Rapid Detection Technology for Harmful Algal Blooms Working Group

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Guidelines

What

To take stock of the **implementation status** and further catalyze ocean science solutions for sustainable development, this ppt template is designed to:

- Gather information on the **current development status** of the WESTPAC Programme/Project/Working Group, particularly since the Fourteenth Session of the IOC Sub-Commission for the Western Pacific (WESTPAC-XIV) in *April 2023*.
- More importantly, assess its **future development**, along with **potential action plans** for future implementation, i.e., for the period of *2025-2026 and beyond*.

Why

- The Information will facilitate considerations concerning how to harness, stimulate and empower interdisciplinary ocean research that can increase our understanding and inform policy and decision-making.
- It will also aid in improving programme efficiency and effectiveness that will serve the requirement of Member States and the Sub-Commission as a whole.

How

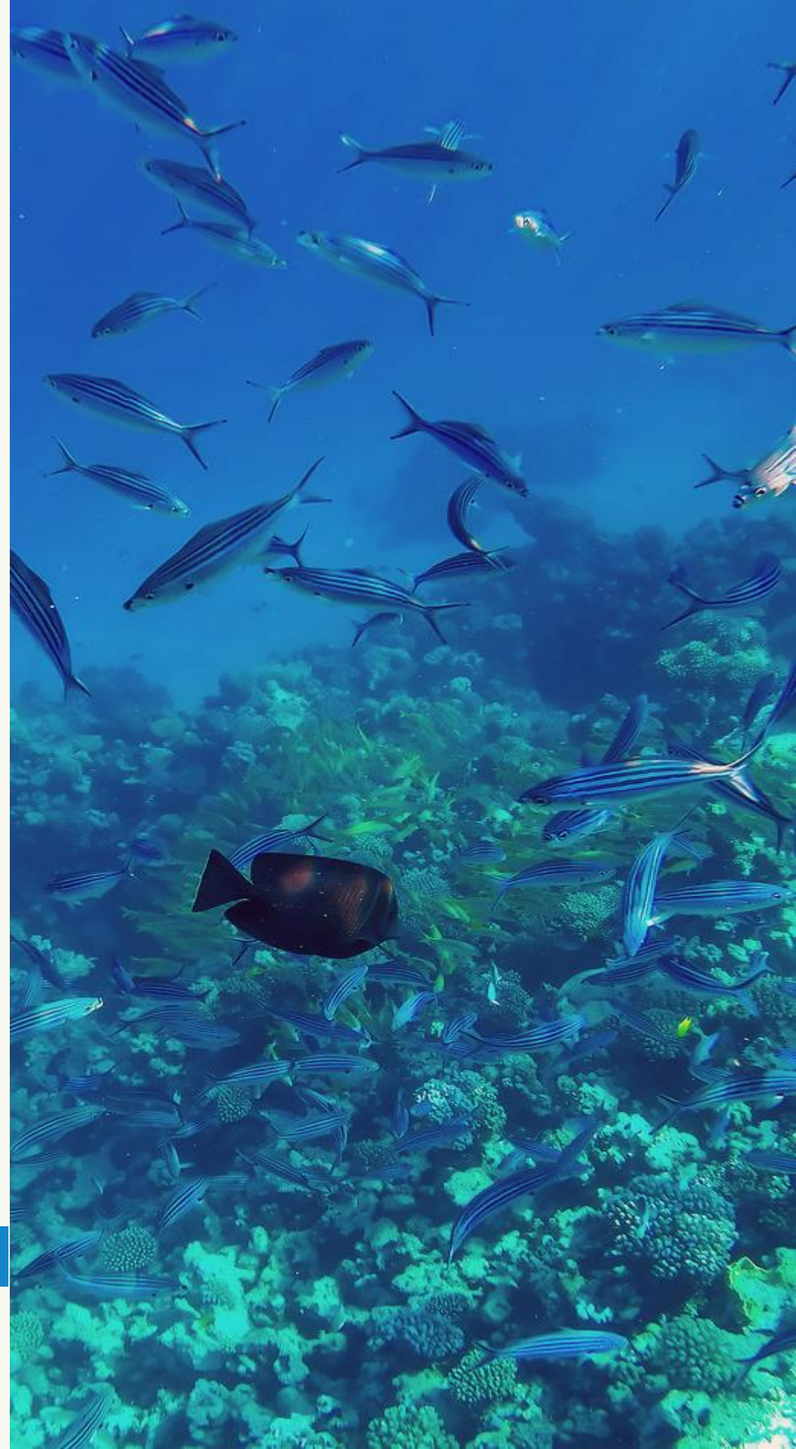
Filling out the following slides, which should not take much time, and return the completed slides to *iocwestpac@unesco.org* by **20 September 2024**. We appreciate your kind cooperation.

