



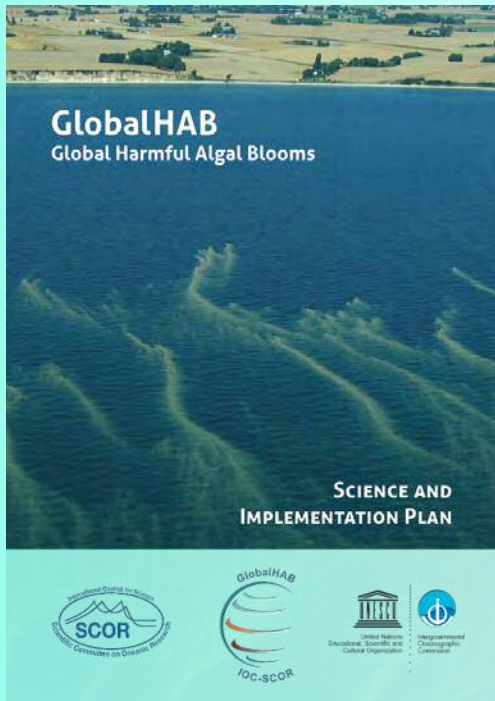
**GlobalHAB (IOC-UNESCO and SCOR):
Latinamerica contribution to the international
coordination for sound knowledge of HABs and
management of their impacts**

SYM12: Harmful Algal Blooms: from detection to countermeasures

Elisa Berdalet¹, Clarissa Anderson², Neil Banas³, Timothy Davis⁶,
David Clarke¹⁷, Hae Jin Jeong⁷, Bengt Karlson⁴, Raphael M. Kudela¹⁸,
Brian Lapointe¹², Po Teen Lim⁵, José Eduardo Martinelli Filho¹³, Ester Serrao¹⁴,
Raffaele Siano⁹, Joe Silke¹⁷, Vera Trainer¹⁹, Brigitta van Tussenbroek¹¹,
Susie Wood¹⁰, Aletta Yñiguez⁸, Patricia Miloslavich¹⁶, Henrik Enevoldsen¹⁵.



The GlobalHAB programme 2016-2025



Goal: to improve

- the understanding and prediction of HABs in aquatic ecosystems, and
- management and mitigation of their impacts

Mission:

- Foster international coordination and co-operative research to address the scientific and societal challenges of HABs, including the environmental, human health and economic impacts, in a rapidly changing world.
- Serve as a liaison between the scientific community, stakeholders and policy makers, informing science-based decision-making.

<http://www.globalhab.info>

www.globalhab.info/

GlobalHAB
IOC-SCOR

Global Harmful Algal Blooms

SCOR
United Nations
Educational, Scientific and
Cultural Organization

Intergovernmental
Oceanographic
Commission

Search ...

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SUSTAINABLE DEVELOPMENT GOALS

In the broader picture GlobalHAB contributes to improved management of HABs as an ocean hazard through improved preparedness and early warning systems contributing to UN Sustainable Development Goal 11, target 11.5 and Priority 4 and Global target 7 of the Sendai Framework on Disaster Risk Reduction (UNISDR) 2015-2030.

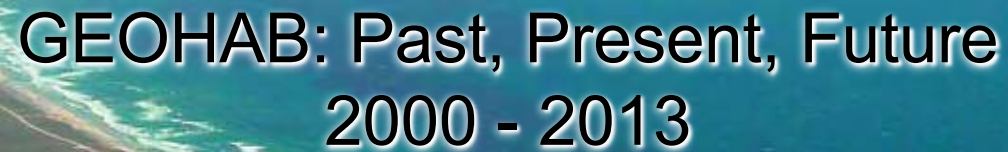
News & Events
Scientific Steering Committee Meetings
GlobalHAB activities
Calendar

Get Involved
Invitation to participate

Global Harmful Algal Blooms - GlobalHAB - an international science programme on HABs building on the foundations of GEOHAB

SCIENCE AND IMPLEMENTATION PLAN

User login
Username
Password



GEOHAB: Past, Present, Future 2000 - 2013

Synthesis GEOHAB Open Science Meeting at IOC
Headquarters in Paris, France in April 2012
51 scientists from the 5 continents attended the meeting

“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.”



Global Ecology & Oceanography of Harmful Algal Blooms

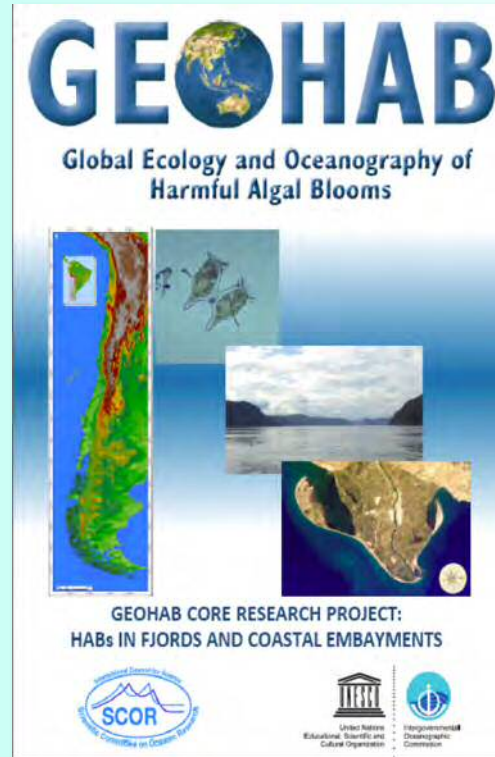
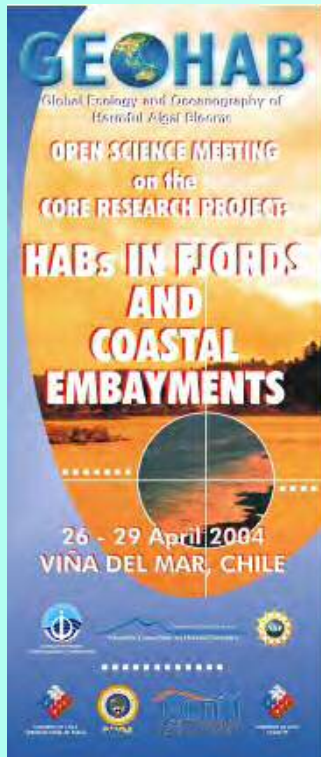
Core Research Programmes:

