataceae (*Amphidoma languida*, *Azadinium spinosum*, *Azadinium poporum*, *Azadinium dexteroporum*)

S: Nausea, vomiting, severe diarrhoea, abdominal cramps; effects on mice tests include severe damage to the intestine, spleen and liver tissues in animal tests

E: Consumption of shellfish

A: Seafood poisoning reported from shellfish in Europe and North America

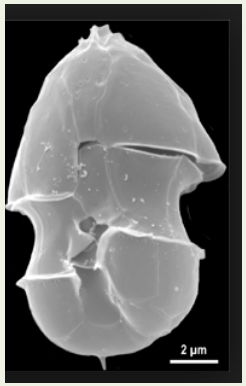
R: Twiner *et al.* (2008, 2012a, b, 2014); Klontz *et al.* (2009); Tillmann *et al.* (2009, 2014); Hess *et al.* (2014)

Journal of the Marine Biological Association of the United Kingdom, 2016, 96(1), 61–91. © Marine Biological Association of the United Kingdom, 2015
doi:10.1017/S0025315415001733

Marine harmful algal blooms, human health and wellbeing: challenges and opportunities in the 21st century

ELISA BERDALET[1], LORA E. FLEMING[2], RICHARD GOWEN[3,4], KEITH DAVIDSON[4], PHILIPP HESS[5], LORRAINE C. BACKER[6], STEPHANIE K. MOORE[7], PORTER HOAGLAND[8] AND HENRIK ENEVOLDSEN[9]

Azaspiracid Shellfish Poisoning (AZP)



Azadinium spinosum

New toxins. BMAA, controversial

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Diatoms: A Novel Source for the Neurotoxin BMAA in Aquatic Environments

Liying Jiang, Johan Eriksson, Sandra Lage, Sara Jonasson, Shiva Shams, Martin Mehine, Leopold L. Ilag, Ulla Rasmussen

Research Article
Environmental Science and Pollution Research
January 2016, Volume 23, Issue 1, pp 338-350

Published: January

First online: 26 August 2015

BMAA extraction of cyanobacteria samples: which method to choose?

Sandra Lage, Alfred Burian, Ulla Rasmussen, Pedro Reis Costa, Heléne Annadotter, Anna Godhe, Sara Rydberg

Toxins (Basel). 2014 Feb; 6(2): 488–508.
Published online 2014 Jan 28. doi: 10.3390/toxins6020488

PMCID: PMC3942747

Co-occurrence of the Cyanotoxins BMAA, DABA and Anatoxin-*a* in Nebraska Reservoirs, Fish, and Aquatic Plants

Maitham Ahmed Al-Sammak,[1,3] Kyle D. Hoagland,[2] David Cassada,[3] and Daniel D. Snow[3,*]

Author information ► Article notes ► Copyright and License information ►

Seafood intoxications related to market trade expansion and global warming?

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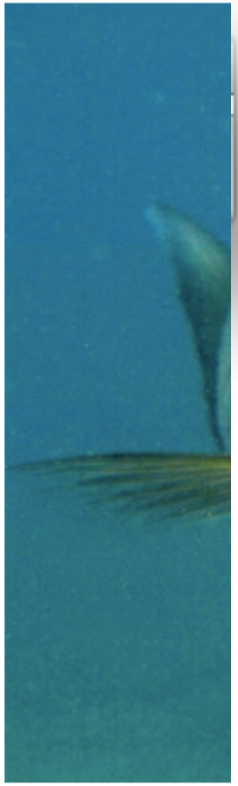
The New York Times

Fish Poisoning More Common Than Believed

Global Health

By DONALD G. McNEIL J

Cigua
Germ



in Germany. T
notes.

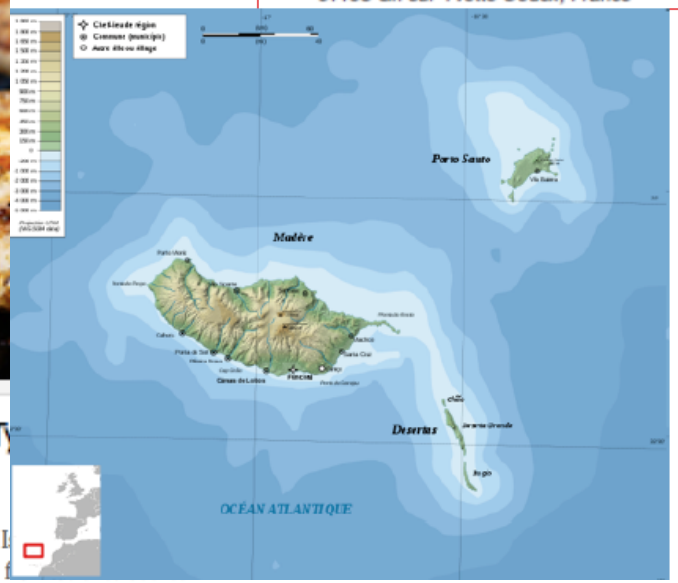
A Great Barracuda in the water near Singer I
epidemologist recommended not eating the f

Anal. Chem. **2010**, *82*, 6032–6039

First Toxin Profile of Ciguateric Fish in Madeira Arquipelago (Europe)

Paz Otero,† Sheila Pérez,† Amparo Alfonso,† Carmen Vale,† Paula Rodríguez,† Neide N. Gouveia,‡ Nuno Gouveia,‡ João Delgado,‡ Paulo Vale,§ Masahiro Hirama,∥ Yuuki Ishihara,∥ Jordi Molgó,⊥ and Luis M. Botana*,†

Departamento de Farmacología, Facultad de Veterinaria, Universidad de Santiago de Compostela, 27002 Lugo, Spain., Direcção Regional das Pescas, Estrada da Pontinha, 9000-017 Funchal, Portugal, Instituto Nacional dos Recursos Biológicos, IPIMAR (INRB-IPIMAR), Av. Brasília, s/n, 1449-006, Lisboa, Portugal, Department of Chemistry, Graduate School of Science, Tohoku University, Sendai 980-8578, Japan., CNRS, Institut de Neurobiologie Alfred Fessard, FRC2118, Laboratoire de Neurobiologie Cellulaire et Moléculaire, FRE3295, 1 Avenue de la Terrasse, 91198 Gif sur Yvette Cedex, France



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Still Ciguatera Fish Poisoning is the most frequent cause of HAB-associated poisoning in tropical waters.

RESEARCH ARTICLE

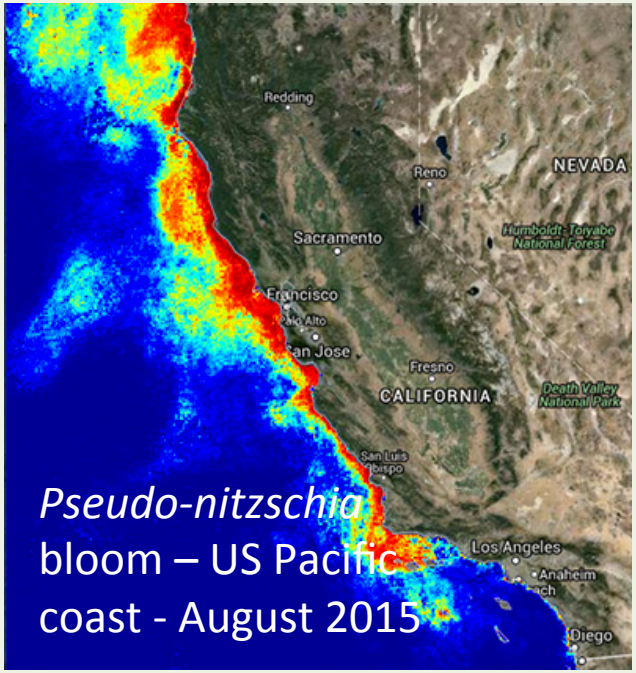
Fluorescent Receptor Binding Assay for Detecting Ciguatoxins in Fish

D. Ransom Hardison[1]*, William C. Holland[1], Jennifer R. McCall[2,3], Andrea J. Bourdelais[2], Daniel G. Baden[2], H. Taiana Darius[4], Mireille Chinain[4], Patricia A. Tester[1,5], Damian Shea[6], Harold A. Flores Quintana[7], James A. Morris, Jr.[1], R. Wayne Litaker[1]

1 National Oceanic and Atmospheric Administration, Center for Coastal Fisheries and Habitat Research, Beaufort, North Carolina, United States of America, 2 University of North Carolina at Wilmington, MARBIONC at CREST Research Park, Wilmington, North Carolina, United States of America, 3 SeaTox Research Inc, UNCW CREST Research Park, Wilmington, North Carolina, United States of America, 4 Institut Louis Malardé (ILM)–UMR 241 EIO, Laboratory of Toxic-Microalgae, Papeete, Tahiti, French Polynesia, 5 JHT, Inc., Orlando, Florida, United States of America, 6 North Carolina State University, Environmental Chemistry and Toxicology Laboratory, Raleigh, North Carolina, United States of America, 7 U.S. Food and Drug Administration, Division of Seafood Science and Technology, Gulf Coast Seafood Laboratory, Dauphin Island, Alabama, United States of America

PLOS ONE | DOI:10.1371/journal.pone.0153348 April 13, 2016

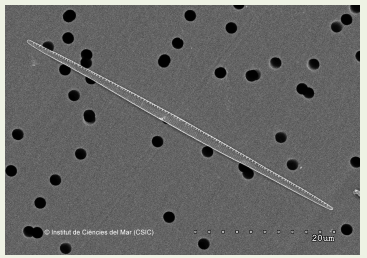
2015: An Unprecedented Year in the Pacific coast of America. *Pseudo-nitzschia bloom*



Pseudo-nitzschia bloom – US Pacific coast - August 2015

- ***Trophic Transfer:***
- Feb 16, 2016: California Requests Federal Disaster Relief

Amnesic Shellfish Poisoning (ASP) – domoic acid



Pseudo-nitzschia spp.