Note:

- *Feel free to use a different slide layout if it better suits your summary content.*
- *Failure to submit will be considered as a lack of substantive activity and may indicate difficulties in continuing the project.*

Summary Outline

1. Justification
2. Objectives
3. Major activities, outputs & outcomes (particular those accomplished during 2023-2024)
4. Problems encountered and recommended actions
5. Strategic considerations/thoughts for future development
6. Potential action plans for 2025-2026 and beyond



1. Justification

(Why this programme/project/working group is needed for the Sub-Commission)

In the past decades Harmful Algal Blooms (HABs) have expanded globally and drawn a great attention of coastal countries worldwide, because of their multiple effects on marine ecosystems and the public health. The HABs studies have been done much in the last several decades, especially on their taxonomy, biodiversity and geographical distribution. However, there still remains a big gap towards the early warning and effective management of HABs, especially in the West Pacific region.

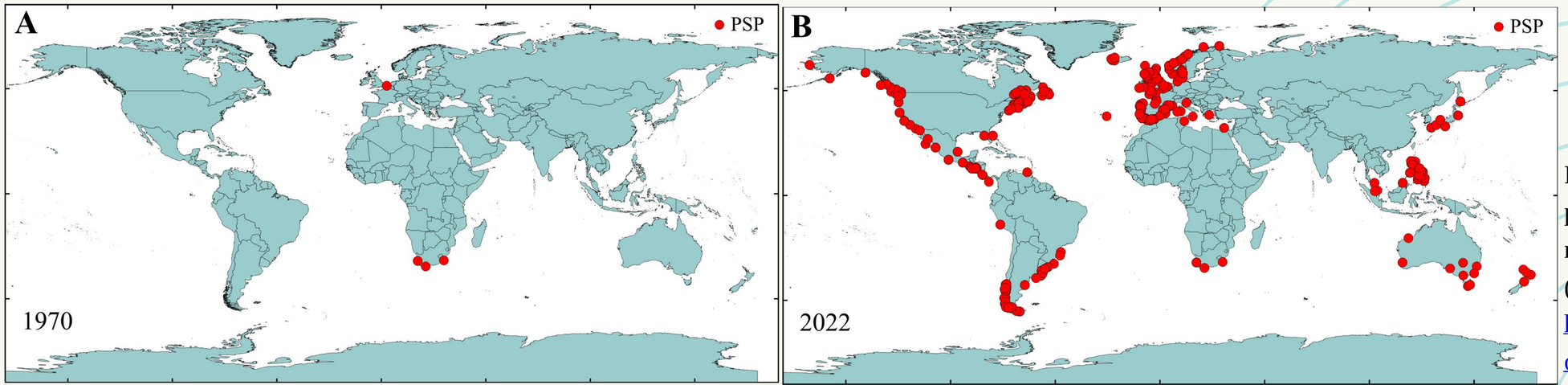


Figure. Global distribution of paralytic shellfish toxins (PSP) recorded cumulatively up to 1970 (A) and 2022 (B)（Data source：https://www.whoi.edu/redtide/regions/world-distribution）