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

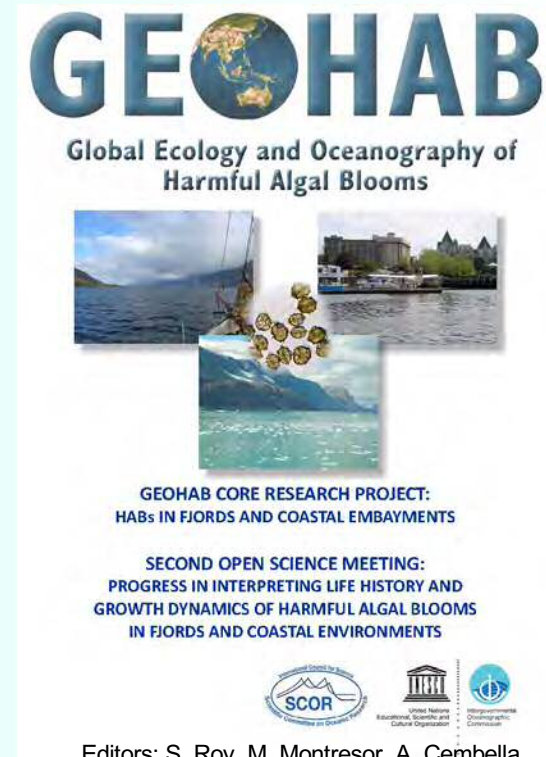
Regional Programme

- Asia





Editors: A. Cembella, L. Guzmán,
S. Roy, J. Diogène



Editors: S. Roy, M. Montresor, A. Cembella

Some Research Priorities for understanding HAB dynamics in Fjords and Coastal Embayments

- What is the importance of **life history transitions and cyst distribution in bloom initiation and maintenance** – endogenous seed beds versus exogenous introduction?
- How do **physical dispersion and aggregation processes** within a semi-confined basin affect HAB growth and distribution?
- What is the relative contribution of **nutrient flux and supply ratios** to HAB dynamics in eutrophic versus non-eutrophic coastal embayments?
- How do **embayment morphology, bathymetry and hydrodynamics** affect HAB dynamics
- Are the effects of **human activities (e.g. aquaculture)** and **global climate change** on HAB dynamics magnified in enclosed and semi-enclosed embayments?

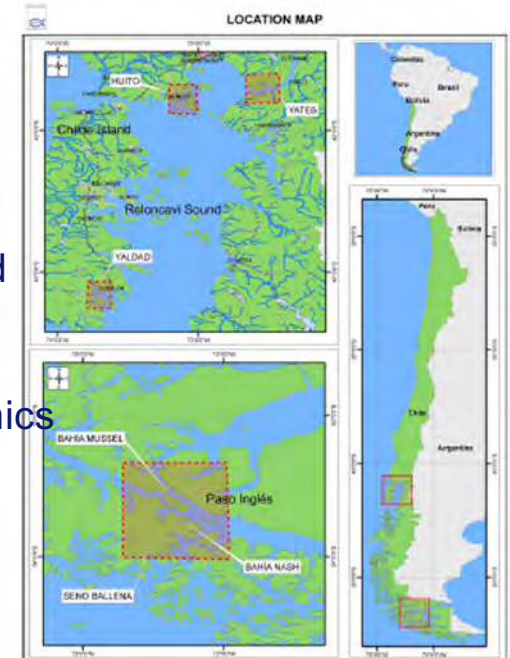


Fig. 3. Map of Chile, including areas of interest in Los Lagos (top left) and Magellan regions (bottom left), along the fjordal system. The Aysén region extends between the Los Lagos and Magellan regions. The Francisco Coloane marine park is located off Paso Inglés. The maps were produced using ARC Editor 9.3, Environmental Systems Research Institute (ESRI).

GEOHAB

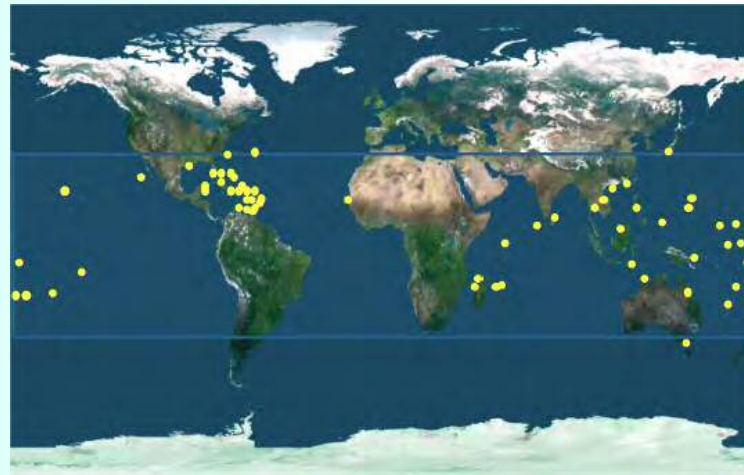
Global Ecology and Oceanography of
Harmful Algal Blooms



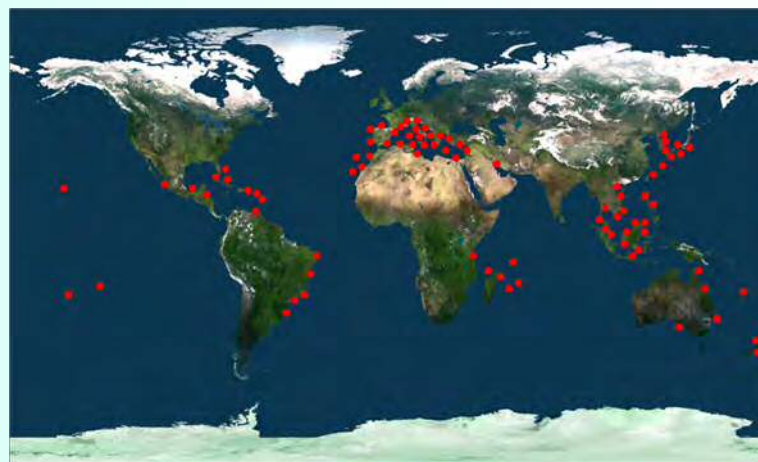
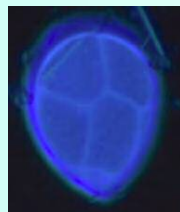
**GEOHAB CORE RESEARCH PROJECT:
HABs IN BENTHIC SYSTEMS**

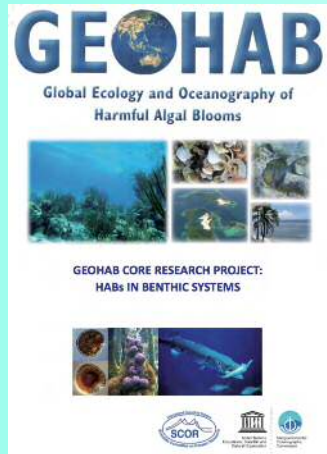


Gambierdiscus spp.



Ostreopsis spp.