2016: An Unprecedented Year in the Pacific coast of America. *Pseudo-chattonella bloom* in Chile

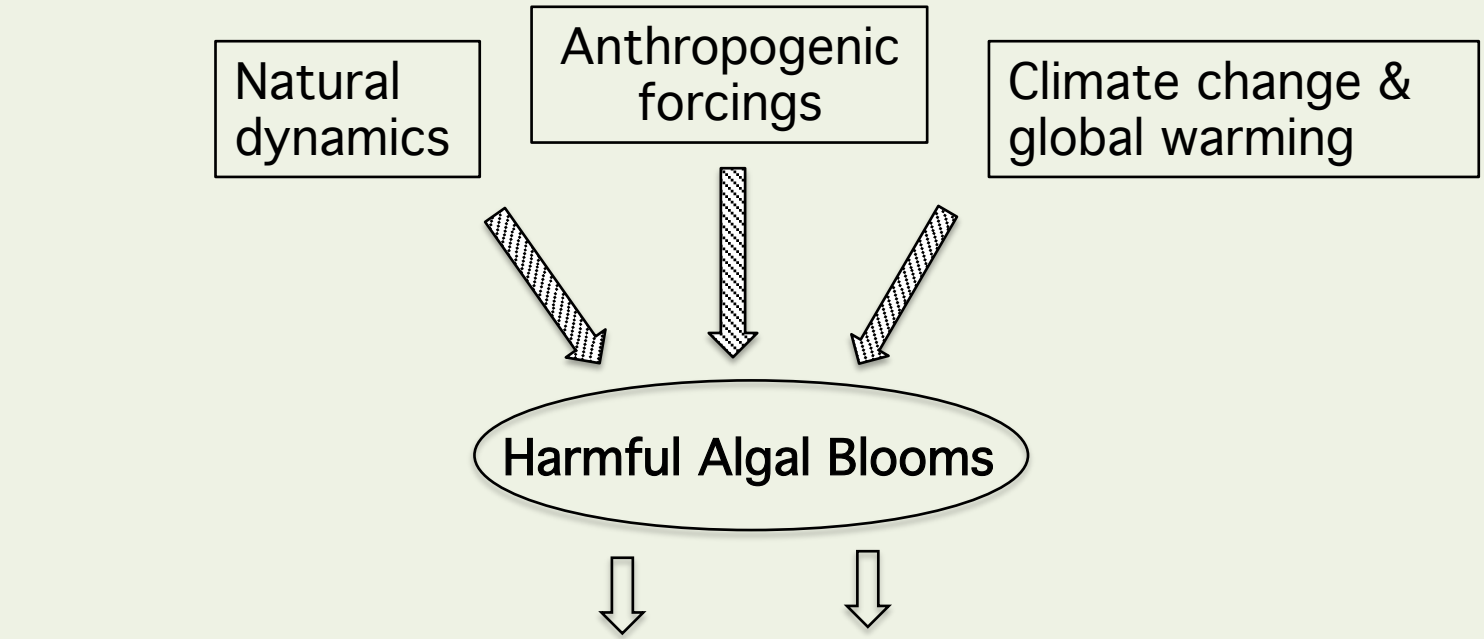
Chile salmon farms lose 23 million fish due to toxic algae bloom

BY KAREN GRAHAM MAR 10, 2016 IN ENVIRONMENT

An ongoing and deadly toxic algae bloom off the coast of Chile, the world's second largest salmon exporter, has sent the country's salmon industry into a tailspin.

http://nordicmicroalgae.org/taxon/Pseudochattonella

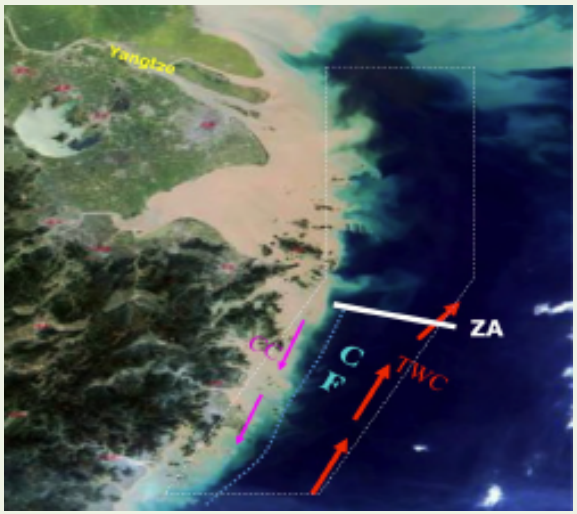
Generalities. Overview of the challenge

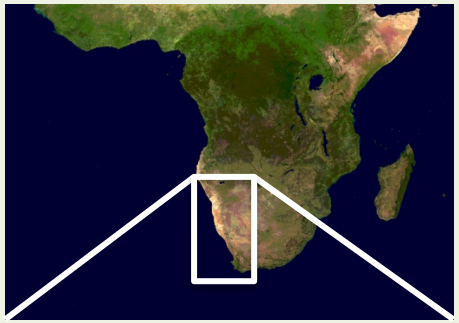


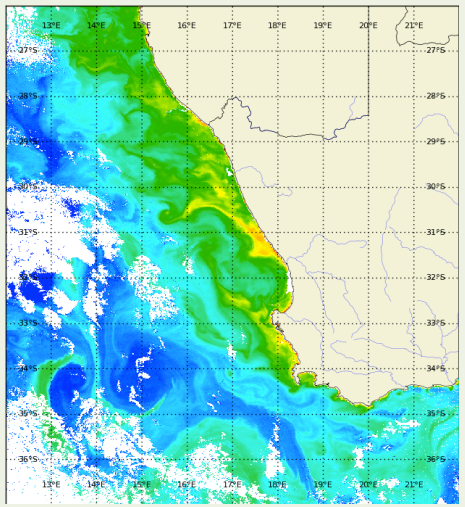
- **HABs events can not be realistically eliminated, but their impacts can be alleviated.**
- **HABs are a global issue that requires international cooperation and local solutions**
- **HABs must be integrated with policy decisions**

Available tools: Monitoring and management

- Information and alerts to the public about human and ecosystem health threats.
- Baseline information for understanding how HAB frequency and abundance are changing **in super-observing sites (GOOS-Bio)**
- Need to continue: long-term commitments at local, regional, national, and international levels.







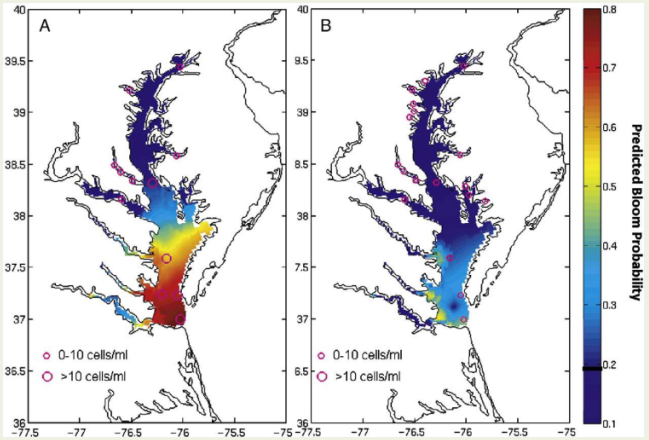
Above: satellite image of chlorophyll concentration, tracking a phytoplankton bloom off the coast of South Africa. (Image: S. Bernard)

Available tools. Modeling and prediction

• Nowadays, a few HABs can be modeled and predicted on a regional scale with some success.

Needs:

- developing new models and new approaches
- integration with the broader community of researchers dealing with physical-biological interactions of algae populations.



Oceanographic models of water circulation allow monitoring and prediction of high biomass blooms and reduction of their impacts on fisheries. **Above:** distribution on toxic microalgae in the Chesapeake Bay (left) and modeled bloom abundances (right). From Anderson et al. 2010. J. Mar. Sys.

Available tools. Modeling and prediction

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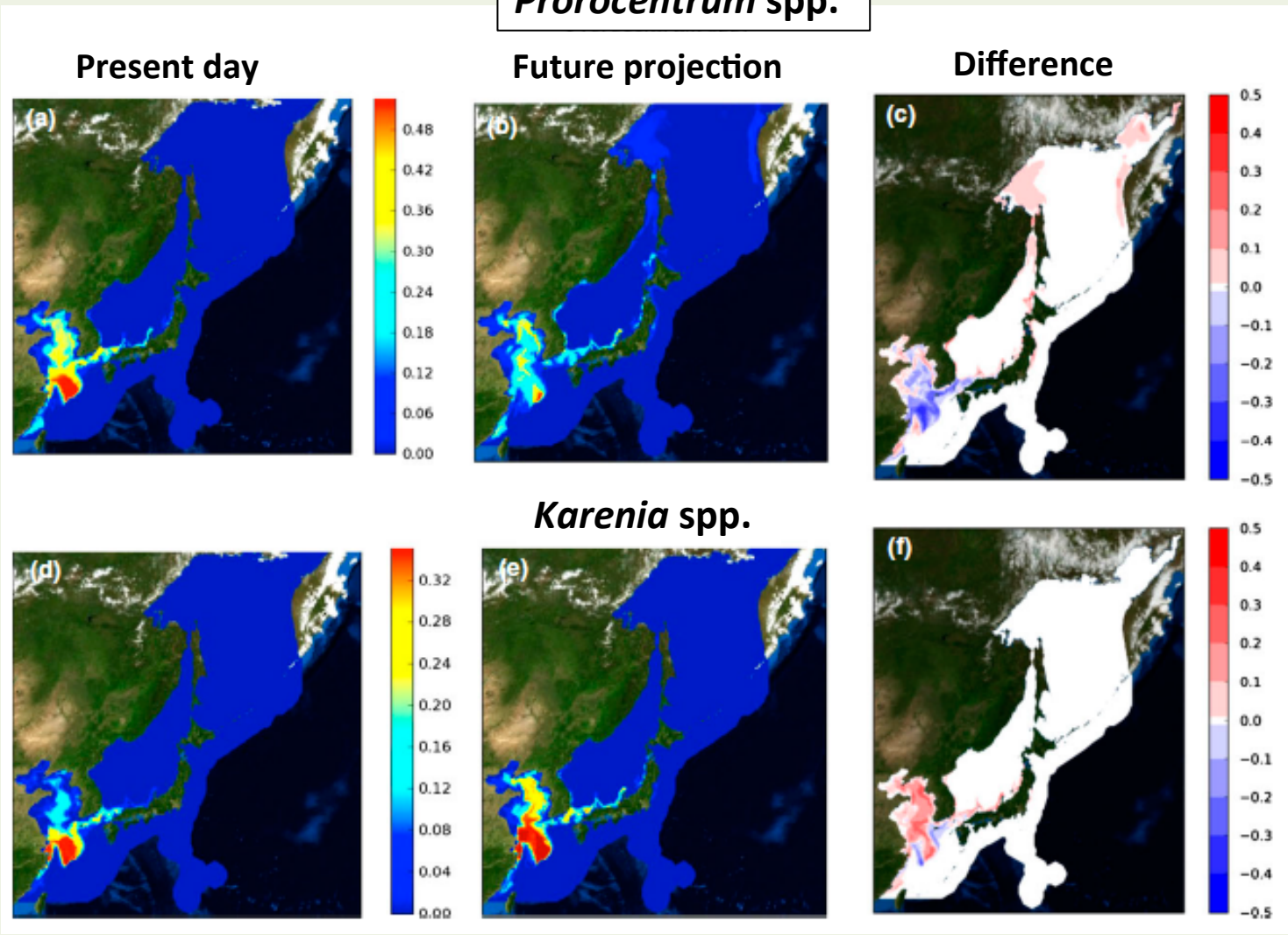
Potential effects of nutrient loading and climate change.