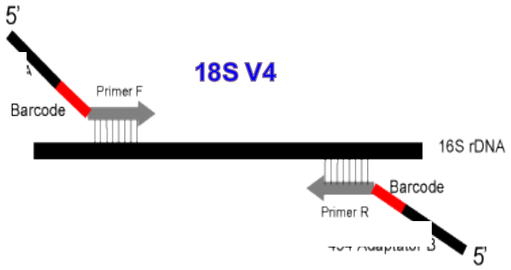
1. Justification

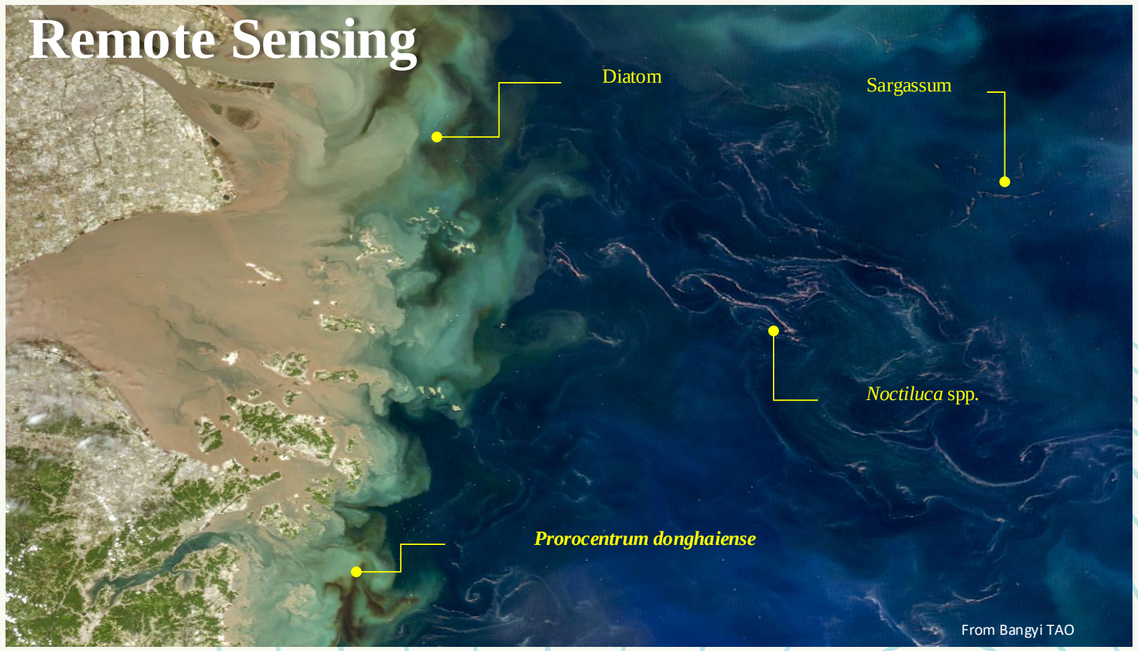
(Why this programme/project/working group is needed for the Sub-Commission)

With the scientific and technological progress, molecular probe or diagnosis has been significantly developed. Remote sensing can also be applied in many fields with a high resolution. Although more and more new rapid detection technologies for HAB were developed, there is still some distance for the application of these technologies to HAB monitoring and detecting on an operational basis, due to technical constraints of each technology, such as efficiency, accuracy, manpower.

High-throughput sequencing （HTS）

HTS analysis for HABs





1. Justification

(Why this programme/project/working group is needed for the Sub-Commission)

Therefore, the **working group** aims, through focused group discussions and pilot studies, explore, to promote, adapt and apply rapid detection technology for HABs towards the early warning and effective management of HABs in the West Pacific Region, by means of via not only using traditional microscopy methods, but also combining with molecular probes and quantitative PCR essays, high-throughput sequencing and remote sensing technique etc. Thus, the WESTPAC WORKING GROUP ON Rapid Detection Technology for Harmful Algal Blooms (RDT-HAB) was established and conducts a joint study on rapid detection technology.

2. Objectives

- The aim of Rapid Detection Technology for Harmful Algal Blooms of IOC-WESTPAC (RDT-HAB-IOC-WESTPAC) is to include, modify and apply the rapid detection technology for HABs base on molecular and remote sensing technique etc. So that a capability can be developed to detect the HABs at its earlier stage, and thus towards the early warning of HABs and its effective management.

3. Major activities, outputs & outcomes

Latest accomplishment, particular those during 2023 to 2024

Major activities

1. Webinar of Rapid Detection Technology for Harmful Algal Blooms

- Webinar of rapid detection technology for harmful algal blooms was held in 2022. 08.10, Online. More than 30 participants joint the webinar and the different HAB Rapid Detection Technologies were introduced, such as molecular method, buoy or IFCB, remote sensing and smart ocean. Additionally, all participants conducted the discussion on the design of HAB rapid detection technologies in the Western Pacific Region.

