



GlobalHAB - the International SCOR-IOC Science Program on Harmful Algal Blooms

Activities 2019-2020 and Plans for 2020-2021

June 11th, 2020

GlobalHAB Scientific Steering Committee members 2016-2020:

Elisa Berdalet, Institute of Marine Sciences, CSIC, Spain, Chair
Raphael Kudela, University of California, Santa Cruz, USA, Vice-chair

Neil S. Banas, University of Strathclyde, United Kingdom
Michele Burford, Griffith University, Australia
Christopher J. Gobler, Stony Brook University, USA
Bengt Karlson, Swedish Meteorological and Hydrological Institute, Sweden
Po Teen Lim, University of Malaya, Kuala Lumpur, Malaysia
Lincoln Mackenzie, Cawthron Institute, New Zealand
Marina Montresor, Stazione Zoologica Anton Dohrn, Italy
Kedong Yin, Sun Yat-Sen (Zhongshan) University, China

Eileen Bresnan, Marine Scotland Science, United Kingdom, ICES representative
(2016-2020)

Dave Clarke, Marine Institute, Ireland, ICES representative after April 2020

Keith Davidson, The Scottish Association for Marine Science, United Kingdom, Ex-officio

Vera L. Trainer, National Oceanic and Atmospheric Administration, USA, ISSHA and PICES representative (2016-2020)

Gires Usup, Universiti Kebangsaan Malaysia, Malaysia, IPHAB representative (2015-2019)

Joe Silke, Marine Institute, Ireland, IPHAB representative (2019-2023)

Henrik Enevoldsen, IOC UNESCO, IOC Science and Communication Centre on Harmful Algae at the University of Copenhagen, Denmark (2016-

Ed Urban, Scientific Committee on Oceanic Research, USA (2016-2020)

Patricia Miloslavich, Scientific Committee on Oceanic Research, USA (2020-)

The GlobalHAB Scientific Steering Committee (SSC) acknowledges the financial and logistic support received from SCOR and IOC during the 2015-2019 period. The funds made possible the elaboration of the GlobalHAB Science and Implementation Plan, representation of the programme at international meetings and publications completing the work of the GEOHAB program.

A special gratitude to Ed Urban for all his support to the harmful algal blooms programs GEOHAB and GlobalHAB. Furthermore, a warm welcome to Patricia Miloslavich and acknowledgement of her help to GlobalHAB.



Left: *Alexandrium pacificum* bloom in Marlborough Sounds, New Zealand. Right, top: Mussel harvesting in Pelorus Sound. Right, bottom: *A. pacificum* hypnozygotes. Photos: Lincoln Mackenzie.

1. Meetings of the GlobalHAB SSC

Since the last SSC meeting at the Laboratoire d'Océanographie de Villefranche (LOV) in Villefranche-sur-mer (France) on April 10 and 11, 2018, the GlobalHAB SSC members worked on the implementation of the GlobalHAB activities by communication through email, virtual meetings, and meetings of opportunity (e.g. 18th International Conference on Harmful Algae, Nantes, France, October 21-26, 2018). Among other items, the SSC reviewed the status of ongoing activities, prioritized new activities. This saved funds to be used for specific activities and products.

For 2020, GlobalHAB has received support from NOAA (see section 5) to conduct a physical meeting. However, it has been postponed due to the Covid-19 pandemic. Thus, the coordination continues through email and virtual meetings.

2. Science highlights in the 2019-2020 period

2.1. Communications about the GlobalHAB program from GlobalHAB endorsed projects and other programmes related to GlobalHAB at international scientific events:

- * International Conference on Toxic Cyanobacteria, Krakow, Poland, 2019, Poster presentation on GlobalHAB program and activities associated with cyanobacteria research. Presenter Michele Burford.
- * Representation at the UN Ocean Decade Copenhagen 13-14 May 2019. Bengt Karlson gave the presentation "Reducing HAB problems for sustainable development".



Accumulations of cyanobacteria in the Baltic Sea between the islands of Gotland and Öland, 10 August, 2015. Photo courtesy of the Swedish Coast Guard. From the presentation by B. Karlson.

- * Berdalet, E. *Climate Change and Harmful Algal Blooms: Challenges and Strategies*, <https://www.youtube.com/watch?v=-Yidh1cTcPA&feature=youtu.be>, Congreso MIMAR. Cambio Global en la Región Macaronésica, Technological Institute of Canarias (ITC), Pozo Izquierdo, Gran Canaria, 3-4 Dec 2019.

* Representation of GlobalHAB at the COP25 in Madrid, by Elisa Berdalet



2.2. Paper on HAB Observing System: C. R. Anderson, E. Berdalet, R.M. Kudela, C. Cusack, J. Silke, E. O'Rourke, D. Dugan, M. McCammon, J. Newton, S. K. Moore, K. Paige, S. Ruberg, J. R. Morrison, B. Kirkpatrick, K. Hubbard, J. Morell. 2019. *Scaling Up From Regional Case Studies to a Global Harmful Algal Bloom Observing System*. *Frontiers in Marine Science*, <https://www.frontiersin.org/articles/10.3389/fmars.2019.00250/full>, doi:10.3389/fmars.2019.00250

Participation in the **OceanObs'19 Town Hall** on "Design and Implementation of a Global Harmful Algal Bloom Observing System, 17th Sept 2019, C. R. Anderson et al.