Projections in NE Asia: expansion in area and/or number of months annually conducive to development of *Prorocentrum* and *Karenia*.

***Prorocentrum* spp.**

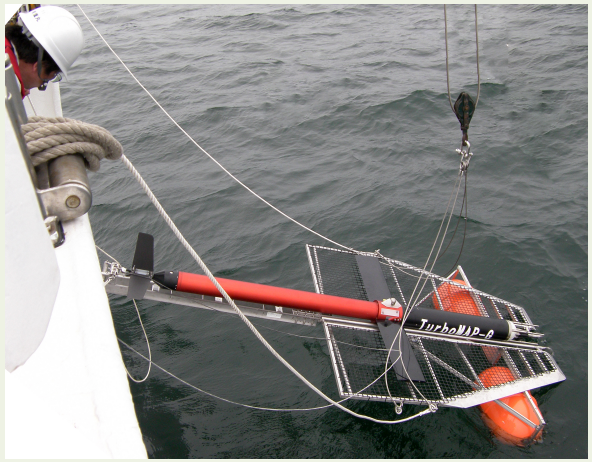


Glibert et al. 2014. Global Change Biology **20**, 3845-3858

Available tool. Multidisciplinary Research

- HAB research has markedly progressed in recent years, in part with advances in technology.

- Continued support of research into:
  - ✓ HAB biology
  - ✓ fate of toxins (transference through the food webs)
  - ✓ ecology: physico-chemical-biological interactions
  - ✓ taxonomic identification of toxic organisms



The TurboMap-G (H Yamazaki, Japan) device allows us to understand the small-scale physical hydrodynamics that control the aggregation of toxic microalgae in thin layers in the water column. (Photo: H. Yamazaki).

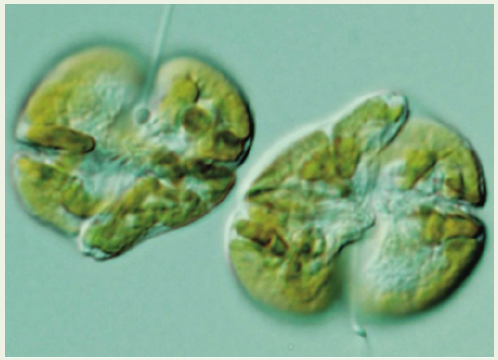
The Environmental Sample Processor (MBARI, US) is a robotic biochemistry laboratory that detects some toxic microorganisms in the ocean in real time. (Photo: R. Kudela)

Karenia brevis blooms or "Florida red tides"

Gulf of Mexico and Florida

Multiple effects:

- Toxin accumulation in mussels: Neurotoxic Shellfish Poisoning (NSP)
- Respiratory diseases in beach users or nearby inhabitants: brevetoxin/sea water aerosols
- Mucilage production: massive fish killings
- Death of marine mammals and seabirds
- Foam accumulation in beaches:impacts on tourism
- Seabed high biomass accumulation: hypoxia/anoxia



Karenia brevis

Direct medical costs:

* average: US$0.1-0.7 million /year
* long lasting: >US$1.0 million
- future estimated cost (model): 2.0 – 24.0 million/year

Karenia brevis blooms

Brevetoxins | Mini-Monograph

Overview of Aerosolized Florida Red Tide Toxins: Exposures and Effects

Lora E. Fleming,[1] Lorraine C. Backer,[2] and Daniel G. Baden[3]

[1]National Institute of Environmental Health Sciences Marine and Freshwater Biomedical Sciences Center and National Science Foundation–National Institute of Environmental Health Sciences Oceans and Human Health Center, University of Miami Rosenstiel School of Marine and Atmospheric Sciences, Miami, Florida, USA; [2]National Center for Environmental Health, Centers for Disease Control and Prevention, Atlanta, Georgia, USA; [3]Center for Marine Science, University of North Carolina at Wilmington, Wilmington, North Carolina, USA

- Aerosolized Florida red tide toxins offer many opportunities to conduct interdisciplinary, synergistic research.
- More than 30 years of research characterizing the *K. brevis* organism and brevetoxins. Costly initiative, coordination of physicians, toxicologists, ecologists, stakeholders and end-users.
- When the neurologic activities of brevetoxins were identified, researchers began to understand the neurophysiology and the mechanisms of actions of the sodium channels in nerve cells.
- Advances in molecular biochemistry: isolation of the toxin.
- Relationships between the presence of *K. brevis* and brevetoxins in marine ecosystems and the generation of toxin-containing aerosols at the seawater–air interface.

Within the last 5 years, these collaborative efforts have resulted in

a) identification of brevenal, a new brevetoxin antagonist elaborated by **K. brevis** itself;

b) development of a highly sensitive brevetoxin ELISA, as well as refinement of existing analytical techniques, applicable to multiple substrates;

c) characterization of the particle size distribution of the Florida red tide aerosol;

d) measurement of complex mixtures of brevetoxin levels in ambient and personal breathing zone air;

e) exploration of acute and chronic effects of the Florida red tide aerosols in rodent models and in an asthmatic sheep model;

f) expansion of the understanding of the toxicology and physiology of the brevetoxins;

g) initial evaluation of self-reported symptoms and objective measurements of physiologic respiratory changes in humans with recreational and occupational exposures;

h) initial identification of readily available medications to prevent and/or treat the effects of exposure to the Florida red tide aerosols

Environment International 68 (2014) 144–153

Contents lists available at ScienceDirect

Environment International

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

The human health effects of Florida Red Tide (FRT) blooms: An expanded analysis

Porter Hoagland [a,*], Di Jin [a], Andrew Beet [a], Barbara Kirkpatrick [b,c], Andrew Reich [d], Steve Ullmann [e], Lora E. Fleming [c,f], Gary Kirkpatrick [b]

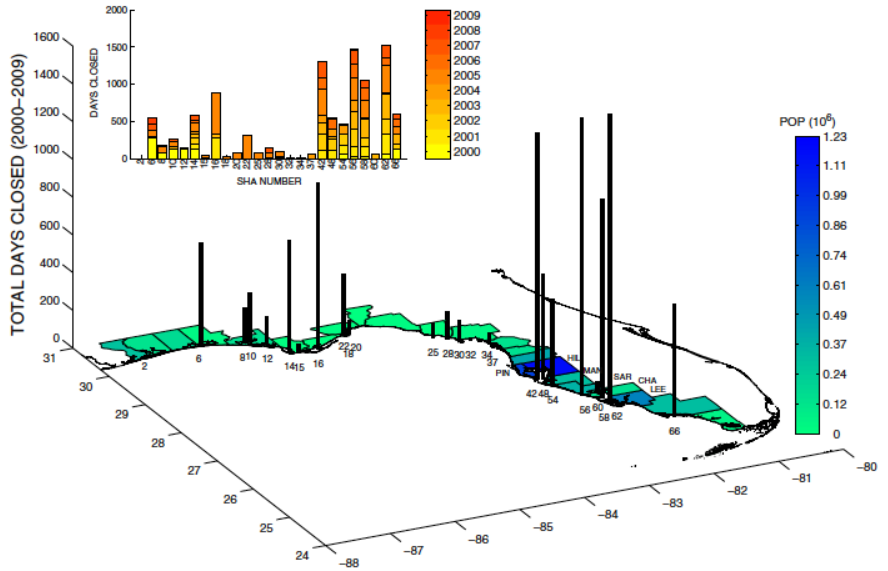


Fig. 1. Map showing the 2010 distribution of county resident populations along the Gulf Coast of Florida and the total number of days closed of closures occurring during 2000–2009 within two-digit shellfish harvest areas (SHAs) due to Florida red tides (Hoagland, 2014; data from FDACS and US Census Bureau).

OCEANEXT

Ecological Modelling 313 (2015) 251–258

Contents lists available at ScienceDirect

Ecological Modelling

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

Identifying bloom origins of the toxic dinoflagellate *Karenia brevis* in the western Gulf of Mexico using a spatially explicit individual-based model

Darren W. Henrichs [a], Robert D. Hetland [a], Lisa Campbell [a,b,*]

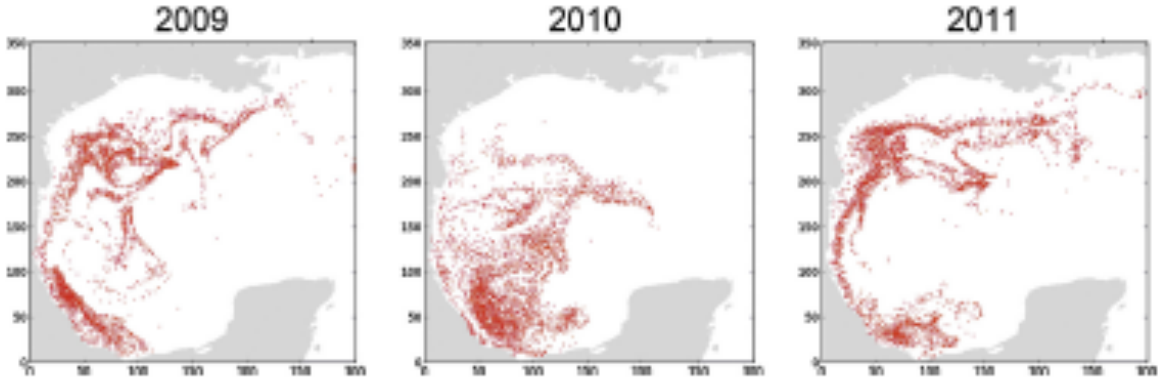


Fig. 5. Distributions of individual cells after 60 days from a single model run in forward time for each year highlight the differences between bloom years (2009, 2011) and the non-bloom year. Each red dot represents a single individual cell from the model.