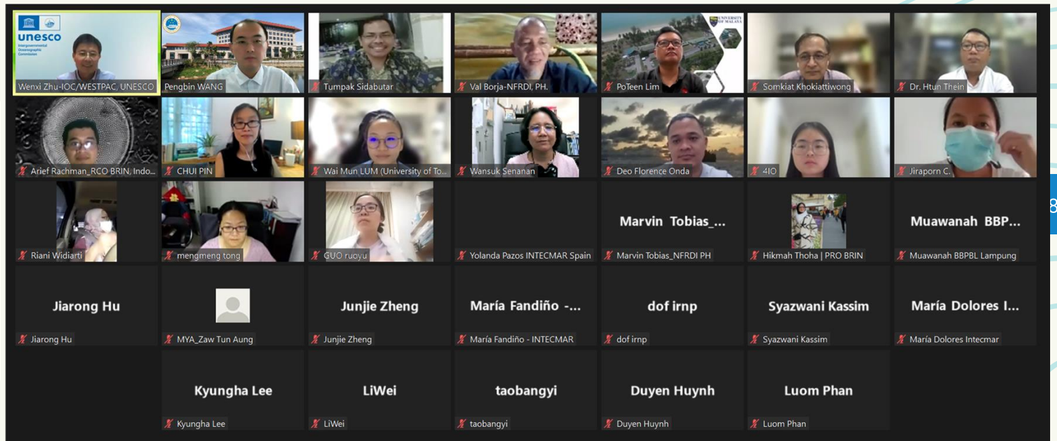
Timeframe

Project start year: 2021

Agenda of the HAB-RDT Webinar

Date/time (in Chinese Standard Time)		Speakers	Topic
2022-08-10 Chair: Pengbin WANG	14:00-14:05	Pengbin WANG	Opening and Introduction
	14:05-14:10	WESTPAC Office	Opening Remark
	14:10-14:50	Chuipin LEAW	HAB Rapid Detection Technologies: Molecular Method
	14:50-15:30	Deo Florence ONDA	HAB Rapid Detection Technologies: Buoy or IFCB
	15:30-16:10	Bangyi TAO	HAB Rapid Detection Technologies: Remote Sensing
	16:10-17:00	Pengbin WANG	HAB Rapid Detection Technologies: Smart Ocean
	17:00-17:30	All participants	Discussion on the design on HAB rapid detection technologies in the Western Pacific Region

1. All presentations are requested to finish in 30 minutes, and the remaining 10 minutes for questions and answers.
2. This webinar will be recorded for further sharing with other researchers and related stakeholders who are not be able to attend.
3. All presentations (in PDF format) will be further shared with permission of the speakers.



3. Major activities, outputs & outcomes

Latest accomplishment, particular those during 2023 to 2024

Major activities

2. Harmful Algal Bloom Data Collections

- Collecting Historic Harmful Algal Bloom events Data in the Western Pacific Region. Currently, partial data were uploaded in the system and can be shown virtually, including the data from China (1980-2023), Korea (2017-2022), Philippines (1991-2021), Thailand (1995-2021), which were contributed by the working group members from the related countries.
- Database construction.

Timeframe

Project start year: 2021

Date	Distribution area	Longitude (°E)	Latitude (°N)	Major causative species
2017/1/24	South of Eastern KOREA	129.106202	35.1906077	*Cryptomonas sp.*
2017/4/3	South of Eastern KOREA	129.2372495	35.2639585	*Scrippsiella trochoidea*
2017/5/4	South of Eastern KOREA	129.4671376	35.4487423	*Noctiluca sp.*
2017/5/25	South of Eastern KOREA	128.8809069	35.0770636	*Heterosigma akashiwo*
2017/6/27	South of Eastern KOREA	129.118563	35.1510666	*Pyramimonas sp.*
2017/6/28	South of Eastern KOREA	128.8622693	35.0309087	*Ceratium furca*
2017/7/12	West of sourthern KOREA	127.0735507	34.6078256	*Chattonella marina*
2017/7/28	East of sourthern KOREA	128.3854121	34.7593904	*Chaetoceros spp.*
2017/8/7	East of sourthern KOREA	128.3756495	34.76487	*Alexandrium sp.*
2017/8/9	East of sourthern KOREA	128.1416274	34.8172504	*Alexandrium sp.*
2017/8/10	West of sourthern KOREA	127.779947	34.7285409	*Alexandrium sp.*
	East of sourthern KOREA	127.9324396	34.712294	*Alexandrium sp.*
2017/8/11	West of sourthern KOREA	127.8020229	34.7158329	*Alexandrium sp.*
	East of sourthern KOREA	128.3204416	34.7969504	*Alexandrium sp.*
2017/8/12	East of sourthern KOREA	128.0906916	34.7457593	Alexandrium sp.
2017/8/14	East of sourthern KOREA	128.3518036	34.762824	*Alexandrium sp.*
2017/8/18	East of sourthern KOREA	128.325399	34.9350293	*Chaetoceros spp.*
2017/8/23	West of sourthern KOREA	127.0532317	34.648578	*Prorodon sp.*
2017/8/28	West of sourthern KOREA	126.913996	34.4624503	*Mesodinium rubrum*
2018/4/3	littoral sea of Busan, KOREA	129.1240381	35.1701375	Teleaulax sp.
2018/5/10	East of sourthern KOREA	128.6785835	35.0795669	*Akashiwo sanguinea*
2018/5/29	South of Eastern KOREA	128.886898	35.0323604	*Akashiwo sanguinea*
2018/5/30	South of Eastern KOREA	128.9028055	35.031508	*Akashiwo sanguinea*
2018/6/4	South of Eastern KOREA	128.8587083	35.0268171	*Akashiwo sanguinea*
2018/7/11	West of sourthern KOREA	127.7685717	34.7353142	*Chaetoceros curvisetus*