2.3. Paper on HABs and Oceans and Human Health (see also section 3). Borja, A., White, M.P., Berdalet, E., Bock, N., Eatock, C., Kristensen, P., Leonard, A., Lloret, J., Pahl, S., Parga, M., Vera Prieto, J., Wuijts, S., Fleming, L.E. 2020. *Moving towards an agenda on ocean health and human health*. *Frontiers in Marine Sciences*, section Marine Ecosystem Ecology. *Front. Mar. Sci.* 7:37. doi: 10.3389/fmars.2020.00037

2.4. Inclusion of data on cyanobacterial blooms and toxins in HAEDAT database which presents reporting of HAB blooms globally (<http://haedat.iode.org/index.php>).

2.5. Manual for water managers on mitigation of cyanobacterial HABs: M.A. Burford, C.J. Gobler, P.M. Visser, M. Lurling, G.A. Codd. 2019. *Solutions for managing cyanobacterial blooms: A scientific summary for policy makers*. IOC/UNESCO, Paris (IOC/INF-1382). An aesthetically appealing, easy to understand document for drinking and recreational water managers on managing cyanobacterial HABs was produced. The document is available in print and on web:

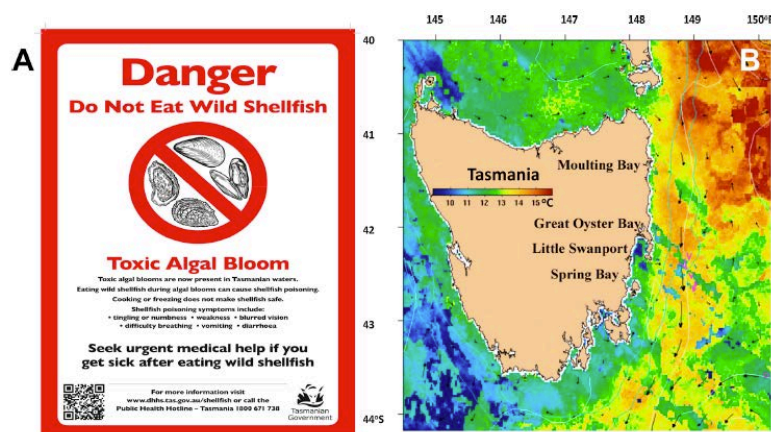


(http://www.globalhab.info/files/GlobalHAB_SSPM_Cyano_IOCINF-1382.pdf).

2.6. Special issue on *Harmful Algae* journal focused on "Climate Change and HABs", was completed in February 2020: <https://www.sciencedirect.com/journal/harmful-algae/vol/91/suppl/C>

It included the following papers:

1. C.G. Gobler. *Climate Change and Harmful Algal Blooms: Insights and perspective*. HA 91 (2020) 101731
2. V. L. Trainer, S. K. Moore, G. Hallegraeff, R. M. Kudela, A. Clement, J. Mardones, W. Cochlan. *Pelagic harmful algal blooms and climate change: Lessons from nature experiments with extremes*. HA 91 (2020) 101591
3. M.A. Burford, C.C. Carey, D.P. Hamilton, J. Huisman, H.W., Paerl, S.A. Wood, A. Wulff. *Perspective: Advancing the research agenda for improving understanding of cyanobacteria in a future of global change*. HA 91 (2020) 101601
4. P.A. Tester, E. Berdalet, W. Litaker. *Climate change and benthic harmful algae*. HA 91 (2020) 101728
5. M. Olofsson, S. Suikkanen, J. Kobos, N. Wasmund, B. Karlson. *Basin-specific changes in filamentous cyanobacteria community composition across four decades in the Baltic Sea*. HA 91 (2020) 101685
6. M. L. Brosnahan, A. D. Fischer, C. B. Lopez, S. K. Moore, D. M. Anderson. *Cyst-forming dinoflagellates in a warming climate*. HA 91 (2020) 101728
7. J. Raven, C. Gobler, P. J. Hansen. *Dynamic CO₂ and pH levels in coastal, estuarine, and inland waters: theoretical and observed effects on harmful algal blooms*. 91 (2020) 101594
8. P. Glibert. *Harmful algae at the complex nexus of eutrophication and climate change*. HA 91 (2020) 101583
9. A. Griffith, C. J. Gobler. *HABs: a climate change co-stressor in marine and freshwater ecosystems*. HA 91 (2020) 101590
10. G. M.M. Hennon, S. T. Dhyrman. *Progress and promise of omics for predicting the impacts of climate change on harmful algal blooms*. HA 91 (2020) 101587
11. D. K. Ralston, S. K. Moore. *Modeling harmful algal blooms in a changing climate*. HA 91 (2020) 101729
12. M.L. Wells, B. Karlson, A. Wulff, R.M. Kudela, C. Trick, V. Asnaghi, E. Berdalet, W. Cochlan, K. Davidson, M. De Rijcke, S. Dutkiewicz, G. Hallegraeff, K. Flynn, C. Legrand, H. Paerl, J. Silke, S. Suikkanen, P. Thompson, V.L. Trainer. *Future HAB Science: Directions and Challenges in a Changing Climate*. HA 91:101632

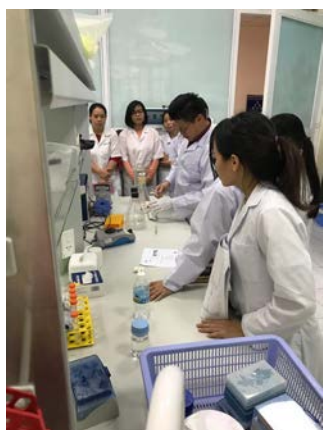


Trainer et al. 2020. Fig. 6. Signage (A) and SST (B) during the anomalous Paralytic Shellfish Toxin event in eastern Tasmania. Map of Tasmania, south of the mainland of Australia, showing sea surface temperatures on 27 September 2015 during peak PST, with the East Australian Current (in red) interacting with the continental shelf. Locations of the main affected shellfish farm areas.