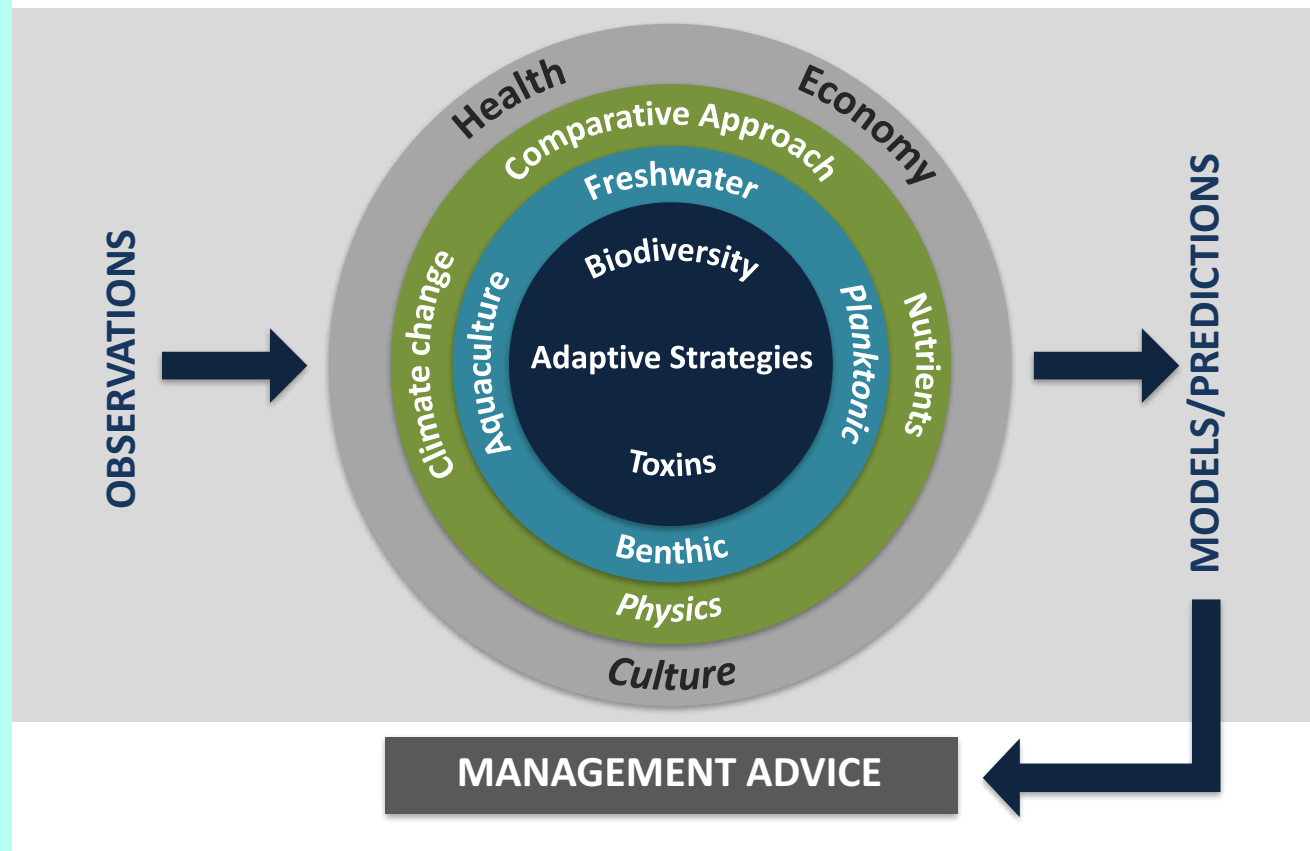


Some Research Priorities for understanding Benthic HABs

- Assess the **genetic variability** of *Gambierdiscus* and *Ostreopsis* species in relation to their **toxicity**, population **dynamics** and **biogeography**
- Determine the effects of **varying nutrient inputs** on the harmful properties of BHABs, **toxin production** and toxic gene expression
- Study the **trophic transfer processes** (fish, shellfish and other potential vectors grazing on macroalgae), which may affect human health
- Address the **link between fish size and CFP**, which appears to be associated with large fish in the Caribbean but variable fish size in the Pacific
- Explore links with microorganisms (allelopathy) and **macroalgal substrate**
- **Standardize sampling methods**

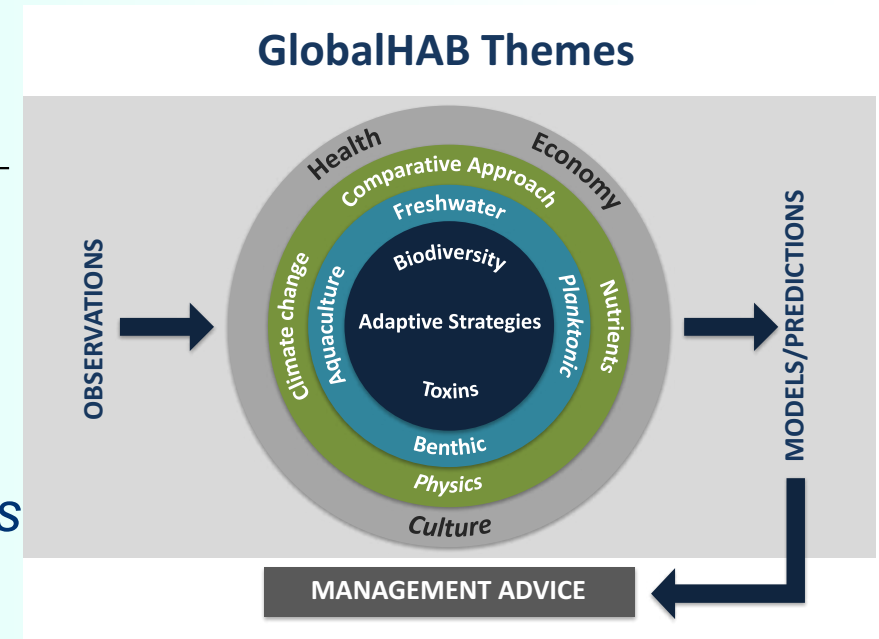
The GlobalHAB Science Plan is implemented through activities addressing the scientific questions formulated in each of the 12 Themes structuring the program (2016)

GlobalHAB Themes



GlobalHAB Science Plan 12 Themes (2016)

1. *Biodiversity and Biogeography*
2. *Adaptive Strategies*
3. *Toxins*
4. *Nutrients and Eutrophication*
5. *Freshwater HABs and cyanobacterial HABs*
6. *Benthic HABs (BHABs)*
7. *HABs and Aquaculture*
8. *Comparative Ecosystems*
9. *Observation, Modeling, and Prediction*
10. *HABs and Human and Animal Health*
11. *Economy*
12. *Climate Change and HABs*





GlobalHAB SCIENTIFIC STEERING COMMITTEE meeting

Laboratoire d'Océanographie de Villefranche (LOV) -
Hosted by Rodolphe Lemée
10-11 April 2018

Elisa Berdalet (Chair)	- Spain
Neil Banas	- UK
Michele Burford	- Australia
Chris Gobler	- USA
Bengt Karlson	- Sweden
Raphael Kudela (Vice)	- USA
Po Teen Lim	- Malaysia
Lincoln Mackenzie	- New Zealand
Marina Montresor	- Italy
Kedong Yin	- China