3. Major activities, outputs & outcomes

Latest accomplishment, particular those during 2023 to 2024

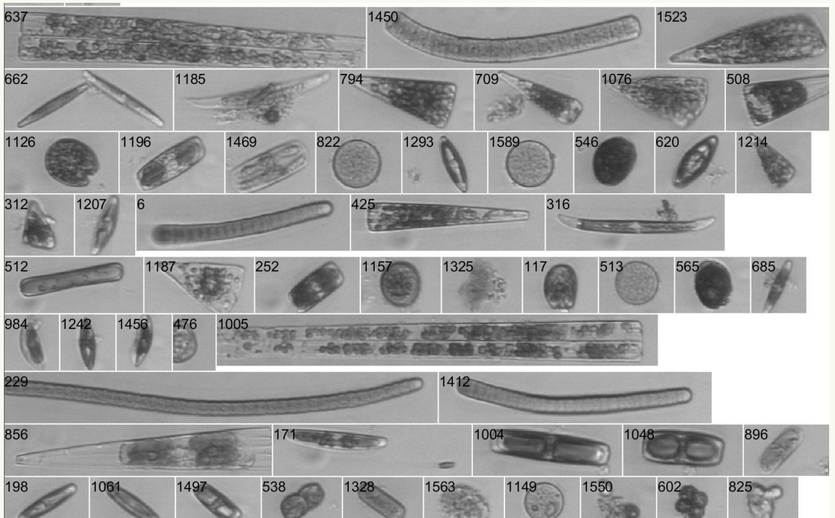
Major activities

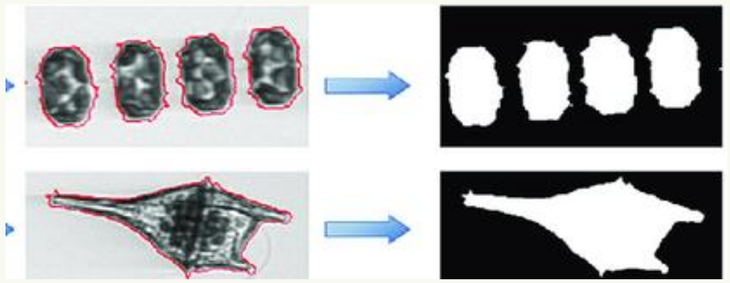
3. Co-developing the HAB rapid detection technology

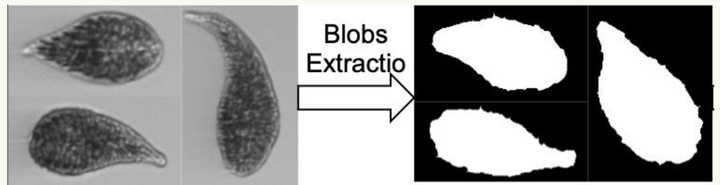
- The Imaging FlowCytobot (IFCB) based database construction
- AI based detection model training
- Detecting accuracy testing

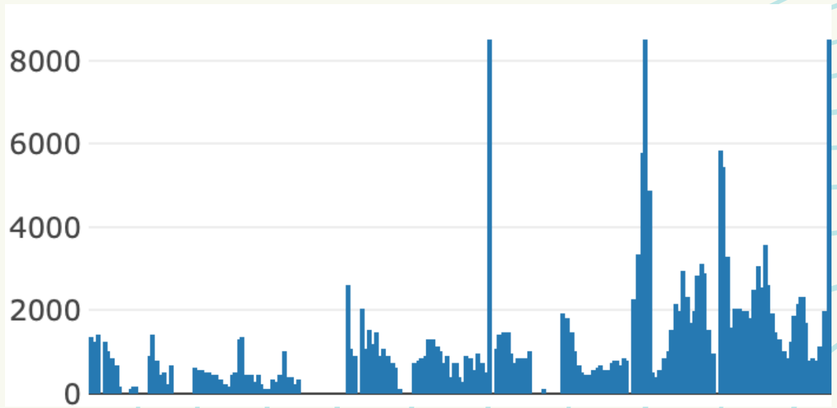
Timeframe

Project start year: 2021









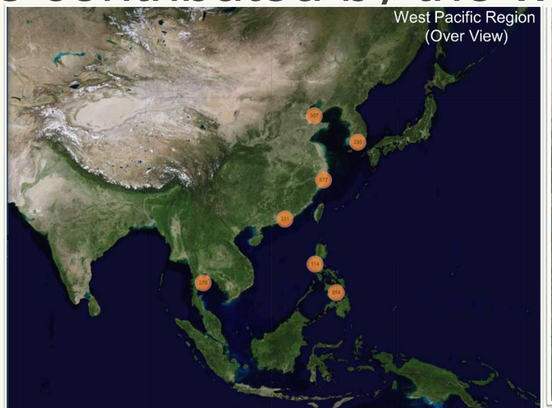
3. Major activities, outputs & outcomes

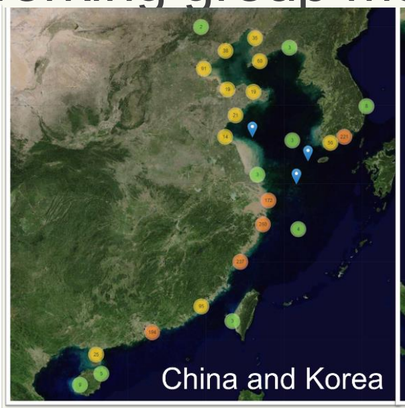
Latest accomplishment, particular those during 2023 to 2024