3. Implemented activities 2019-2020

In addition to the Science Highlights in the previous Section 2, other activities have been conducted by the GlobalHAB SSC:

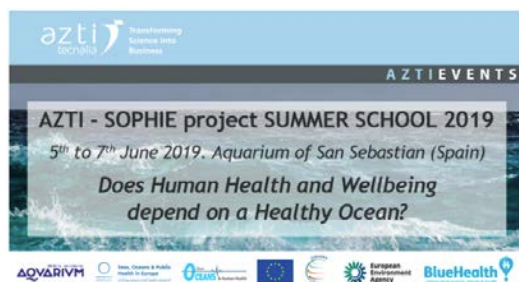
- **February 25-27, 2019.** A workshop was organized by IOC WESTPAC-HAB at Chulalongkorn University from to review the status of HABs and fish-killing Raphidophytes species in Western Pacific region. Two related papers have been published from this activity and another publication of the impacts of *Chatonella* in the region is expected by 2021:



Yñiguez, A.T., Lim, P.T., Leaw, C.P., Jipanin, S.J., Iwataki, M., Benico, G. Azanza, R.V. 2020. Over 30 years of HABs in the Philippines and Malaysia: What have we learned? *Harmful Algae*, <https://doi.org/10.1016/j.hal.2020.101776>.

Lum, W.M., Benico, G., Azanza, R., Furio, E., Lim, P.T., Lim, H.C. 2019. Morphology and molecular phylogeny of the harmful raphidophyte *Chattonella subsalsa* isolated from Bolinao, Philippines. *Philippine Journal of Natural Sciences* 24: 50-56.

- **June 5-7, 2019.** AZTI-SOPHIE project Summer School: "Does human health and Wellbeing depend on a healthy Ocean?" Aquarium of San Sebastian (Spain). This was a GlobalHAB endorsed project. Elisa Berdalet gave a lecture, representing GlobalHAB (<https://www.azti.es/eventos/azti-sophie-project-summer-school-2019-does-human-health-and-wellbeing-depend-on-a-healthy-ocean/>). The activity was linked to the World Oceans Day (<http://www.worldoceansday.org/Default.aspx?CCID=31759&FID=343862&ExcludeBoolFalse=True&PageID=17466397>). A paper was produced: Borja, A. et al. (2020), acknowledging GlobalHAB (see section 2.6).



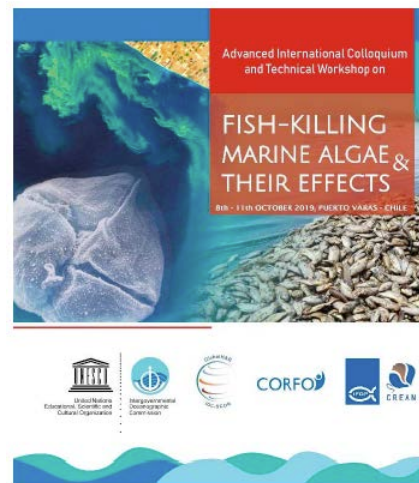
- **June 10-11, 2019.** As already initiated within GEOHAB (lead by Grant Pitcher and Raphael Kudela) GlobalHAB included fostering research on the potential links between ocean deoxygenation and HABs through interaction with IOC GO2NE (Global Ocean Oxygen Network, <http://www.unesco.org/new/en/natural-sciences/ioc-oceans/sections-and-programmes/ocean-sciences/global-ocean-oxygen-network/>). A joint GO2NE - GlobalHAB workshop was organized to identify potential research on this topic in 2019. It was held in Paris immediately prior to the next GO2NE workshop (http://hab.ioc-unesco.org/index.php?option=com_oe&task=viewEventRecord&eventID=2469).

- **August 25-30, 2019.** A session on HABs was conducted within the 7th European Phycological Conference (<http://epcseven.biol.pmf.hr/>), Zagreb (Croatia). The session was chaired by S. Accoroni and P.M. Visser, and M. Montresor was member of the Organizing Committee.

- **October 8-11, 2019.** An Advanced International Colloquium and Technical Workshop, under the auspices of IOC-IPHAB and GlobalHAB, with the support of the government of Chile through CORFO and collaboration of CREAN-IFOP, was held in Puerto Varas, Chile. Ten invited participants (D.M. Anderson, A.D. Cembella -WG chair-, O. Espinosa, L. Guzman, G.M. Hallegraeff, P.J. Hansen -acting chair-, H. Hégaret, T.O. Larsen, J. Mardones, M.Iwataki, L.MacKenzie) reviewed state-of-knowledge and addressed gaps in knowledge to develop strategies for technological and scientific approaches to mitigate impacts of fish killing algal blooms.