Liaisons:

Eileen Bresnan	- ICES-IOC WGHABD
Joe Silke (Gires Usup)	- IPHAB
Vera Trainer	- PICES and ISSHA
Raphael Kudela	- GOOS Biology and Ecosystems Panel

Ex-officio: Keith Davidson, UK

Sponsors Representatives:

Henrik Enevoldsen	- IOC/UNESCO
Ed Urban	- SCOR

***Since April 2018, coordination of the GlobalHAB SSC members has been conducted remotely and through meetings of opportunity (e.g. ICHA).
The corresponding budget is used on GlobalHAB implementation activities.***

Elisa Berdalet (Chair) - Spain
 Clarissa Anderson - USA
 Neil Banas - UK
 Timothy Davis - USA
 Hae Jin Jeong - S Korea
 Bengt Karlson - Sweden
 Po Teen Lim - Malaysia
 Raffaele Siano - France
 Susie Wood - New Zealand
 Aletta Yñiguez - Philippines

Liaisons:

David Clarke - ICES-IOC WGHABD
 Joe Silke - IPHAB
 Vera Trainer - PICES and ISSHA
 Raphael Kudela - GOOS Biology and
 Ecosystems Panel & IPCC

Sponsors Representatives:

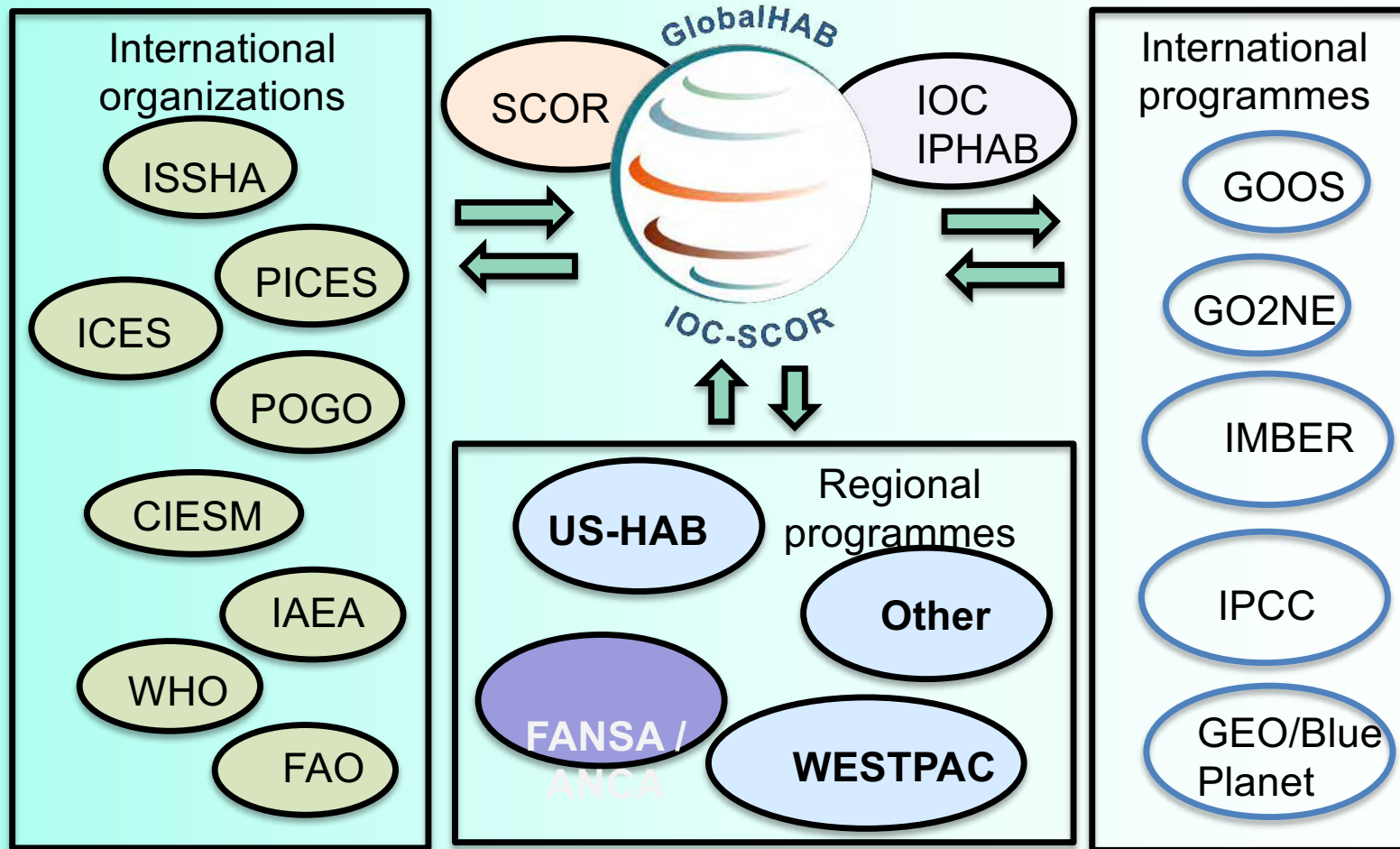
Henrik Enevoldsen - IOC/UNESCO
 Patricia Miloslavich – SCOR
 TBD - NOAA