Inland transport of aerosolized Florida red tide toxins

Barbara Kirkpatrick [a], Richard Pierce [a], Yung Sung Cheng [b], Michael S. Henry [a], Patricia Blum [a], Shannon Osborn [a], Kate Nierenberg [a], Bradley A. Pederson [a], Lora E. Fleming [c,*], Andrew Reich [d], Jerome Naar [e], Gary Kirkpatrick [a], Lorraine C. Backer [f], Daniel Baden [e]

Harmful Algae 9:186-189. 2010.

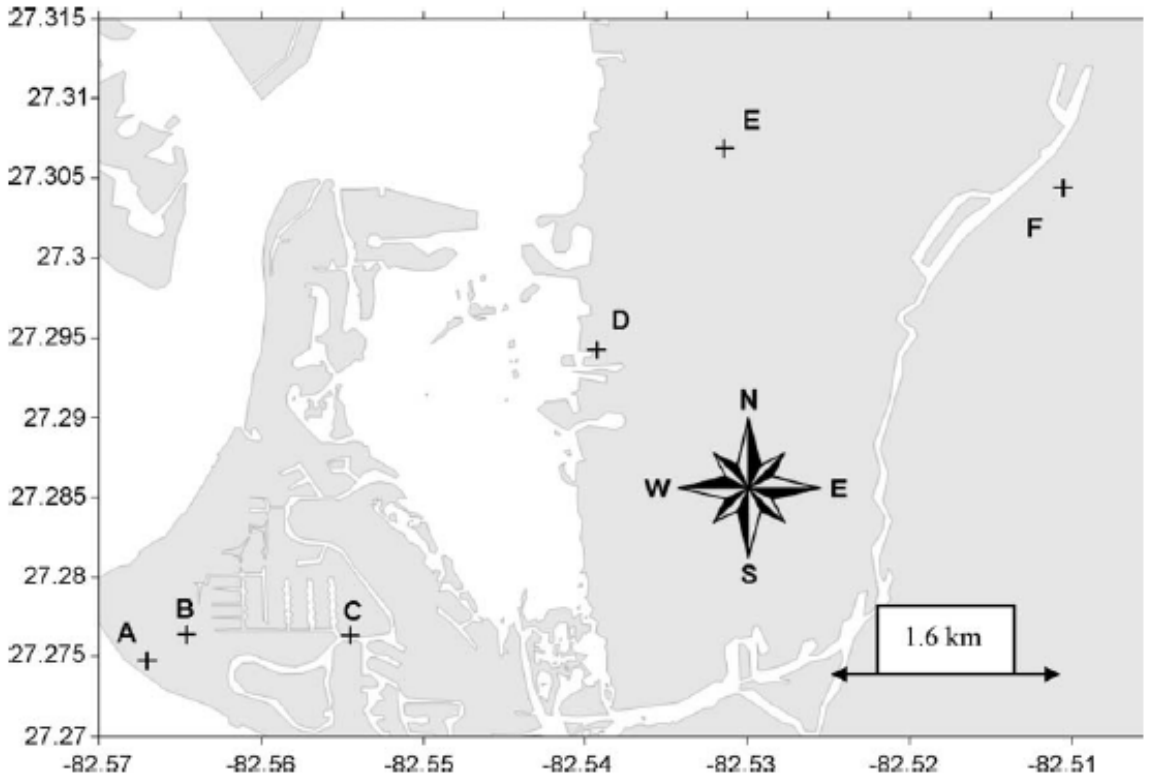


Fig. 1. Inland transect aerosol sampling locations.

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Harmful Algae 43 (2015) 13–19

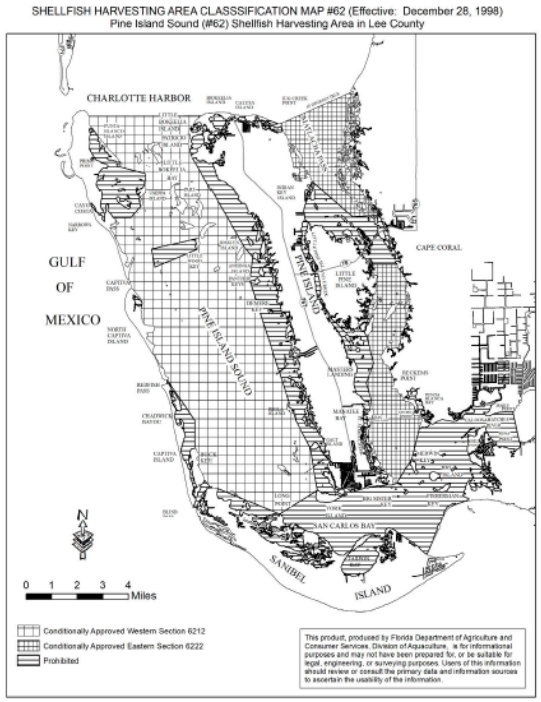
Contents lists available at ScienceDirect

Harmful Algae

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

Assessing the impact of shellfish harvesting area closures on neurotoxic shellfish poisoning (NSP) incidence during red tide (*Karenia brevis*) blooms

Andrew Reich [a,*], Rebecca Lazensky [a], Jeremy Faris [b], Lora E. Fleming [c,d], Barbara Kirkpatrick [d,e], Sharon Watkins [a], Steve Ullmann [d], Kate Kohler [e], P



Harmful Algae 29 (2013) 22–30

Contents lists available at ScienceDirect

Harmful Algae

journal homepage:

Three-dimensional structure of a *Ka*
from gliders, satellites, and field mea

Jun Zhao [a,b], Chuanmin Hu [a,*], Jason M. Lenes [a],
David English [a], Jennifer Wolny [c], Lianyuan Zhe

The case study here demonstrates the unique value of an integrated coastal ocean observing system in studying harmful algal blooms (HABs).

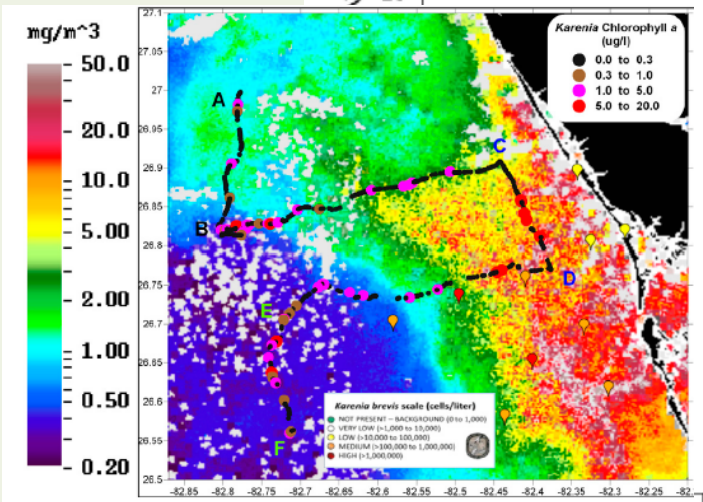


Fig. 5. (a) MERIS chlorophyll-a image on 14 October 2011 showing the *K. brevis* bloom concentrations measured by the BreveBuster glider (colored circles) and *K. brevis* cell coun

Fig. 6. Near-bottom velocity vectors superimposed on bottom temperature for 24 September 2011, derived from the FVCOM model.

tidesandcurrents.noaa.gov

Home | NOAA Harmful Algal Bloom Operational Forecast System: Operational C

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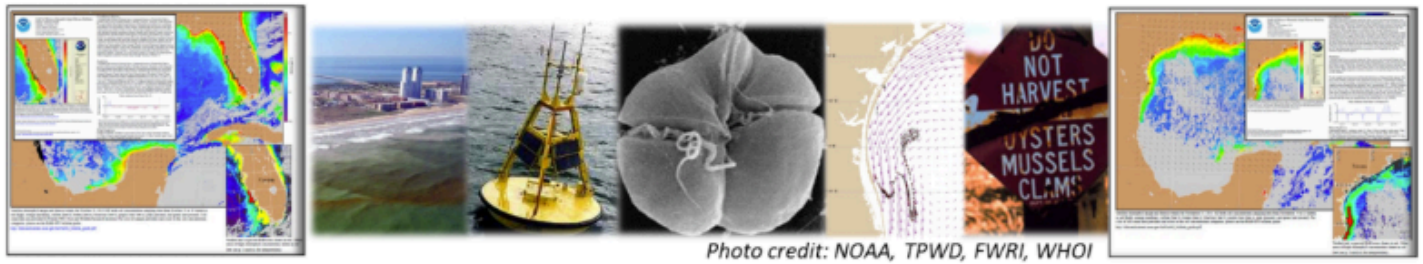


Photo credit: NOAA, TPWD, FWRI, WHOI

NOAA Harmful Algal Bloom Operational Forecast System (HAB-OFS)

Operational Conditions Reports

HAB-OFS Products:
Overview - FAQs - Contact Us

Public Conditions Reports by Region *(including Impact Forecasts)*:
Southwest Florida | Northwest Florida to Louisiana | East Florida | Texas

Operational Conditions Reports

Southwest Florida — Forecast Region Maps

Thursday, June 2, 2016

Karenia brevis (commonly known as Florida red tide) ranges from not present to background concentrations along the coast of southwest Florida, and is not present in the Florida Keys. No respiratory irritation is expected alongshore southwest Florida Thursday, June 2 through Monday, June 6.

Check http://tidesandcurrents.noaa.gov/hab/beach_conditions.html for recent, local observations.

Other Sources of Gulf of Mexico HAB Status Info:

Check our Local Beach Conditions page.