The workshop included Closed sessions with presentations and discussions within the participants group, and an Open session with public from the area and offered in streaming as well. A white paper, ***Fish-Killing Algal Blooms and Ichthyotoxins: Prevention, Mitigation and Control***, with the outcomes of the workshop is under process. The contents include:

1. *Taxonomy.* M. Iwataki
2. *Chemistry and analytic methods – how to deal with the many congeners.* T. Larsen
3. *Modulation of toxin production and release.* P. J. Hansen
4. *Mechanisms of effect (dissolved, cell bound, micropredation).* P. J. Hansen
5. *Modes of action, toxicology and biotechnological applications.* TBD
6. *The necessity of bioassays – and which ones to select.* H. Hégaret, J. Mardones
7. *Ecology and physiology of Fish Killing Algae.* A. Cembella
8. *Ecosystem effects.* L. MacKenzie
9. *Climate change.* G. Hallegraeff
10. *Prevention, control, mitigation.* D.M. Anderson
11. *Socio-economics.* J. Mardones
12. *Implementation.* TBD



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

- **October 17-19, 2019.** An international workshop, “Evaluating, reducing and mitigating the cost of harmful algal blooms: a compendium of case studies”, was held in Victoria, British Columbia, Canada as part of the Annual Meeting of the North Pacific Marine Science Organization (PICES). The workshop co-convenors were Drs Vera Trainer (USA), Keith Davidson (UK) and Kazumi Wakita (Japan). It was jointly sponsored by GlobalHAB (SCOR and IOC), PICES, NOWPAP, ISSHA, NOAA, FAO and private companies. The goal of the 2.5-day workshop was to bring together international experts in economics, social sciences, and the study of harmful algal blooms (HABs) to develop a compendium of case studies to guide future research on the economic and social costs of HABs, identify priorities and unify methods for future collaborative assessments of HAB impacts. <https://meetings.pices.int/meetings/annual/2019/PICES/Program>. Information about the event was included in:

PICES Press 2020, 28(1): 30-32. Trainer, V. L., Davidson, K., Wakita, K., Berdalet, E. Suddleson, M., Myre, G., Trethewey, D. GlobalHAB: Evaluating, Reducing and Mitigating the Cost of Harmful Algal Blooms, a Compendium of Case Studies.

Harmful Algal News 2019, 63. Trainer, V.L., Davidson, K., Wakita, K., Berdalet E., Suddleson, M., Myre, G., Trethewey, D. IOC-SCOR GlobalHAB Workshop: Evaluating, Reducing and Mitigating the Cost of Harmful Algal Blooms, a Compendium of Case Studies.



Participants from the GlobalHAB Workshop (W18): Evaluating, reducing and mitigating the cost of Harmful Algal Blooms, at PICES-2019, Victoria, British Columbia, Canada.

A Report is going to be completed in July 2020 (after revision) and including the following sections:

Chapter 1. *GlobalHAB Workshop: Evaluating, Reducing and Mitigating the Cost of Harmful Algal Blooms, a Compendium of Case Studies. Introduction.* V. L. Trainer, K. Davidson, K. Wakita, E. Berdalet, M. Suddleson, G. Myre, D. Trethewey.

Chapter 2. *Evaluating the economic impacts of harmful algal blooms: Issues, methods, and examples.* D. Jin, S. Moore, D. Holland, L. Anderson, W.-A. Lim, S. Jardine, S. Martino, F. Gianella, D.-H Kim.

Chapter 3. *Situation, Management and Economic Impacts of Cochlodinium in Korea.* W.-A. Lim, D. Kim, K. Wakita.

Chapter 4. *An economic assessment of ciguatera outbreaks – an island model.* C. Trick, L. Anderson, E. Berdalet, W.P. Cochlan, P. Wang, M.L. Wells.

Chapter 6. *Estimating and mitigating the economic costs of Harmful Algal Blooms (HABs) on commercial and recreational shellfish harvesters.* J. Mardones, D.S. Holland, L. Anderson, V. LeBihan, f. Gianella, A. Clement, V.L. Trainer.

Chapter 7. *The economic impacts of harmful algal blooms on salmon cage aquaculture.* K. Davidson, S.L. Jardine, S. Martino, G. Myre, L.E. Peck, R.N. Raymond, J. J. West.

Chapter 8. *Commonalities and Summary recommendations.* V. Trainer, R. Kudela, T. Yoshida, V. LeBihan, W. Cochlan, W.-A. Lim, D.-H. Kim, et al.

4. New activities to be implemented 2020-2021

4.1. Ongoing and confirmed activities

- **March 2018 to June 2020.** E. Berdalet has been participating, in representation of GlobalHAB at the CLEFSA project activities *"Emerging threats on human health in Europe due to climate change"*. CLEFSA is a project of the European Food Safety Agency (EFSA) that explores the risks of food intoxication in future climate change scenarios. CLEFSA included aquatic biotoxins in the European landscape. E. Berdalet is collaborating in the analysis through online communication and attendance to a unique first meeting (April 2018, funded by GlobalHAB). The final Report is expected on June 2020.

- **May 2020.** A 3.5-day workshop on *"Modelling and prediction of harmful algal blooms, from event response to multi-decadal projections"* was planned to be held in Glasgow, UK. The organising committee consists of Neil Banas, David McKee, Bingzhang Chen, Paul Udom (University of Strathclyde), Bengt Karlson (Swedish Meteorological and Hydrological Institute), Keith Davidson, Dmitri Aleynik (Scottish Association of Marine Science), Clarissa Anderson (Scripps / SCCOOS), Dennis McGillicuddy (Woods Hole Oceanographic Institution), Beatrix Siemerling (UK Food Standards Agency), and is also coordinating with Katja Fennel and Marion Gehlen, chairs of the Marine Ecosystem Analysis and Prediction Task Team (MEAP-TT) of the GODAE OceanView programme.