Outputs & Outcomes

1. Harmful Algal Blooming Information System of West Pacific Region

- Under review the harmful algal blooming status, developing and establishing the Harmful Algal Blooming Information System of West Pacific Region, collecting and loading the HAB events and biogeographic information in the system. Currently, partial data were uploaded in the system and can be shown virtually, including the data from China (1980-2023), Korea (2017-2023), Philippines (1991-2021), Thailand (1995-2021), which were contributed by the working group members from the related countries.





Timeframe

Project start year: 2021

3. Major activities, outputs & outcomes

Latest accomplishment, particular those during 2023 to 2024

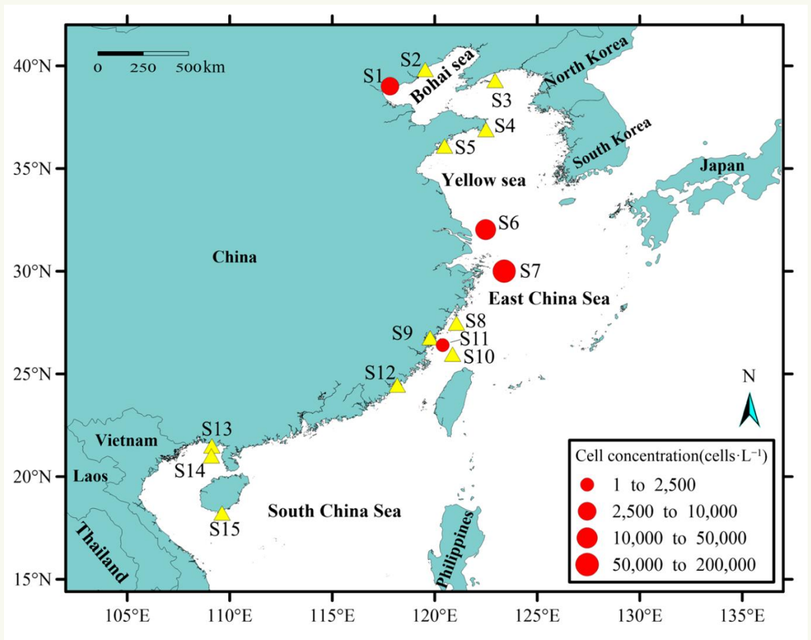
Outputs & Outcomes

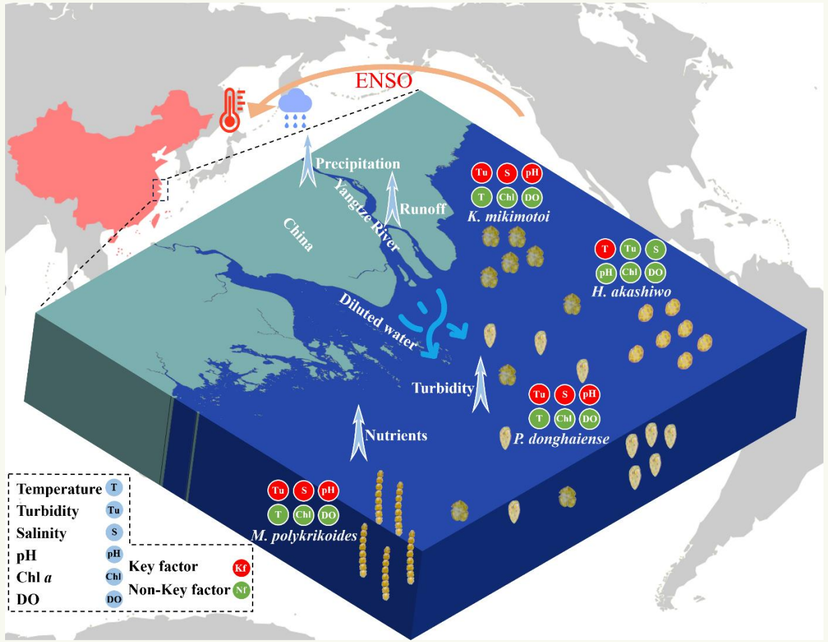
2. Pilot test via quantitative real-time PCR in Chinese coastal water

- Quantitative real-time PCR based detecting methods on *Karenia mikimotoi*, *Margalefidinium polykrikoides*, *Prorocentrum donghaiense*, and *Heterosigma akashiwo* were test in Chinese cost and East China Sea.