NOAA HABSOS:
View map of cell counts and environmental data.

The interdisciplinary synergy within the red tide research group has generated considerable progress in understanding the exposures and potential impacts of Florida red tide aerosols.

We are advancing toward our goals:

1) understanding whether exposure to these aerosols represents a public health threat beyond the nuisance eye, nose, and throat irritation, and determining whether people who have underlying respiratory conditions such as asthma, should take special precautions when visiting the beach during a red tide.

2) Integrating this research program with ongoing oceanographic monitoring and modeling will help to establish Florida red tide **early warning systems** to **mitigate or even prevent exposure in susceptible human populations (both residents and tourists)**.

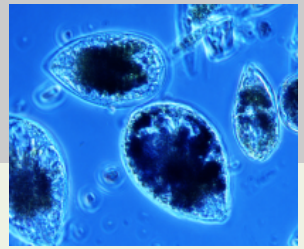
3) Finally, even though we have specifically applied the expertise in this research program to investigate Florida red tide aerosols, **our approach is a model for the study of other HAB-related toxins and for other aerosolized environmental contaminants.**

Ostreopsis blooms

OCEANEXT

Multidisciplinary studies on *Ostreopsis* in the Mediterranean:

- MediOs – France (Lemée et al. 2008-2010)
- EBITOX project (Vila, Franco, Riobó; 2009-2011)
- RAMOGE (on going) Monaco, France, Italy, Spain



Cryptogamie, Algologie, 2012, 33(2):137-142

Interactions between scientist, managers and policy makers in the framework of the French MediOs project *on Ostreopsis* (2008-2010)

Rodolphe LEMÉE[a,b], Luisa MANGIALAJO[c], Stéphanie COHU[a,b,c], Zouher AMZIL[d], Aurélie BLANFUNE[a,b,c], Nicolas CHOMERAT[d], Nicolas GANZIN[d], Stéphane GASPARINI[a,b], Hubert GROSSEL[d], Laurence GUIDI-GUIVARD[a,b], Laurent HOAREAU[e], Franck le DUFF[f], Sophie MARRO[a,b], Nathalie SIMON[g], Elisabeth NEZAN[d], Maria-Luiza PEDROTTI[a,b], Véronique SECHET[d], Odile SOLIVERES[e], Thierry THIBAUT[c]*

Ostreopsis blooms

Multidisciplinary studies on *Ostreopsis* in the Mediterranean:

- MediOs – France (Lemée et al. 2008-2010)
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- RAMOGE (on going) Monaco, France, Italy, Spain

Cryptogamie, Algologie, 2012, 33 (2): 143-152

Management of *Ostreopsis* blooms in recreational waters along the Catalan coast (NW Mediterranean Sea): cooperation between a research project and a monitoring program

Magda VILA[a], Laura ARIN[a], Cecilia BATTOCCHI[b], Isabel BRAVO[c], Santiago FRAGA[c], Antonella PENNA[b], Albert REÑÉ[a], Pilar RIOBÓ[d], Francisco RODRIGUEZ[c], M. Montserrat SALA[a], Jordi CAMP[a], Mariona de TORRES[e] & José M. FRANCO[d]*

Ostreopsis blooms

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Accord RAMOGE

Prévention & Lutte contre la Pollution du Milieu Marin

Accueil | Accord RAMOGE | Gestion intégrée de la zone côtière | Plan RAMOGEPOL | Education et Communication | Documents RAMOGE | Partenaires & Liens | Urgence | Contact

L'Accord & La Zone RAMOGE

La zone RAMOGE comprend les zones maritimes de la Région Provence-Alpes-Côte d'Azur, de la Principauté de Monaco et de la Région Ligurie formant ainsi une zone pilote de prévention et de lutte contre la pollution du milieu marin.

L'Accord RAMOGE représente un instrument de coopération scientifique, technique, juridique et administrative où les gouvernements Français, Monégasque et Italien mettent en oeuvre des actions pour une gestion intégrée du littoral.

Actualités & Evènements

[01 septembre 2014]

EXERCICE RAMOGEPOL 2014

Archipel Toscan 16 - 17 septembre 2014 - Télécharger le dossier de presse.

Voir toutes les actualités

Ostreopsis blooms

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Suivi de la problématique Ostreopsis

Ostreopsis ovata est une algue microscopique unicellulaire qui vit habituellement dans les eaux chaudes des mers tropicales. Le transport par les eaux de ballast des navires et des conditions climatiques très favorables ont permis à cette microalgue de se développer sous nos latitudes.

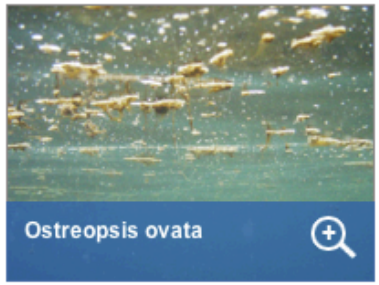
Ainsi, depuis quelques années, des phénomènes d'efflorescence impliquant cette algue ont été observés dans toute la partie nord-ouest de la Méditerranée et dans certains cas une toxicité sur l'homme a été observée.

Les effets toxiques se limitent habituellement à des **symptômes de type grippal** tels que fièvre, toux, nausées, rhume, conjonctivite, troubles respiratoires. **Les personnes atteintes n'ont pas forcément été en contact direct avec l'eau ; il suffit d'inhaler les gouttelettes transportées par le vent pour que les symptômes se manifestent**.

Avec le soutien de l'Accord RAMOGE, des recherches sont actuellement en cours sur les causes et effets de la toxicité de cette algue.

En 2010 une réunion regroupant des scientifiques et des autorités sanitaires des trois Etats a permis de faire le point sur **le mode de surveillance** de cette algue dans chaque Etat, sur leur **gestion de la crise liée à une efflorescence** ainsi que sur les **problèmes sanitaires induits** par cette algue et leur gestion.

En 2011, l'Accord RAMOGE a apporté son soutien à l'organisation du Congrès International sur l'algue Ostreopsis ICOD, organisé par l'Observatoire de Villefranche-sur-Mer, l'Université de Nice-Sophia Antipolis et l'Université de Gênes.


Ostreopsis ovata

Durant la dernière décennie une grande attention a été portée sur le développement des espèces du genre *Ostreopsis* (dinoflagellés benthiques), dont certaines ont proliféré dans les mers tempérées. Ce Congrès International sur le Développement d'*Ostreopsis* a permis de dresser un bilan des connaissances sur :"

- les aspects écologique, chimique et toxicologique en relation avec les espèces du genre *Ostreopsis*
- les méthodes écologique, économique et sanitaire liées à la gestion de ce problème.

Le congrès a été une grande réussite, avec 4 conférences plénières, plus de 25 communications orales et 20 communications affichées, concernant l'écologie, la biogéographie et les impacts d'*Ostreopsis* sur les écosystèmes côtiers, la toxicité des métabolites secondaires et la gestion environnementale, sanitaire et économique du problème.

Ostreopsis blooms

Informative brochure
In Italian, French, Catalan and Spanish

Quels sont les effets sur les écosystèmes ?

Par ailleurs, les différentes études menées en Méditerranée, au Brésil et en Nouvelle-Zélande ont montré que **le développement de certaines espèces d'*Ostreopsis* peut être accompagné d'une mortalité chez certains invertébrés marins**, comme les oursins, étoiles de mer, moules et crabes.

Cette mortalité peut être aussi bien liée à la toxicité des micro-algues qu'aux effets indirects des efflorescences (comme une diminution de la teneur en oxygène de l'eau de mer suite à la dégradation des micro-algues par les bactéries).

©M. Vila. ICM-CSIC.
Macro algues recouvertes d'un épais biofilm d'Ostreopsis.

Actions en cours pour mieux comprendre et gérer le phénomène *Ostreopsis*

Depuis les récents événements d'efflorescences d'*Ostreopsis* en mer Méditerranée, des programmes de surveillance ont été mis en place par les autorités et les chercheurs afin de surveiller les concentrations des micro-algues des zones de baignade les plus fréquentées pendant les périodes estivales.

Ces programmes de surveillance initiés en France, en Espagne, à Monaco et en Italie visent à **réduire le risque d'intoxication et à mieux comprendre l'écologie et la dynamique d'*Ostreopsis*.**

Des directives nationales ont également été édictées afin **d'informer les populations locales sur les efflorescences d'*Ostreopsis*** et de leur indiquer les comportements à adopter en cas d'efflorescence.

Numéro utile

En cas de symptômes pouvant être causés par une efflorescence d'*Ostreopsis*, alertez le poste de secours le plus proche sur la plage ou allez à la pharmacie.

Vous pouvez contacter le
CENTRE ANTIPOISON ET DE TOXICOVIGILANCE
de Marseille
04 91 75 25 25

Accord RAMOGE

Prévention & Lutte contre la Polution du Milieu Marin

Secrétariat de l'Accord RAMOGE
Le Michelangelo
7, avenue des Papalins - 98 000 Monaco

tel (+377) 98 98 42 29
fax (+377) 98 98 40 07
contact@ramoge.org
www.ramoge.org

ARPAL · ISPRA Istituto Superiore per la Protezione e la Ricerca Ambientale · DISTAV · Regione Liguria · Centre Scientifique de Monaco · Gouvernement Princier Principauté de Monaco · UPMC Sorbonne Universités · cnrs · Université Nice Sophia Antipolis · Région PACA · ECOMERS · ICM Institute of Marine Sciences · CSIC · ARS

L'ALGUE OSTREOPSIS

Ostreopsis blooms

- Informative video
- In Italian, French, Catalan and Spanish
- In collaboration with M3-HAB project (next presentation by Rodolphe Lemée)

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The OstreoRisk project (CTM2014-53818-R): a multidisiciplinary approach to understand the impacts on human health of the *Ostreopsis* cf. *ovata* blooms

Sant Andreu de Llavaneres, July 2014

Institut de Ciències del Mar

ICM

CSIC

Consejo Superior de Investigaciones Científicas

Universitat de Barcelona

idaea

Generalitat de Catalunya
Agència de Salut Pública de Catalunya

Ajuntament de Sant Andreu de Llavaneres

Agència Catalana de l'Aigua

Ministerio de Economía y Competitividad

Available tools. International Coordination

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Global Ecology & Oceanography of Harmful Algal Blooms