The organizers secured enough funds from different institutions, including co-fund from GlobalHAB, to invite a substantial number of early-career and developing-world scientists. A programme of summer-school-like tutorials will be woven into conference-style presentations and discussions. The draft programme is organised into four parts:

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

Information is shown at:

<http://www.globalhab.info/activities/globalhab-activities>
<http://habmodelworkshop.sccoos.org>

The workshop has been postponed from May 2020 to May 2021 because of disruption caused by Covid-19. The organisers will confirm and refine this plan in summer 2020, and more information will follow in autumn 2020.

- Summer 2020. A Mini-symposium on automated in situ observations of plankton, was planned to be hosted at Kristineberg Marine Research Station, Sweden on June 1-6, 2020.

In recent years novel in situ instrumentation has been developed for automated high frequency HAB detection in near real time. Also instruments for observing grazers, e.g. microzooplankton and multicellular zooplankton are becoming available commercially. These instruments are now being adopted in research and also in monitoring programmes. The aim of the mini-symposium is 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. Another aim is to carry out a comparison of results when analysing plankton communities quantitatively. Young scientists is one target group of the symposium. After the main symposium a young scientist's data workshop for data processing and report/article writing is planned. The organizers secured enough funds from different institutions, including co-fund from GlobalHAB.

Information is shown at:

<http://www.globalhab.info/activities/globalhab-activities>

Dates

1-6 June 2020

Venue

Kristineberg Marine Research Station, Fiskebäckskil, Sweden
This is well-equipped field station is located at the mouth of the Gullmar fjord on the Swedish west coast, adjacent to the North Sea. More information is available at:



<https://mi.gu.se/kristineberg-marina-forskningsstation> (select English in menu)

The Mini-symposium has been postponed to June 2021 because of disruption caused by Covid-19. New information will be provided when possible.

- 2020. The elaboration of a "Best Practice Guidelines for the Study of HABs and Climate Change", editorial team constituted by Mark Wells (chair), Michele Burford, Anke Kremp, Marina Montresor, Grant Pitcher and Gires Usup, started on March 2018. A tentative deadline for the submission of the draft chapters was the month of May 2019. When closing this report, the chapters have been reviewed and authors are completing the final version, expected by early July.

The Manual includes the following chapters:

Overview (Editorial Board)

Chapter 1 - Rationale and Introduction (Editorial Board)

Chapter 2 - Observing changes in HABs over time — Long Term Observations (Richardson AJ, Eriksen R, Hallegraeff GM, Rochester W, Pitcher GC, Burford M)

Chapter 3 - Databases for the study of harmful algae, their global distribution and their trends (Zingone A, Escalera L, Bresnan E, Enevoldsen H, Provoost P, Richardson A, Hallegraeff G)

Chapter 4 - Experimental approaches (van der Waal D, Kremp A)

Authors have received feedback from reviewers and are currently revising the manuscript.

Chapter 5 - Understanding Responses of HAB Species to climate change through experimentation (Dyhrman S, Godhe A, Hennon G, Sefbom J)

Chapter 6 - Future Perspectives in Modeling Harmful Algal Blooms (HABs) - Guidelines for HABs modelling (Hense I, Anderson CR, Hamilton D, Chapra S)

Authors have received feedback from reviewers. Hamilton is leading a major revision of the manuscript.

Funds for the first working meeting of the editorial team were provided by GlobalHAB. *The initiative of the Best Practices Manual for HAB and Climate Change is in line with the activities of SCOR WG149 that is focusing on Changing Ocean Biological Systems (COBS) and particularly on "How will biota respond to a changing ocean?" (<https://scor149-ocean.com/>).*

4.2. Other activities ongoing and under exploration by the GlobalHAB SSC members and collaborators:

*** Global Harmful Algal Bloom Status Report**

The first Global HAB Status Report is an initiative of IOC UNESCO with the support of IAEA, ICES, PICES and ISSHA. The GlobalHAB SSC is following and supporting the initiative where it can. In order to develop and launch the first Global HAB Status Report a network of data providers for OBIS-HAB and HAEDAT has been established and an Editorial Team for the First Global HAB Status Report was established together with a data flow structure. A data compilation template for HAB data in OBIS has been developed and reviewed and is in use (https://github.com/iobis/habtemplate/blob/master/habtemplate_a_v4.xlsx). This will allow to complement, and add value to, data already in OBIS with baseline observations recorded in the literature. Focus continues to be on data compilation and upgrades and adjustments to the data systems (HAEDAT as well as the OBIS-HAB data entry template). Additionally, the Editorial Team for the GHSR has developed the outline of the GHSR and chapters are drafted. Regional summaries on HAB based on OBIS, HAEDAT and the literature will constitute a special issue of the Elsevier Journal *Harmful Algae* in 2020. The planned online tools to create information products have yet to be developed and will focus on creating the products for the GHSR. Currently, a new data portal for HAEDAT is in development (<http://dev.iobis.org/haedat/>). The GHSR is foreseen to be complete by end 2019/early 2020.

*** New GlobalHAB Theme: *Sargassum* Blooms.** The GlobalHAB Science and Implementation Plan identifies that new emerging HAB related issues can be incorporated into the program after its launch. This is the case of the blooms of green macroalgae and *Sargassum*. **Elisa Berdalet** and **Henrik Enevoldsen** have been in touch with several researchers about this topic since 2016. The SSC have with Brian Lapointe (US) developed a short overview paper and the GESAMP Group of Experts have prepared a longer scoping paper on the *Sargassum* issue. The SSC proposed to GESAMP at its 2018 session to organize a joint Open Science Meeting (OSM) to identify the main research questions to understand the population dynamics of *Sargassum*. Several of the GESAMP (represented by Peter Kershaw) sponsoring agencies and the European Funded project EuroSea (coordinated by Caroline Cusack) have shown interests in the topic.