Timeframe

Project start year: 2021





Hu & Wang* et.al
China and Korea Corporations

3. Major activities, outputs & outcomes

Latest accomplishment, particular those during 2023 to 2024

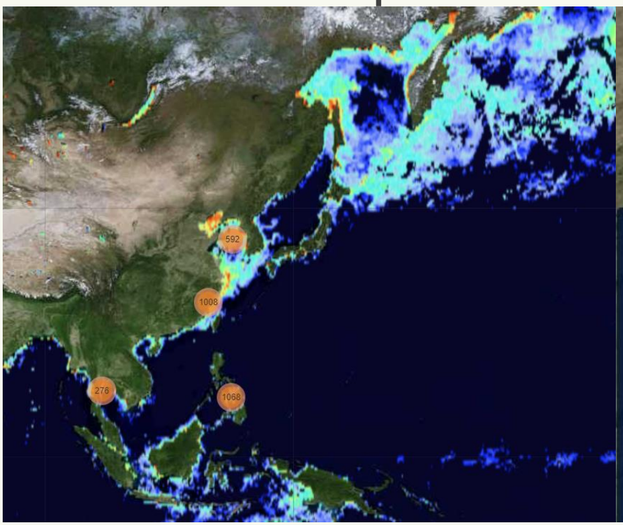
Outputs & Outcomes

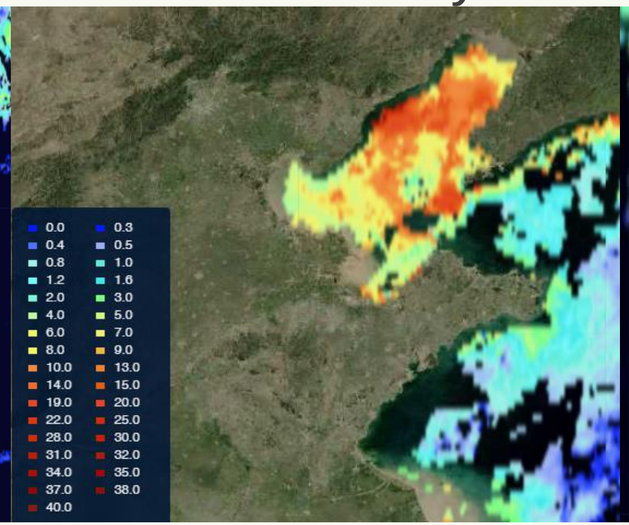
3. Developing the satellites based (remote sensing) HAB rapid detection technology

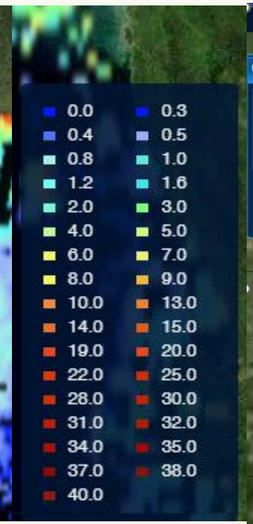
- Remote sensing is a good way to detect high biomass HAB, thus our working group is trying to develop and test the application on satellite based remote sensing method to detect HAB in west pacific region. The business operation HAB information system is under construction.