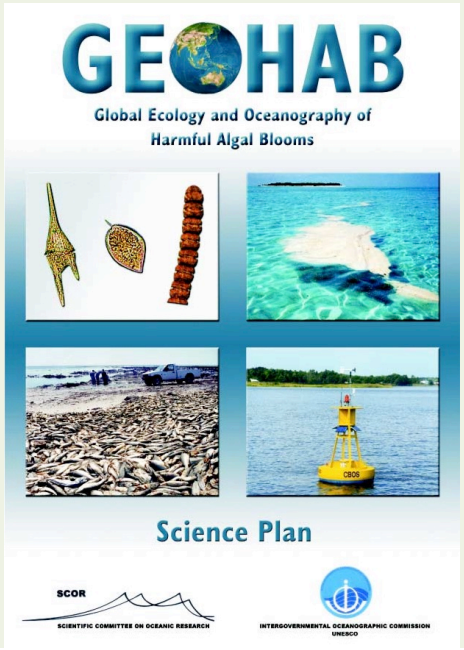
The GEOHAB programme (1998-2013)

United Nations Educational, Scientific and Cultural Organization

Intergovernmental Oceanographic Commission

Overall Scientific Goal of GEOHAB:

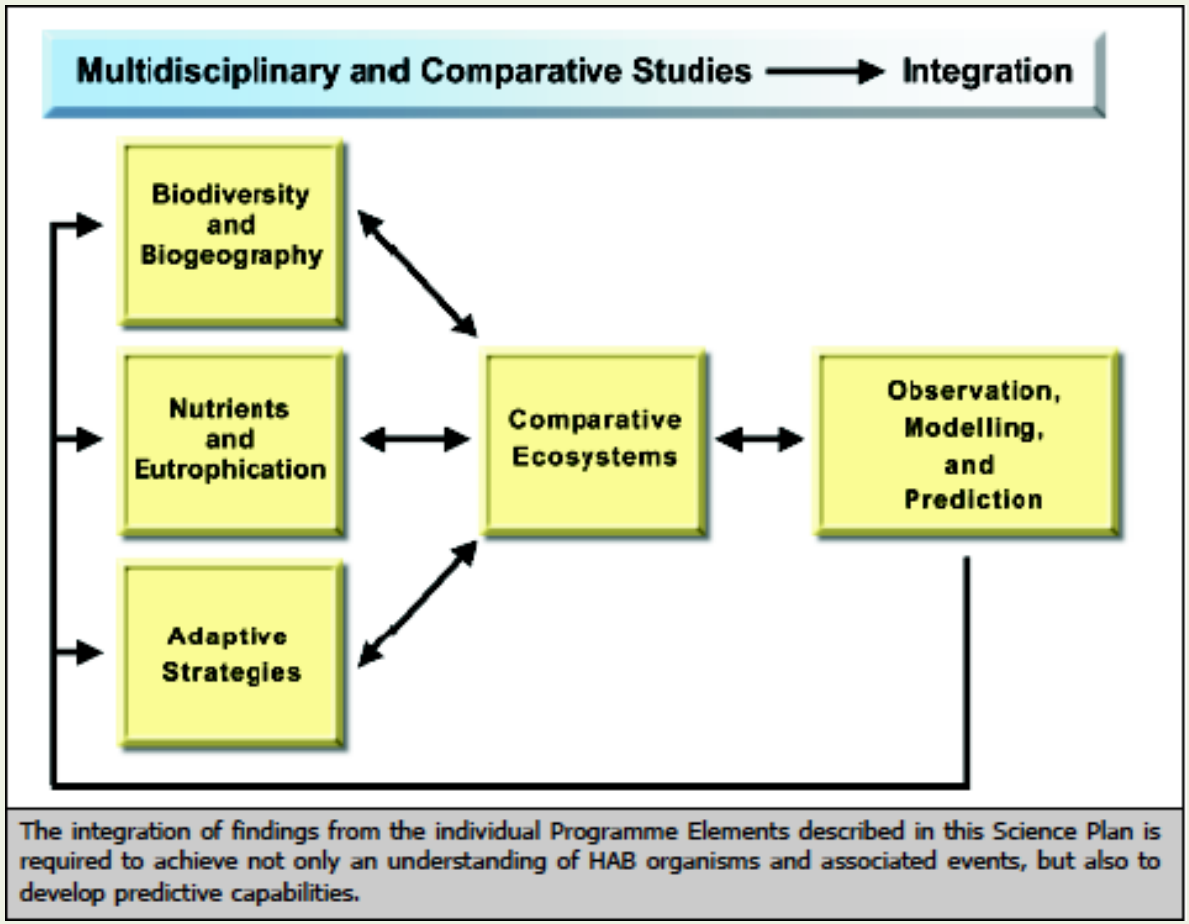
"Improve prediction of HABs by determining the ecological and oceanographic mechanisms underlying their population dynamics, integrating biological, chemical, and physical studies supported by enhanced observation and modelling techniques." GEOHAB Science Plan, p. iv



The **mission of GEOHAB** is to:

Foster international co-operative research on HABs in ecosystem types sharing common features, comparing the key species involved and the oceanographic processes that influence their population dynamics

GEOHAB SCIENCE PLAN – KEY ELEMENTS



The integration of findings from the individual Programme Elements described in this Science Plan is required to achieve not only an understanding of HAB organisms and associated events, but also to develop predictive capabilities.

The approach of the GEOHAB Programme is comparative, from the cellular to the ecosystem level. This approach is based on the view that the ecology and oceanography of HABs can best be understood through the study of causative organisms and affected systems in relation to comparable species and systems.

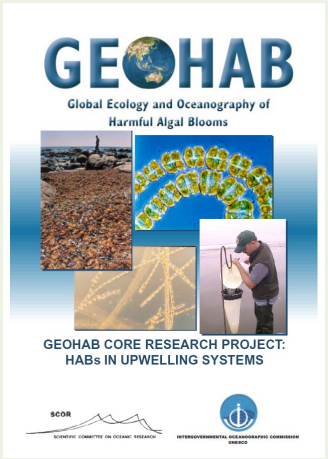
Some GEOHAB products

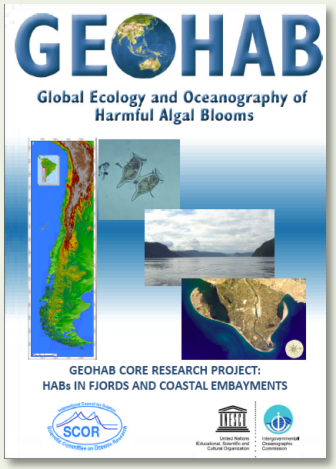
Core Research Programmes:

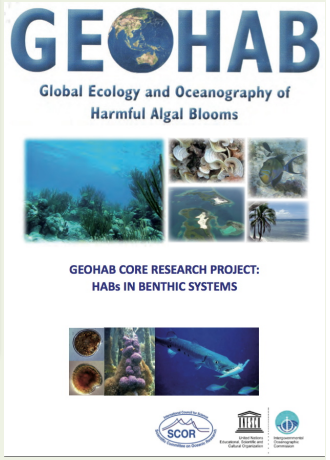
- Upwelling
- Eutrophic systems
- Stratified Systems
- Fjords & Coastal Embayments
- Benthic HABs

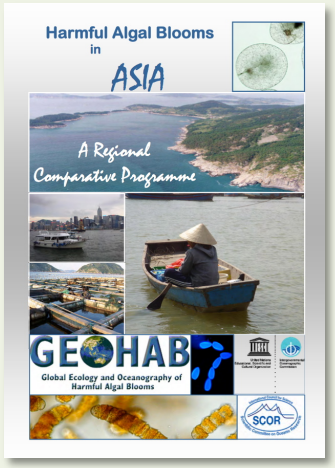
Regional Programme

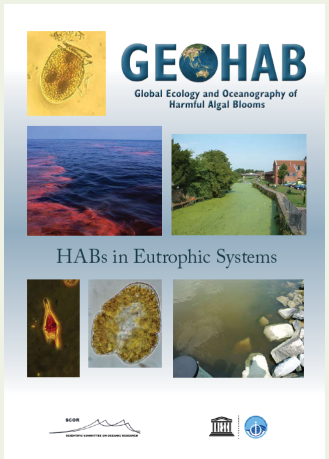
- Asia

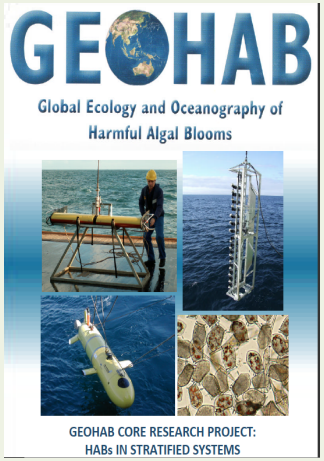












GEOHAB Global Ecology and Oceanography of Harmful Algal Blooms

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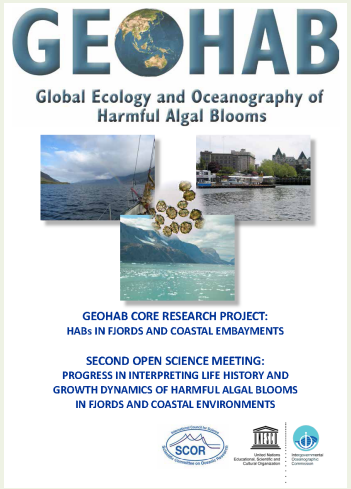
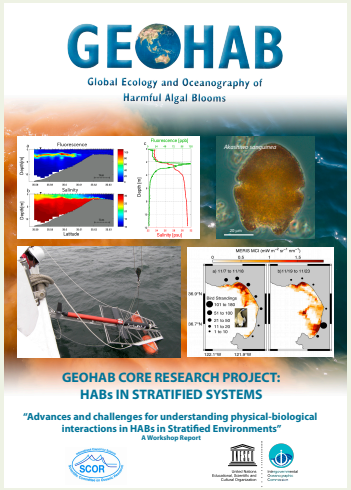
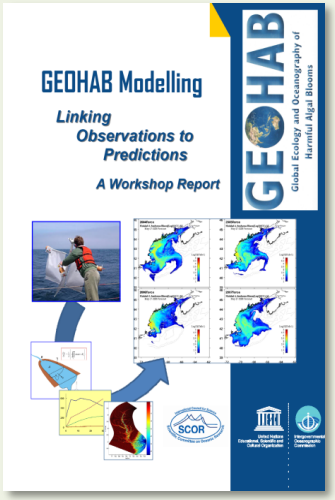
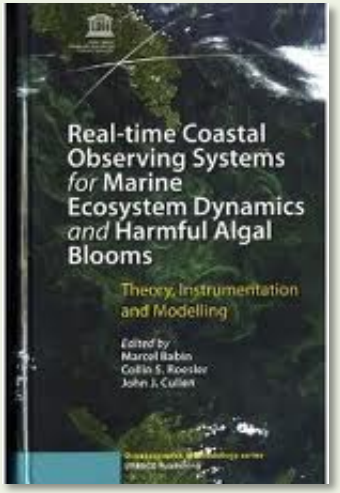
Framework Activities:

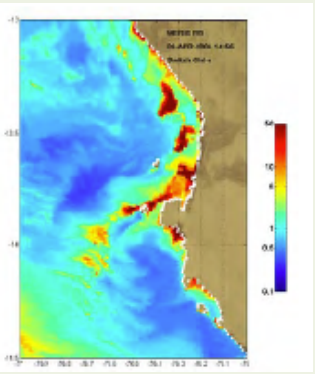




- Intl. Coordination
- Modeling
- Observation systems
- Capacity Building
- Remote Sensing
- Outreach







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Harmful Algal Blooms
A scientific summary for policy makers
SCOR
GEOHAB

OCEANEXT

GEOHAB – Summary for Policy Makers

- HABs result from noxious and/or toxic algae that cause direct and indirect negative impacts to aquatic ecosystems, coastal resources, and human health.
- HABs are present in nearly all aquatic environments as naturally occurring phenomena.
- Many HABs are increasing in severity and frequency, and biogeographical range. Some of this expansion is attributed to climate change and global change.
- Research has improved understanding, leading to better prediction and monitoring, and potentially, mitigation.
- HABs are a worldwide phenomenon requiring international understanding leading ultimately to local and regional solutions.
- HABs must be integrated with policy decisions.

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GEOHAB: Past, Present, Future
Open Science Meeting, Paris 2013

"We all came to Paris because we recognize a fundamental problem (HABs), and cannot solve this problem in our individual laboratories. This requires an international approach."

GEOHAB Global Ecology and Oceanography of Harmful Algal Blooms

GEOHAB Synthesis

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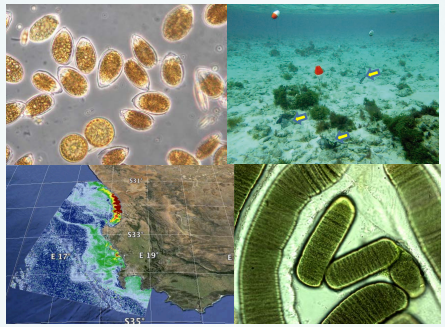
Main successful aspects of GEOHAB:

- establish and sustain global research groups on core research topics, sound science leading to better understanding and prediction of HABs;
- OSMs, Reports, and Workshops: HabWatch, Modeling Workshop;
- endorsing process;
- sponsorship of framework activities: technology development, capacity building, and training of young scientists

GEOHAB
Global Ecology and Oceanography of Harmful Algal Blooms



GEOHAB Synthesis Open Science Meeting
Paris, April 2013

SCOR
United Nations Educational, Scientific and Cultural Organization
Intergovernmental Oceanographic Commission

The ***GEOHAB Science Plan*** (GEOHAB, 2001):
a solid basis for another ten years of HAB research.

GEOHAB Synthesis

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- ***GlobalHAB:***

  - **new structures and mechanisms** defined with **clear goals**, of relatively **short duration**,

  - able to produce **useful documents for a broad scientific community and the society,**

  - include **new strategic research targets and approaches** non present in the former GEOHAB, such as:

HABs are a worldwide phenomenon requiring international understanding leading ultimately to local and regional solutions

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GEOHAB
Global Ecology and Oceanography of Harmful Algal Blooms

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UNESCO
United Nations Educational, Scientific and Cultural Organization

Intergovernmental Oceanographic Commission

1998-2013

- Biodiversity & Biogeography
- Nutrients & Eutrophication
- Adaptive Strategies
- Comparative Ecosystems
- Observation, Modelling and Prediction

GlobalHAB
IOC-SCOR

2016-2025

- Emerging Toxins & BHABs
- Climate Change
- Epidemiology
- Economic impacts
- Links with aquaculture
- New Integrated policies

- **HABs Management and Mitigation**
- **Better Oceans and Human Health**

GOAL

To improve understanding, prediction, management and mitigation of HABs in aquatic ecosystems.

MISSION

GlobalHAB will address the science and societal challenges of HABs, including the environmental, human health and economic impacts, in a rapidly changing world.

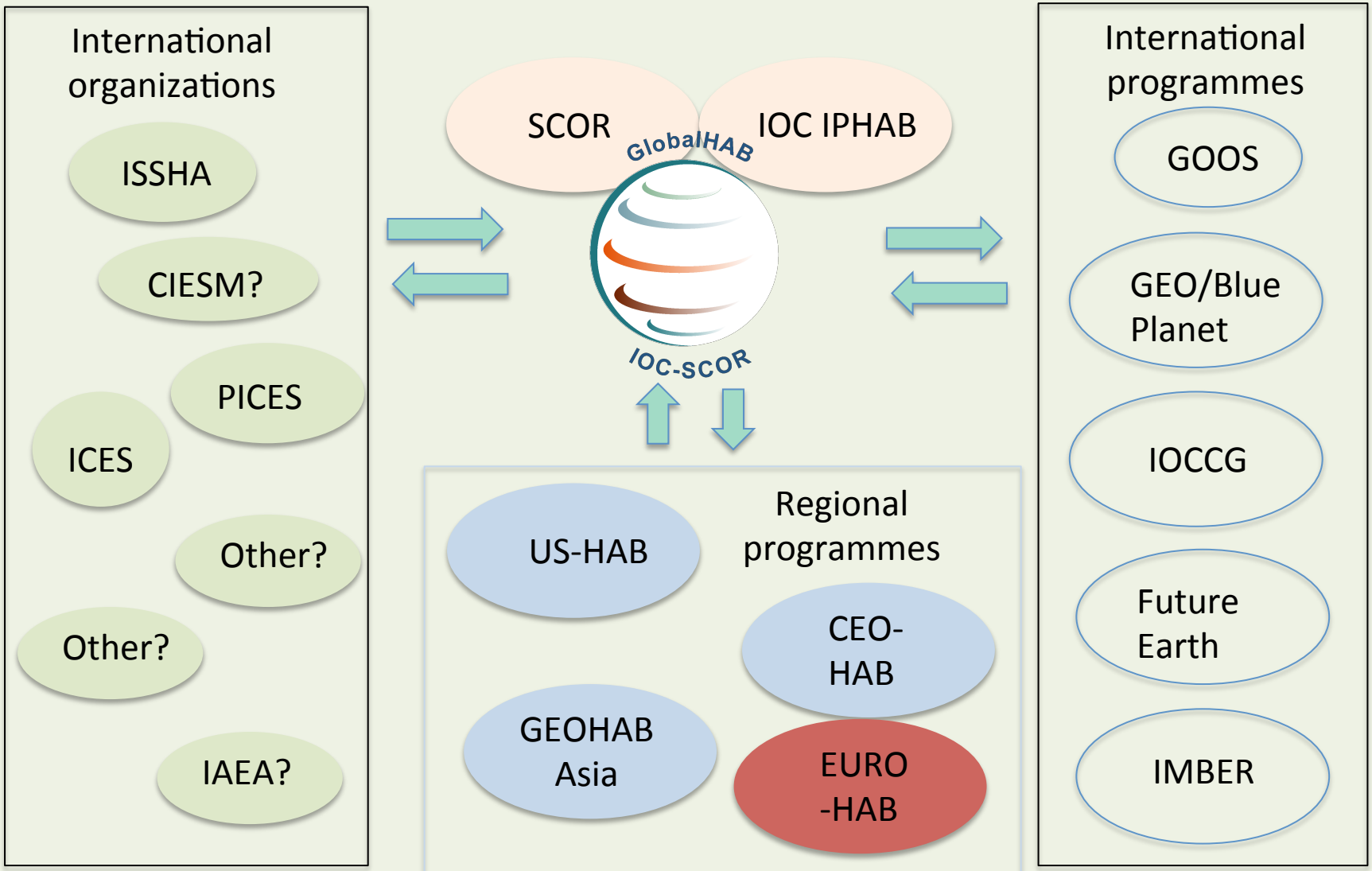
GH will consolidate linkages with broader scientific fields and other regional and international initiatives relevant to HABs.

GH will foster the development and adoption of advanced technologies.

GH will promote training, capacity building and communication of HAB research to society.

GlobalHAB will be the liaison between the scientific community, stakeholders and policy makers, informing science based decision making.