The GlobalHAB SSC has established a subcommittee, based on the experience on *Sargassum* to organize the OSM integrated by:

- * Brigitta van Tussenbroek, UNAM, Mexico, vantuss@cmarl.unam.mx
- * Brian Lapointe, Harbor Branch Oceanographic Institute, FL, 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
- * Hoang C. Tin, University of Sciences, Hue City, Vietnam, hoangcongting@gmail.com
- * Elisa Berdalet, GlobalHAB SSC Chair, ICM-CSIC, Spain
- * Henrik Enevoldsen, IOC representative

On May 26, Elisa Berdalet, Henrik Enevoldsen and Brian Lapointe participated in a Webinar organized by UNEP "*Sargassum in the Caribbean and West Africa: Key Challenges, Responses and Collaboration*" and presented the progress on the OSM to be hosted by Universidad Autónoma Nacional de México (UNAM). The OSM was very well received and different research initiatives, including SPAW RAC and IOCARIBE, manifested their interest to be engaged as well. Although initially planned to be held in May 2020, the Covid-19 postponed it. Meanwhile, a series of webinars will be conducted co-organized with GlobalHAB in order to progress on the scientific needs and opportunities to address the problems associated to *Sargassum* blooms.



WEBINAR AGENDA:

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

TUESDAY, 26 May 2020

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

Time (Kenya time)	Agenda item	Discussant/Facilitator
17:00 - 17:10	Welcome remarks	<ul style="list-style-type: none"> • Habib El-Habr, UNEP GPA • Henrik Enevoldsen, IOC/UNESCO <i>Facilitator: Joana Akrofi, UNEP Science Division</i>
17:10 - 17:30	Sargassum: Key issues and challenges	<ul style="list-style-type: none"> • Peter Kershaw, GESAMP • Brian LaPointe, Marine Scientist <i>Facilitator: Joana Akrofi, UNEP Science Division</i>
17:30 - 17:50	Sargassum: Regional Reflections <ul style="list-style-type: none"> ▪ Caribbean Region ▪ West Africa (Abidjan Convention) 	<ul style="list-style-type: none"> • Ileana Lopez, Cartagena Convention Secretariat, CEP, SPAW Protocol • Sandrine Pivard, SPAW RAC Director • Jaques Abe, Abidjan Convention <i>Facilitator: Mahesh Pradhan, UNEP GPA GPNM</i>
17:50 - 18:00	Research Update on Harmful Algal Blooms (HABs)	<ul style="list-style-type: none"> • Elisa Berdalet, Institute of Marine Sciences (ICM-CSIC) <i>Facilitator: Mahesh Pradhan, UNEP GPA GPNM</i>
18:00 - 18:20	Sargassum: Challenges, Responses and Collaboration Q&A	<i>Facilitator: Mahesh Pradhan, UNEP GPA GPNM</i>
18:20 - 18:30	Conclusions and way forward	<ul style="list-style-type: none"> • Joana Akrofi, UNEP Science Division • Mahesh Pradhan, UNEP GPA GPNM

Registrations online at: <https://attendee.gotowebinar.com/register/812715421760261645>

For more information: Milcah.Ndegwa@un.org

* A HABs session and a workshop on HABs metabarcoding using Next-generation sequencing have been planned at the coming 5th International Symposium on Marine Environmental Sciences (XMAS-V), Xiamen 2021. <https://melmeeting.xmu.edu.cn/xmas5/>

* A workshop on the use of the artificial substrate for sampling harmful species (*Gambierdiscus*, *Ostreopsis*, *Prorocentrum*, cyanobacteria) had been organized by Elisa Berdalet, Pat Tester and Emilio Soler-Onís to be conducted during the DINO12 Conference to be hosted in Gran Canaria, Canary Islands in July 2020. However, the meeting has been postponed to 2021 due to the Covid-19 pandemic.

* A Scientific Summary for Policy Makers (SSPM) on HABs and Climate Change will be elaborated based on the main key messages from the special issue in *Harmful Algae* and the Manual on Best Practices to investigate HABs and Climate Change. The SSPM could be linked to the two IPCC 1.5C special reports that are coming out this year and next year. The SSC will determine how to address it.

5. Funding considerations and future funding plans

The scientific meetings of the GlobalHAB SSC have been supported by IOC UNESCO and SCOR (with funding from the U.S. National Science Foundation), and by in-kind contributions from ICES, PICES and SAMS. Additional funds have been received from other institutions to conduct the specific activities indicated previously.

The US NSF earmarked contribution to SCOR was exhausted on August 31st, 2019. SCOR authorized GlobalHAB to use the remaining funds on that date to contribute to the implementation of the planned activities in 2020. Unfortunately, the Covid-19 pandemic has forced to postpone them until 2021. The GlobalHAB SSC to SCOR solicits that these secured funds could be used in 2021. This extension will allow conducting the planned activities and produce the scientific outcomes papers, new knowledge, training and coordination) that implement GlobalHAB goal.