New 2020 – 2022 GlobalHAB SSC

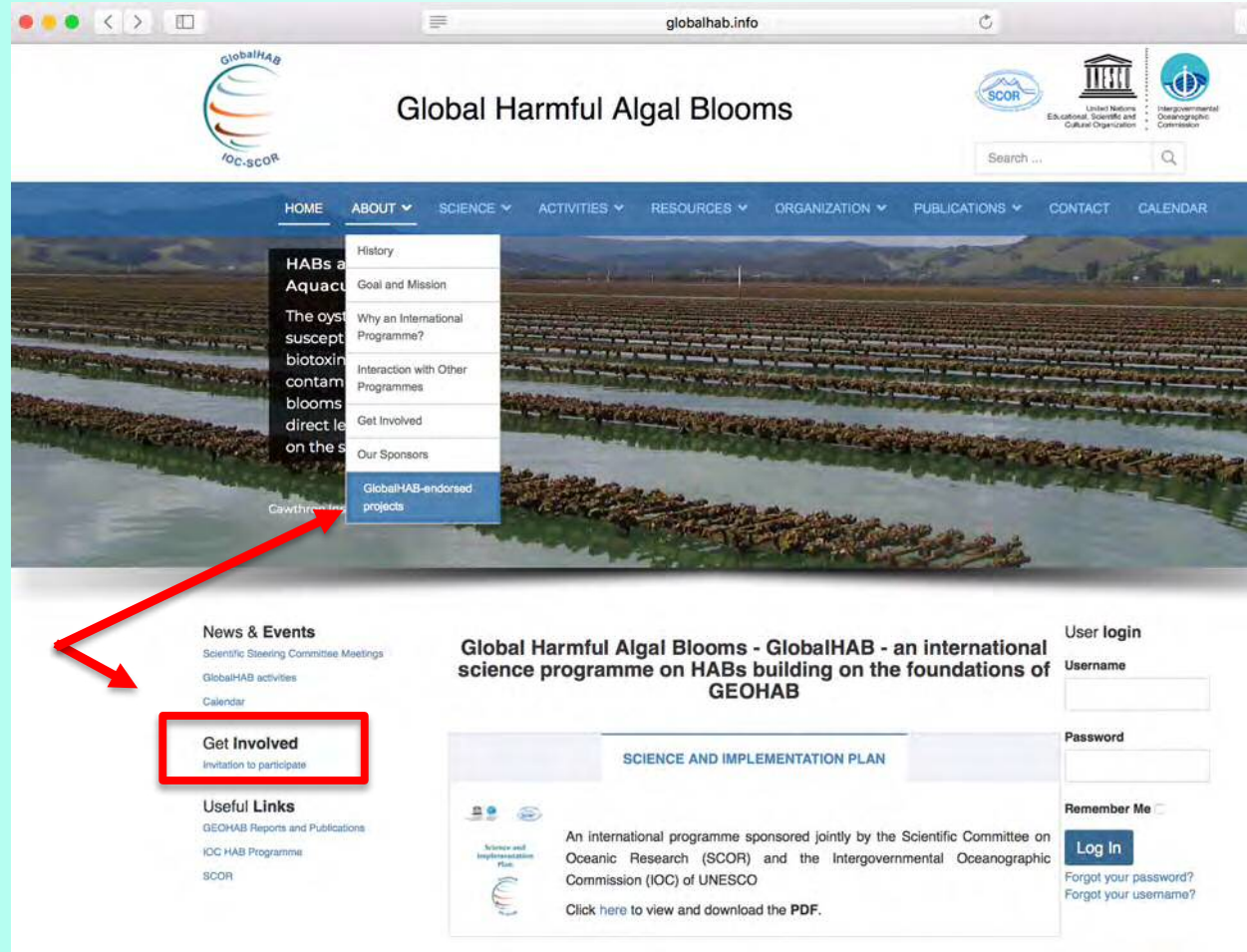


NOTE: Photos of the new SSC and the new ICES-IOC representative

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



The international community is invited to participate in the **GlobalHAB** programme, through seeking **endorsement** of relevant research, monitoring, and modelling activities relating to HAB projects



Endorsement
Application
Form

GlobalHAB Endorsed projects



The screenshot shows the GlobalHAB website interface. At the top left is the GlobalHAB logo, which includes the IOC-SCOR logo. The main title is "Global Harmful Algal Blooms". To the right are logos for SCOR, UNESCO, and the Intergovernmental Oceanographic Commission. A search bar is located below these logos. A blue navigation bar contains the following menu items: HOME, ABOUT, SCIENCE, ACTIVITIES, RESOURCES, ORGANIZATION, PUBLICATIONS, CONTACT, and CALENDAR. The "ACTIVITIES" menu is expanded, showing a list of project categories: GlobalHAB Activities, GlobalHAB-endorsed projects (highlighted in green), Past GEOHAB Targeted Research, Past Regional/National Research, and Past GEOHAB Framework Activities. Below the navigation bar, the "Globalhab endorsed projects" section lists several projects, including "REMEDIOS: Role of Mixing on phytoplankton blooms", "Selvagens Islands: an emerging 'hotspot' of benthic algal blooms", and "International Collaborative Study for the Validation and Tetrodotoxin in Live Bivalve Molluscs". To the right of this list is a "User Location" section with the text "Activities > GlobalHAB-endorsed projects". At the bottom left, there is a "New Projects Welcome" section.

Activities from **endorsed** projects and activities:

“Effects of climate changes on harmful algal and cyanobacterial blooms along the South Atlantic Ocean”.

Leader: Dr. Márcio Silva de Souza (Oceanography Institute (Federal University of Rio Grande, Brasil)

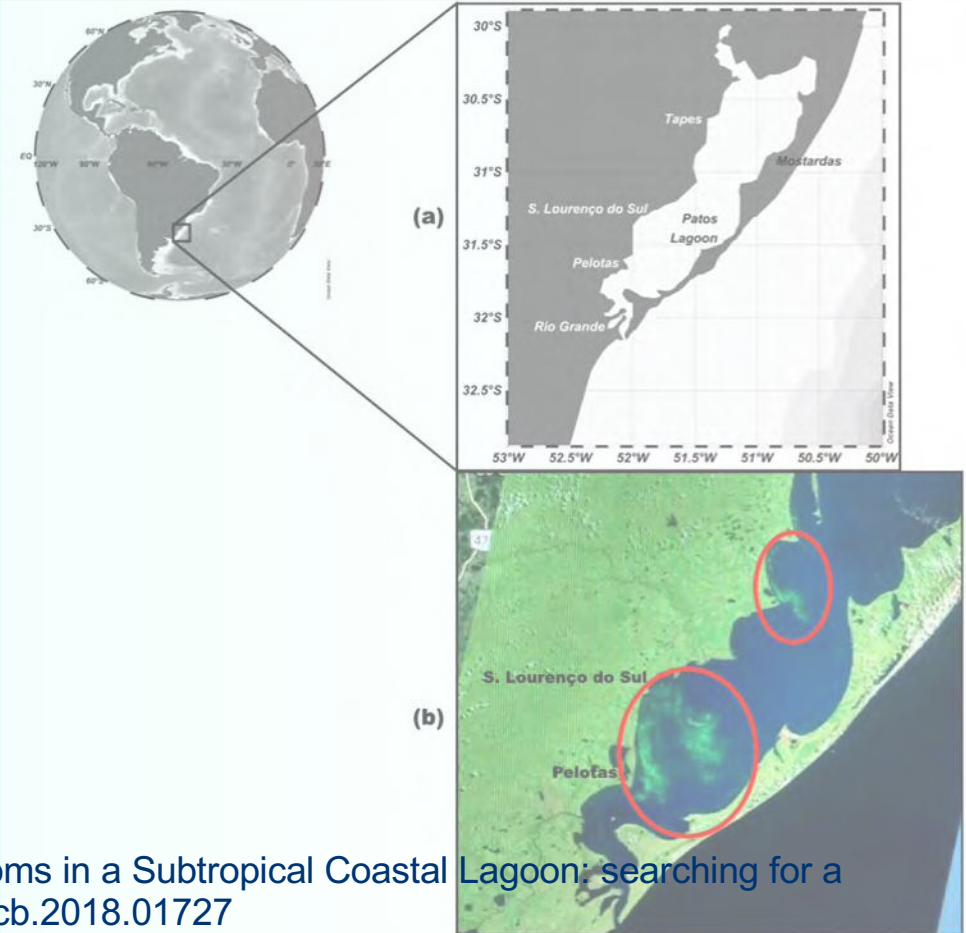
Participants: J. Sarkis Yunes, J. H. Muelbert,