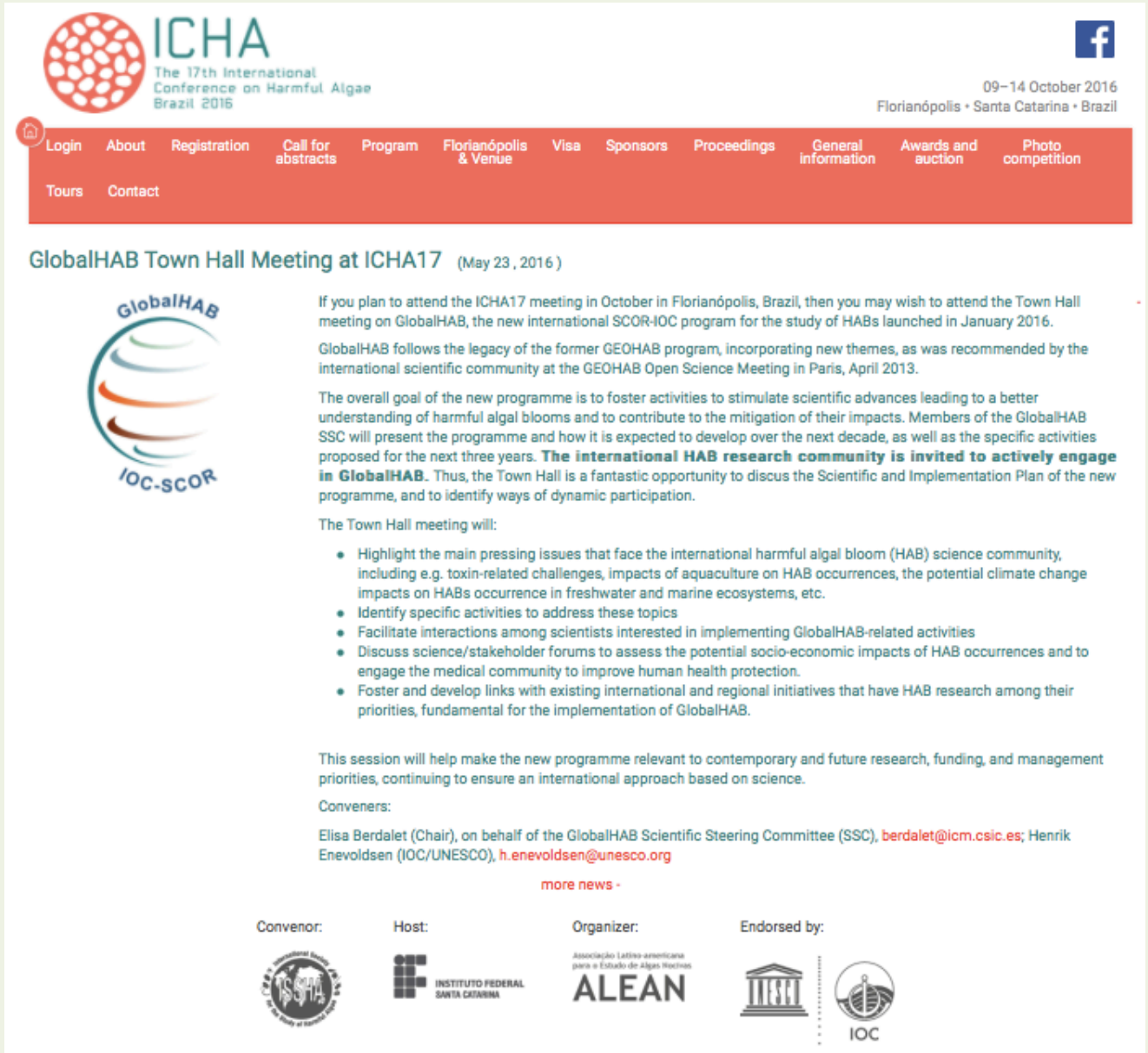
Interaction with international programmes that have HAB research as a term of reference is fundamental for the success of GlobalHAB



Scientific Steering Committee Meeting, Oban, 7-9 March, 2016

Banas, Neil	UK	Modeling
Berdalet, Elisa	Spain	BHAB, Human Health
Burford, Michele	Australia	Freshwater, CyanoHABs
Davidson, Keith	UK	Modelling, Economy
Gobler, Chris	US	Ecophysiology, Acidification
Karlson, Bengt	Sweden	Brackish, Observation
Kudela, Raphe	US / GOOS	Climate Change
Lim, Po Teen	Malaysia	Toxins
Mackenzie, Lincoln	New Zealand	Aquaculture
Montresor, Marina	Italy	Biodiversity, taxonomy
Yin, Kedong	China	Eutrophication, time series
Bresnan, Eileen	ICES-WGHABD	
Trainer, Vera	ISSHA, PICES	
Usup, Gires	IPHAB	
Enevoldsen, Henrik	IOC-UNESCO	
Urban, Ed	SCOR	

Active involvement of the scientific community studying HABs is fundamental for the success of GlobalHAB



ICHA
The 17th International Conference on Harmful Algae
Brazil 2016

09–14 October 2016
Florianópolis • Santa Catarina • Brazil

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GlobalHAB Town Hall Meeting at ICHA17 (May 23 , 2016)

If you plan to attend the ICHA17 meeting in October in Florianópolis, Brazil, then you may wish to attend the Town Hall meeting on GlobalHAB, the new international SCOR-IOC program for the study of HABs launched in January 2016.

GlobalHAB follows the legacy of the former GEOHAB program, incorporating new themes, as was recommended by the international scientific community at the GEOHAB Open Science Meeting in Paris, April 2013.

The overall goal of the new programme is to foster activities to stimulate scientific advances leading to a better understanding of harmful algal blooms and to contribute to the mitigation of their impacts. Members of the GlobalHAB SSC will present the programme and how it is expected to develop over the next decade, as well as the specific activities proposed for the next three years. **The international HAB research community is invited to actively engage in GlobalHAB**. Thus, the Town Hall is a fantastic opportunity to discus the Scientific and Implementation Plan of the new programme, and to identify ways of dynamic participation.

The Town Hall meeting will:

- Highlight the main pressing issues that face the international harmful algal bloom (HAB) science community, including e.g. toxin-related challenges, impacts of aquaculture on HAB occurrences, the potential climate change impacts on HABs occurrence in freshwater and marine ecosystems, etc.
- Identify specific activities to address these topics
- Facilitate interactions among scientists interested in implementing GlobalHAB-related activities
- Discuss science/stakeholder forums to assess the potential socio-economic impacts of HAB occurrences and to engage the medical community to improve human health protection.
- Foster and develop links with existing international and regional initiatives that have HAB research among their priorities, fundamental for the implementation of GlobalHAB.

This session will help make the new programme relevant to contemporary and future research, funding, and management priorities, continuing to ensure an international approach based on science.

Conveners:

Elisa Berdalet (Chair), on behalf of the GlobalHAB Scientific Steering Committee (SSC), berdalet@icm.csic.es; Henrik Enevoldsen (IOC/UNESCO), h.enevoldsen@unesco.org

more news -

Convenor: Host: Organizer: Endorsed by:

INSTITUTO FEDERAL SANTA CATARINA

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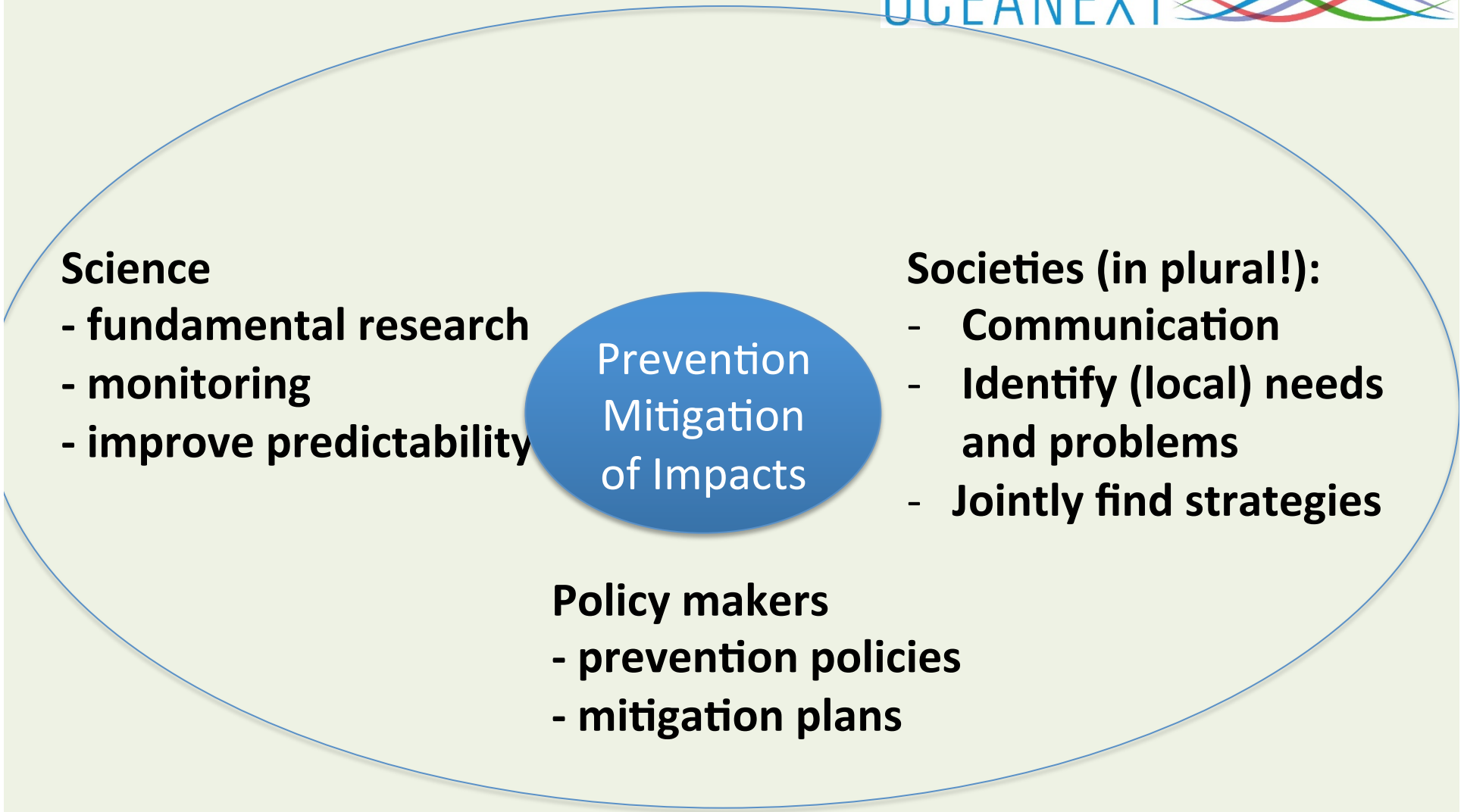
OCEANEXT
Science
- fundamental research
- monitoring
- improve predictability
Prevention
Mitigation
of Impacts
Societies (in plural!):
- Communication
- Identify (local) needs and problems
- Jointly find strategies
Policy makers
- prevention policies
- mitigation plans

We need HABs-activists!

Do you join GlobalHAB?

Thanks for your attention!!!