Support has been provided by NOAA's National Centers for Coastal Ocean Science (NCCOS) Competitive Research Program (CRP) via the US National HAB Office. Funding is provided through the IOC Science and Communication Centre on Harmful Algae at University of Copenhagen, Denmark.

6. GlobalHAB SSC members renewal 2020

The Scientific Steering Committee of the SCOR and IOC GlobalHAB program was constituted in January 2016, at the launch of the program. It was constituted by 10 members (Table 1) with diverse expertise to address the challenges and priorities of the research on Harmful Algal Blooms during a three years period. During this time, the SSC worked in the development of the GlobalHAB Science and Implementation Plan and other tasks identified in the Terms of Reference of the SSC (www.globalhab.info). In addition, the GlobalHAB SSC includes ex-officio members acting as liaisons with other organizations.

An extension of the SSC term until 31 December 2019 was allowed by IOC and SCOR in order to facilitate the consolidation of the program and because all SSC members were involved in many activities programmed in 2019 and 2020.

Towards the end of 2019, the whole SSC started an internal analysis to conduct a partial renew of the membership for the 2020-2022 period (Table 2). In order to provide some continuity, only those members having a direct responsibility on a planned activity on that period were invited to continue in the SSC until this activity is accomplished. This continuation could be as "core SSC members" or as members of a new operational structure on Subcommittees (Tables 3 and 4) defined to conduct some ongoing tasks. Once these activities will be achieved (including finishing products, e.g. papers, reports, ...), the turnover scheme will continue. Based on this, 4 people, Neil Banas, Elisa Berdalet, Bengt Karlson and Po Teen would remain as core SSC members. Michele Burford, Raphael Kudela, Lincoln Mackenzie and Marina Montresor would continue as members of specific subcommittees. Chris Gobler and Kedong Yin would step down.

In addition, the SSC members were invited to nominate candidates with energy, motivation and generosity for implementing the GlobalHAB Science Plan and addressing new challenges. Through email communication and two conference calls 24 candidates were shortlisted and a preferential ranking was established. The two main criteria were to ensure that the SSC will cover all the diverse expertise and to have a biogeographic representation. The first names in the list were invited to join the SSC with accompanying information about the GlobalHAB program, the SSC Terms of Reference, the last Report of conducted and planned activities and the funds conditions for the 2020-2022 period. The six candidates that accepted to join the GlobalHAB SSC are: Clarissa Anderson, Tim Davis, Hae Jin Jeong, Raffaele Siano, Susie Wood and Aletta Íñiguez. Some of the names in the highest positions, namely, Tomasa Cuéllar-Martínez, Chuanmin Hu and Sanna Suikanen, will be invited to join the subcommittees.

Concerning the Chair, different possibilities were considered. By consensus the SSC decided that Elisa Berdalet will continue to serve as Chair of the SSC until 31 December 2020 in order to facilitate transfer of all the different program activities and issues she is in charge. Raphael Kudela, Vice-Chair, will step down from the SSC but will continue to participate as a liaison for some of the programs and activities (i.e. not a full SSC member). The new Vice-Chair will be decided when the new SSC will be established. The renewal of the members that started in 2016 is expected at the end of 2020, and the new members will serve until 2022. New rotation rules should be established as part of the GlobalHAB SSC Terms of Reference.

When closing this Report, the new composition of the SSC has been submitted to SCOR and IOC/IPHAB for consideration.

GlobalHAB, on behalf of all the international community working on HABs, thanks all the SSC members and liaisons that step down for their dedication and engagement with the program along the 2016-2019 period.

Table 1. Composition of the first GlobalHAB SSC in the period 2016-2019.

GlobalHAB SSC 2016-2019				
SSC Scientific Members	Country / Entity	Main SSC 2016-2019		Expertise / Theme
		Start	End	
Berdalet, Elisa	ES	2016	2019	Chair. 6-BHAB, 10-Health
Banas, Neil	UK	2016	2019	9-Modeling, 12-CC
Burford, Michele	AU	2016	2019	2-Adaptive strategies; 5-FHABs, cyano
Gobler, Chris	USA	2016	2019	5- FHABs, cyanoHAB
Karlson, Bengt	SE	2016	2019	8-Comparative; 9-Observation
Kudela, Raphael	USA	2016	2019	Vice-Chair. GO2NE, GOOS
Lim, Po Teen	MY	2016	2019	3-Toxins, 7-Fish kills
Mackenzie, Lincoln	NZ	2016	2019	7-Aquaculture
Montresor, Marina	IT	2016	2019	1-Biodiversity
Yin, Kedong	CN	2016	2019	4-Eutrophication
Ex-officio				
Davidson, Keith	UK	2017	2019	7-Aquaculture, 11-Economics
Liaisons with partner entities				
Bresnan, Eileen	ICES-IOC WGHABD	2016	2020	
Usup, Gires	IPHAB	2016	2019	
Silke, Joe	IPHAB	2019	2021	
Trainer, Vera	PICES and ISSHA	2016	2019	
Kudela, Raphael	GOOS Bio & Eco Panel	2017	2019	
Sponsors Representatives				
Enevoldsen, Henrik	IOC UNESCO	2016		
Urban, Ed	SCOR	2016	2019	

Table 2. Composition of the first GlobalHAB SSC in the period 2020-2022. A short description of the new candidates and their CV follows after table 4.