Objectives:

- To assess direct and indirect effects of climate changes over phytoplankton blooms and HABs in the Atlantic Ocean (between 0°-35°S)
- To build predictive models of these biological events for the Brazilian coast
- To carry on bioassays with certain strains of HAB obtained in some local laboratories

Outcomes:

- 1) de Souza et al. 2018. Environmental variability and cyanobacterial blooms in a Subtropical Coastal Lagoon: searching for a sign of climate change effects. *Frontiers in Microbiology*. doi: 10.3389/fmicb.2018.01727
- 2) Costa et al. 2019. Domoic acid in the tropical South Atlantic Ocean – An environment case study. *Toxicon*. doi: 10.1016/j.toxicon.2019.05.009
- 3) Werlang et al. 2020. Toxigenic phytoplankton groups and neurotoxin levels related to two contrasting environmental conditions at the coastal area of Rio de Janeiro (west of South Atlantic). *Toxicon*. doi: 10.1016/j.toxicon.2020.06.016



Activities conducted by **GlobalHAB SSC members:**



Acknowledgements

This report was prepared by the SCOR-IOC Scientific Steering Committee of the Global Ecology and Oceanography of Harmful Algal Blooms research programme GlobalHAB, with contributions from colleagues.

GlobalHAB (2016-2025) is an international programme that aims to improve understanding and prediction of HABs in aquatic ecosystems, and management and mitigation of their impacts, and is sponsored by the Scientific Committee on Oceanic Research (SCOR) and the Intergovernmental Oceanographic Commission (IOC) of UNESCO.

Authors: M.A. Burford (Griffith University), C.J. Gobler (Stony Brook University), D.P. Hamilton (Griffith University), P.M. Visser (University of Amsterdam), M. Lurling (Wageningen University), G. Codd (University of Dundee).

For bibliographic purposes this document should be cited as:

M.A. Burford et al. 2019. Within lake & pond options for managing cyanobacterial blooms IOC/UNESCO, Paris (IOC/INF-1320).

Design: Emily Barratt, Liveworm Studio, Queensland College of Art, Griffith University

IOC/INF-1320 Rev.


Joint Activities by GlobalHAB and other international programs: Capacity building

UNESCO/IOC WESTPAC Training Workshop on Scientific Diving for Marine Benthic Dinoflagellates Sampling and Processing

17-21 September 2018, Phuket, Thailand

UNESCO IOC WESTPAC Training course on Applying analytical method for detecting Ciguatoxins (CTXs) in fish, 5-9 April 2018, Nha Trang Vietnam. Leader: Dr Leaw



 INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION
COMMISSION Océanographique InterGouvernementale
COMISION OCEANOGRÁFICA INTERGUBERNAMENTAL
МЕЖПРАВИТЕЛЬСТВЕННАЯ ОКЕАНОГРАФИЧЕСКАЯ КОМИССИЯ
اللجنة الدولية للمحيطات
政府同海洋学委员会

IOC Sub-Commission for the Western Pacific (WESTPAC), c/o the Department of Marine and Coastal Resources of Thailand
9th Floor, the Government Complex Building 8, 120 Chaengwattana Road, Lax Si, Bangkok 10210, Thailand
<http://iocwestpac.org> - fax: +66 (0)2 143 8245 - contact phone: +66 (0)2 141 1281-89 - E-mail: u@iucn.unesco.org

Ref. SCI/IOC/WESTPAC 18/15 3 August 2018

Dr Po Teen Lim
Associate Professor/Head of Bachok Marine Research Station
Institute of Ocean and Earth Sciences
University of Malaya, 16310 Bachok, Kelantan
Malaysia

Subject: Invitation to the WESTPAC Training Workshop on Introductory Scientific Diving for Marine Benthic Dinoflagellates Sampling and Processing, Phuket, Thailand, 17-21 September 2018

Dear Dr Po Teen Lim,

I am pleased to inform you that the WESTPAC Training Workshop on Introductory Scientific Diving for Marine Benthic Dinoflagellates Sampling and Processing will take place in Phuket, Thailand, 17-21 September 2018. This event will be kindly hosted by the Phuket Marine Biological Center (PMBC), with generous financial support of the Thai National Commission for UNESCO, and great technical assistance of the City University of Hong Kong (CityU), Sea Dweller Underwater Academy (SDUA), University of Malaya (UM), and the Second Institute of Oceanography (SIO) of the State Oceanic Administration of China.

This training workshop will last for five days, consisting of two parallel programmes, with Programme I as an introduction to scientific diving, and Programme II on sample processing, identification and culturing techniques for marine benthic dinoflagellates, aiming to train young scientists and the government authorities in the region in the standard protocols for introductory scientific diving, underwater sampling, sample processing, culturing and identification of marine benthic dinoflagellates. It will be conducted through lectures, presentations, hands-on training, scientific diving training, field work training workshops, and roundtable discussions at the end of each day to wrap up and summarize findings. Lectures will cover techniques involved in underwater sampling, processing and identification of species, both conventional and advanced techniques. The use of various preservatives in sample treatment and species identification will be discussed. The laboratory/hands-on session will cover application of the single-cell isolation by micropipetting technique, culture media selection and axenic/ non-axenic culture preparations.

On behalf of the IOC Sub-Commission for the Western Pacific (WESTPAC), I have the honor to invite you as a lecturer to this training workshop, providing relevant lectures and guiding the preparations and hands on training on sampling, sample processing, culturing and identification of marine benthic dinoflagellates. Attached please find more details about this training workshop for your considerations and necessary preparations in advance. Further information on the logistic arrangement will be sent to your shortly.

Joint Activities by GlobalHAB and other international programs:



W18: **MEQ** Workshop GlobalHAB: Evaluating, Reducing and Mitigating the Cost of Harmful Algal Blooms: a Compendium of Case Studies

Co-sponsors:

[SCOR](#), [ISSHA](#), [NOWPAP](#), [Greig Seafood Ltd.](#), [IOC UNESCO](#), [GlobalHAB](#), [AXA XL insurance](#), [FAO](#)

Duration:

2.5 days

Convenors:

Vera L. Trainer (USA), *corresponding*
Keith Davidson (ICES, WGHABD)
Kazumi Wakita (Japan)

***Workshop on the Economic Impacts of HABs: PICES REPORT – November 2020
Trainer, V.L., Davidson, K., Wakita, K. (Ed) 2020. GlobalHAB Workshop: Evaluating, Reducing and Mitigating the Cost of Harmful Algal Blooms, a Compendium of Case Studies. PICES Sci. Rep. 2020***

Joint Activities by GlobalHAB and other international programs:

Venue: Puerto Varas, Chile

Dates: 8th – 11th October, 2019

Funding: GlobalHAB (IOC & SCOR) and Gobierno de Chile

Organizing Committee: L. Guzmán, J. Mardones. O. Espinoza, A. Cembella and the IPHAB Task Team on FKA.