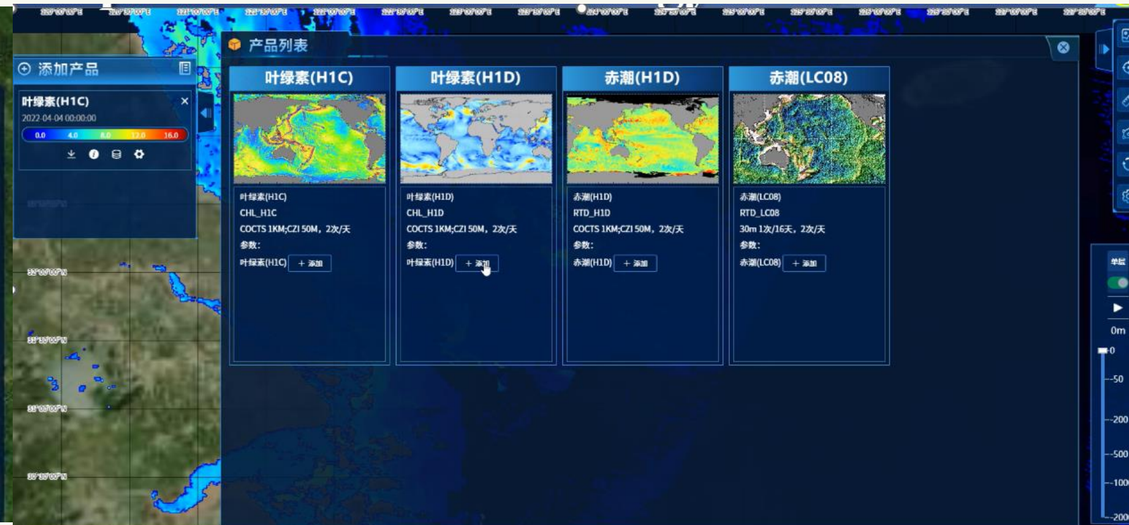
Timeframe

Project start year: 2021









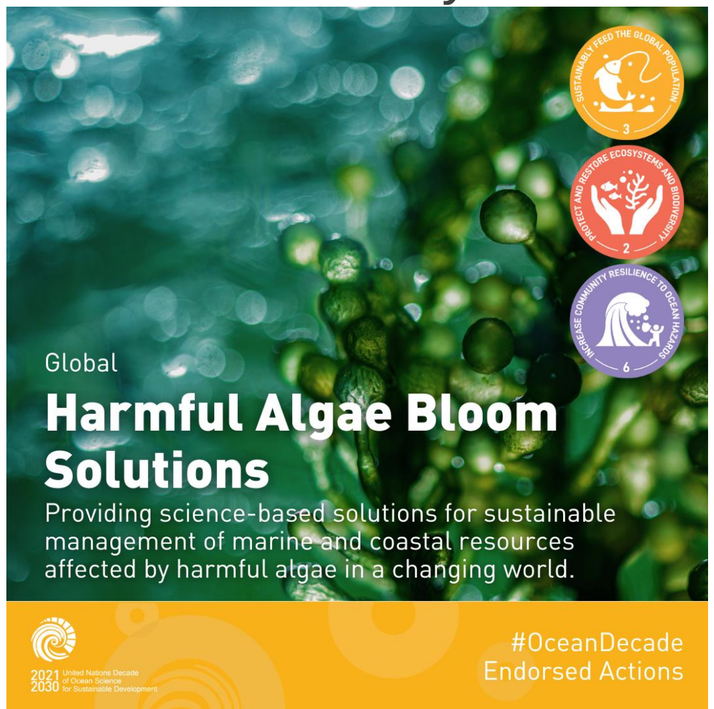
3. Major activities, outputs & outcomes

Latest accomplishment, particular those during 2023 to 2024

Outputs & Outcomes

3. As a partner established Ocean Decade Programme: HAB Solutions (HAB-S)

- In February of 2024, Ocean Decade Programme: HAB Solutions (HAB-S) was launched by IOC. Working Group members as partner focal points.



Timeframe

Project start year: 2021

4. Problems encountered & recommended actions

Problems encountered

- Lack of funding support many face to face communication and activities.

Timeframe

Project start year: 2021

Actions

- Online meetings and task leading solutions
- Small groups face to face visiting

5. Strategic considerations/thoughts for future development

1. Updating the 2024 data to Harmful Algal Blooming Information System of West Pacific Region
2. Developing the Image based HAB rapid detection technology
3. Developing the eDNA based (qPCR and HTS) HAB rapid detection technology
4. Developing the satellites based (remote sensing) HAB rapid detection technology

6. Potential action plans for future implementation

for the period of 2025-2026 and beyond

1. Open running the Harmful Algal Blooming Information System of West Pacific Region
2. Accomplished the Image based HAB rapid detection technology development
3. Developing and testing the eDNA based HAB rapid detection technology
4. Developing and testing the satellites based (remote sensing) HAB rapid detection technology

Planned activities

Program	Plan				Funding Required		Remark
	Activities	Objectives	Expected outputs/outcomes	Date and place	IOC	Other sources (i.e. from national or international)	
【Working Group】Rapid Detection Technology for Harmful Algal Blooms (RDT-HAB)	1. Workshops	13th EASTHAB (Rapid Detection Technology for Harmful Algal Blooms Session)	Review, communicate and exchange the research status of rapid detection technology for HABs; co-design and modify the rapid detection technology for HABs products from our working group towards the early warning and effective management of HABs in the region.	2024.11; Xiamen, China	0	10K USD	
	2. Training Workshops	Study Rapid Detection Technology for Harmful Algal Blooms	Sharing the Study Method and Rapid Detection Technology for Harmful Algal Blooms	TBD	0	10K USD	
	3. Business Meetings	Discuss and summarize the progress of RDT-HAB-IOC-WESTPAC	Business discussion and decision	TBD	0	5K USD	

ThankYou

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