GlobalHAB SSC 2020-2022				
SSC Scientific Members		Main SSC 2020 - 2022		Expertise / Theme
Former SSC members	Country / Entity	Start	End	
Berdalet, Elisa	Spain	2020	2022	Chair. 6-BHAB, 10-Health
Banas, Neil	United Kingdom	2020	2022	9-Modeling, 12-Climate Change
Karlson, Bengt	Sweden	2020	2022	8-Comparative; 9-Observation
Lim, Po Teen	Malaysia	2020	2022	3-Toxins, 7-Aquaculture (Fish kills)
New SSC members				
Anderson, Clarissa	USA	2020	2022	9-Observation, Modeling
Davis, Tim	USA	2020	2022	5-FHABs, cyanoHAB; 4-Nutrients
Jeong, Hae Jin	Korea	2020	2022	1-Taxonomy, 2-Physiology, 3-Toxins
Siano, Raffaele	France	2020	2022	9-Observations
Wood, Susie	New Zealand	2020	2022	5-FHABs, cyanoHAB
Yñiguez, Aletta	Philippines	2020	2022	9-Observation, Modeling. Molecular tools. Citizen science

Table 3. Structure of GlobalHAB SSC including the new Subcommittees, with participation of different SSC members and external collaborators

GlobalHAB SSC 2020-2022			Subcommittees to implement ongoing and pipeline activities in the 2020-2022 period														
SSC Scientific Members	Main SSC 2020 - 2022		Expertise / Theme #	9-Modelling		12-Best Practice Manual HABs & CC		7-Aquaculture & Fish Kills		8-Observations		5-Freshwater & Brackish Water HABs		10&11-Economics & Health		13-Sargassum	
Former SSC members	Start	End		Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
E. Berdalet	2020	2022	Chair. 6, 10, 11, 13							2019	2021			2016	2020	2016	2021
N. Banas	2020	2022	9, 12	2020	2021												
B. Karlson	2020	2022	8, 9	2020	2021					2019	2021						
P.T. Lim	2020	2022	3, 7					2016	2020								
M. Burford			2, 5			2017	2020					2016	TBD				
R.M. Kudela	2020	2022	9, 12	2020	2021					2019	2021						
L. Mackenzie			7					2016	2020								
M. Montresor			1, 12			2017	2020			2019	2021						

New SSC members			Expertise / Theme #	9-Modelling		12-Best Practice Manual HABs & CC		7-Aquaculture & Fish Kills		8-Observations		5-Freshwater & Brackish Water HABs		10&11-Economics & Health		13-Sargassum	
C. Anderson	2020	2022	9														
T. Davis	2020	2022	4, 5														
H.J. Jeong	2020	2022	1, 2, 3														
R. Siano	2020	2022	9														
S. Wood	2020	2022	5														
A. Yñiguez	2020	2022	9														

Ex-officio			Expertise / Theme #	9-Modelling		12-Best Practise Manual HABs & CC		7-Aquaculture & Fish Kills		8-Observations		5-Freshwater & Brackish Water HABs		10&11-Economics & Health		13-Sargassum	
K. Davidson			7, 11	2020	2021			2016	2020					2016	2020		
V. Trainer			11											2016	2020		

Liaisons with partner entities			Expertise / Theme #	9-Modelling		12-Best Practise Manual HABs & CC		7-Aquaculture & Fish Kills		8-Observations		5-Freshwater & Brackish Water HABs		10&11-Economics & Health		13-Sargassum	
D. Clarke	2020	2022	ICES-IOC WGHABD														
R.M. Kudela	2018	2022	GOOS Bio & Eco Panel. IPCC	2020	2021					2019	2021						
J. Silke	2019	2022	IPHAB														
V. Trainer	2020		PICES														

Sponsors Representatives																	
H. Enevoldsen	2016		IOC UNESCO														
P. Miloslavich	2020		SCOR														
NN			NOAA co-sponsor														

Table 4. Members of the operative Subcommittees in 2020, including SSC and non SSC members. In red, persons already involved in the SSC during some period. Note that the new SSC members starting in 2020 have not been assigned to any subcommittee. This will be decided once the SSC will be approved and constituted.

Modelling Organizing Committee		Best Practices Manual CC HABs - Editors		Fish Killing Algal Blooms	
Chair	Members	Chair	Members	Chair	Members
N. Banas	D. Aleynik C. Anderson K. Davidson B. Karlson D. McGillicuddy B. Siemering	M. Wells	A. Kremp M. Burford M. Montresor G. Pitcher	L. Guzmán	D. Anderson A. Cembella G. Hallegraeff H. Hégaret M. Iwataki P.T. Lim T.O. Larsen L. Mackenzie
Task	Workshop + product	Task	Manual	Task	Workshop + product
Expected finalisation	Dec 2021	Expected finalisation	Dec 2020	Expected finalisation	Dec 2020

Observations Organizing Committee	
Chair	Members
B. Karlson	K. Davidson R. Kudela L. Naustvoll P. Tiselius M. Montresor E. Berdalet
Task	Minisymposium + product
Expected finalization	Dec 2021

Freshwater Subcommittee to be decided	
Chair	Members
M. Burford	
Task	TBD
Expected finalization	TBD

Economics Organizing / Follow up Committee	
Chair	Members
V. Trainer	E. Berdalet K. Davidson S. Moore K. Wakita
Task	Finish Report and possible peer-review paper
Expected finalization	Dec 2020

<i>Sargassum</i> Organizing Committee	
Chair	Members
TBD	B. van Tussenbroeck E. Berdalet B. Lapointe J.E. Martinelli Filho Ester Serrao
Task	OSM, define Tasks
Expected finalization	Open, it is a new Topic