TOPICS and Coordinators:

1. Climate change and fish-killing algae. *G. Hallegraeff, Australia*
2. Taxonomy and molecular characterization of fish-killing algae. *M. Iwataki, Japan*
3. Current knowledge of ichthyotoxins produced by fish-killing microalgae. *T.O. Larsen, Denmark*
4. Mechanisms of algal-induced fish-killing syndromes. *P.J. Hansen, Denmark*
5. Development and validation of current fish- or cell-based bioassay methods for assessing ichthyotoxicity. *H. Hégaret, France and J. Mardones, Chile*
6. Impact of fish-killing algal events on other components of coastal marine ecosystems. *L. Mackenzie, New Zealand*
7. Assessment of mitigation strategies and their effectiveness. *D.M. Anderson, USA*

White Paper (in prep)



Venue: Puerto Varas, Chile
Dates: 8th – 11th October, 2019

Joint Activities by GlobalHAB and other international programs:

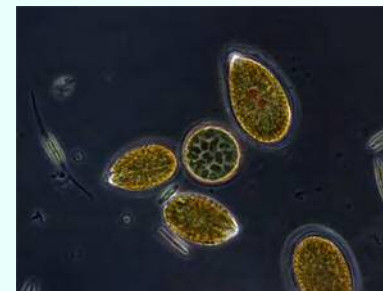
THEME 6. Benthic HABs (BHABs)

OVERALL OBJECTIVE: To achieve a better understanding of BHABs and to provide tools to manage and mitigate the impacts of these events on human health and the environment.

Ongoing Implementation activities:

- Global Ciguatera Strategy, a multi-agency, international initiative (IPHAB-IOC, FAO, WHO, IAEA).

- International exercise for standard sampling methods for BHAB organisms.



Joint Activities by GlobalHAB and other international entities

GlobalHAB Workshop on “Modelling and prediction of harmful algal blooms, from event response to multi-decadal projections” (2021-2022)

Organizers:

- Neil Banas, David McKee, Bingzhang Chen, Paul Udom (University of Strathclyde)
- Clarissa Anderson (Scripps / SCCOOS)
- Dennis McGillicuddy (Woods Hole Oceanographic Institution)
- Bengt Karlson (Swedish Meteorological and Hydrological Institute)
- Keith Davidson, Dmitri Aleynik (Scottish Association of Marine Science)
- Sophie Spatharis, Martin Llewellyn (University of Glasgow)

Program (preliminary):

- Part 1: Exploring the diversity of HAB modelling approaches
- Part 2: Emerging technologies and platforms to support HAB monitoring
- Part 3: Linking models, observations, and stakeholder needs
- Part 4: Scaling up: the global impact of global change on HABs

Funding:

GlobalHAB, Scotland, Europe, US, France, and other sources; the hope is to secure enough funds to invite a substantial number of early-career and developing-world scientists.

Joint Activities by GlobalHAB and other international entities

GlobalHAB symposium on automated in situ observations

Tentative dates: **May 2021**

Total participants: 30 persons

~ 5 invited speakers

~10 young scientists

~ 15 scientists

Organizers: B. Karlson (SMHI)



https://loven.gu.se/english/about_the_loven_centre/kristineberg

VENUE:

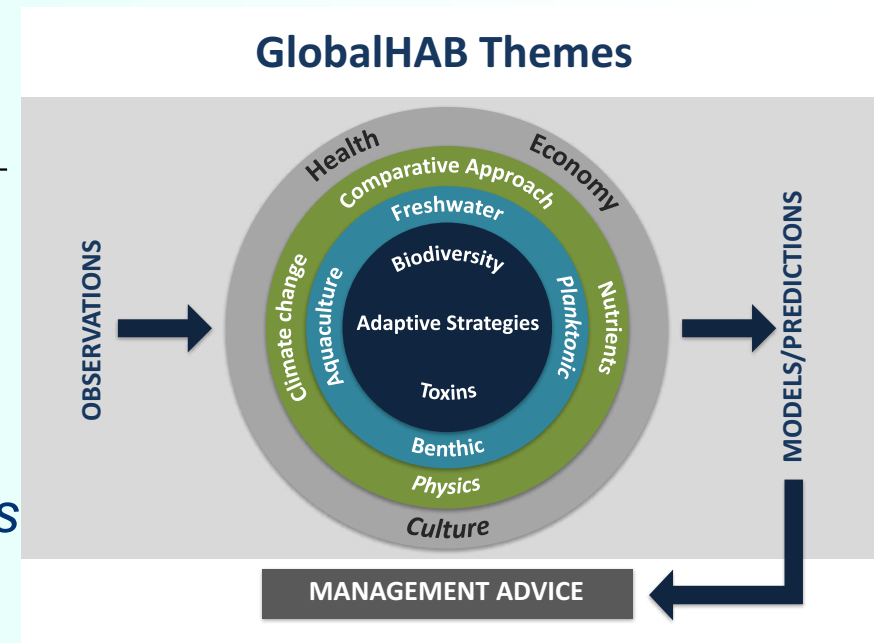
- Sven Lovén Centre for Marine Sciences, Kristineberg, Fiskebäckskil, Sweden
- This well equipped field station is located at the mouth of the Gullmar fjord on the Swedish west coast, adjacent to the North Sea

AIMS:

- To bring together experts on, and users of, in automated in situ imaging systems, novel sampling equipment etc.
- To present methods, recent results and to share experiences.
- To carry out a comparison of methods for analysing plankton communities quantitatively.
- Young scientists is one target group of the symposium

GlobalHAB Science Plan 12 Themes (2020)

1. *Biodiversity and Biogeography*
2. *Adaptive Strategies*
3. *Toxins*
4. *Nutrients and Eutrophication*
5. *Freshwater HABs and cyanobacterial HABs*
6. *Benthic HABs (BHABs)*
7. *HABs and Aquaculture*
8. *Comparative Ecosystems*
9. *Observation, Modeling, and Prediction*
10. *HABs and Human and Animal Health*
11. *Economy*
12. *Climate Change and HABs*
13. *Sargassum*



New GlobalHAB Theme: *Sargassum* blooms

Open Science Meeting on *Sargassum*

Overall objective: To identify research priorities to understand *Sargassum* growth dynamics and to develop adequate forecasting and warning systems to allow long term preventive measures for *Sargassum* beaching

GlobalHAB subcommittee:

- * Brigitta van Tussenbroek, UNAM, Mexico, vantuss@cmarl.unam.mx
- * Brian Lapointe, Harbor Branch Oceanographic Institute, FI, US, blapoin1@fau.edu
- * Ester Serrao, University of Algarve, Portugal, eserrao@ualg.pt
- * José E. Martinelli Filho, Federal University of Pará, Brazil, martinelli@ufpa.br
- * Elisa Berdalet, GlobalHAB SSC Chair, ICM-CSIC, Spain, berdalet@icm.csic.es
- * Raffaele Siano, GlobalHAB SSC, raffaele.siano@ifremer.fr
- * Henrik Enevoldsen, IOC representative, h.enevoldsen@bio.ku.dk



Open Science Meeting on *Sargassum*

Coordinated activity: jointly with
**UNEP, GESAMP, IAEA, Regional
governments, EuroSea, NGOs...**



Content:

A) State-of-the-art of the *Sargassum* beaching in NW Africa, the Caribbean Sea and Asia, dynamics, trends, forcings, ...

B) Assess IMPACTS:

- in ecology: floating biodiversity islands supporting oceanic food webs, identify unbalances
- in economy: fisheries, tourism, local populations

C) Identify SOLUTIONS:

Biomass use, fertilizer? Prevent beachings and impacts?

D) Design MONITORING strategies: Identify protocols and integrate data for Africa, the Caribbean Sea and Asia

Open Science Meeting on *Sargassum*

Structure:

- A) Presentations
- B) Discussion groups



Outcomes:

- Report, white paper
- Establishment of a GlobalHAB Subcommittee to define the *Sargassum* Science and Implementation Plan (as in www.globalhab.info)
- Identify international research coordination on *Sargassum*

Local host: UNAM, Universidad Autónoma Nacional de México

Local organizer: Dr. Brigitta van Tussenbroek (UNAM, vantuss@cmarl.unam.mx)

Locality: Cancún, Mexico

Dates: To be decided (originally 16-18 November 2020), postponed to 2021 when possible

Meanwhile ... in 2020 coordination with UNEP and GESAMP in several Webinars on *Sargassum*



**Sargassum in the Caribbean and West Africa:
*Key Challenges, Responses and Collaboration***

Webinar Agenda

TUESDAY, 26 May 2020

East Africa: 17:00-18:30; West Africa: 15:00-16:30; Jamaica: 09:00-10:30



SARGASSUM WEBINAR SERIES

A joint series by UNEP, IOC UNESCO, GESAMP, GlobalHAB-IOC-SCOR

Second Webinar: The Science of *Sargassum*

Agenda

Tuesday 21 July 2020

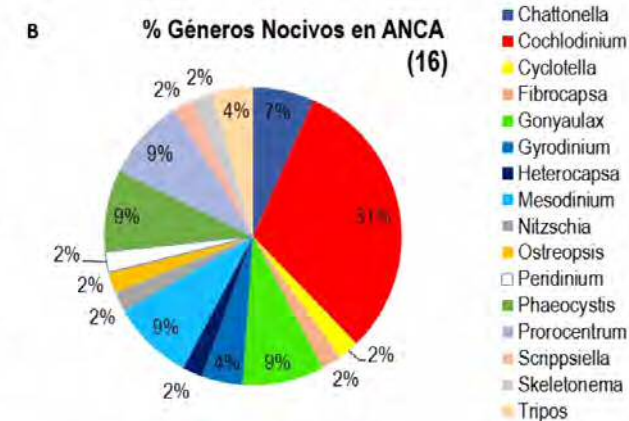
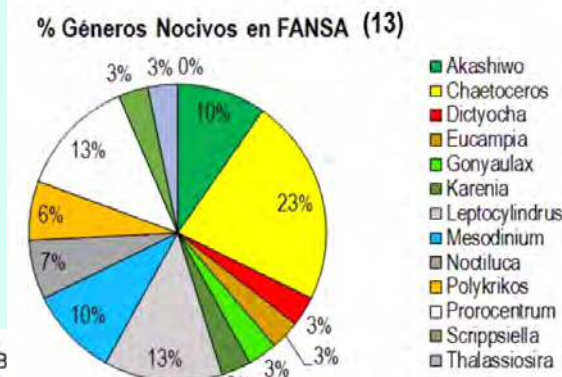
East Africa: 17:00-19:00 | West Africa: 15:00-17:00 | Jamaica: 09:00-11:00

New activities are now analyzed by the GlobalHAB SSC to be fostered in the second period of GlobalHAB (**2021 – 2025**) including, e.g.:

- Continuation of the study of the economic impacts of HABs in collaboration with NOWPAP, PICES and NOAA
- Expert workshop on qPCR and metabarcoding applied to HAB species detection and characterization of community diversity
- A Scientific Summary for Policy Makers on HABs and Climate Change

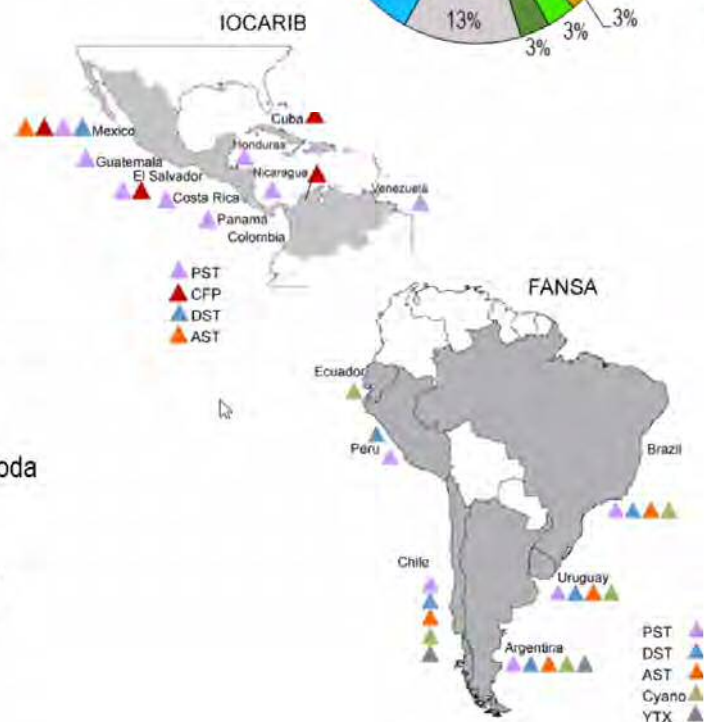
... and hopefully, many others!

... and new activities in coordination with ANCA and FANSA



Qué toxinas producidas por microalgas marinas, tenemos en la región LAC?

- La distribución geográfica de las toxinas muestra diferencias entre las subregiones.
- Se observa que hasta la fecha, la Ciguatera está restringida a ANCA y ASP a FANSA.
- Las demás toxinas (PSP, DSP) se distribuyen en toda la región LAC.
- Las cianotoxinas que han sido registradas para la región, no están incluidas en el presente informe debido a su bajo registro en HAEDAT.



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