

# ICHA 2023 Highlights

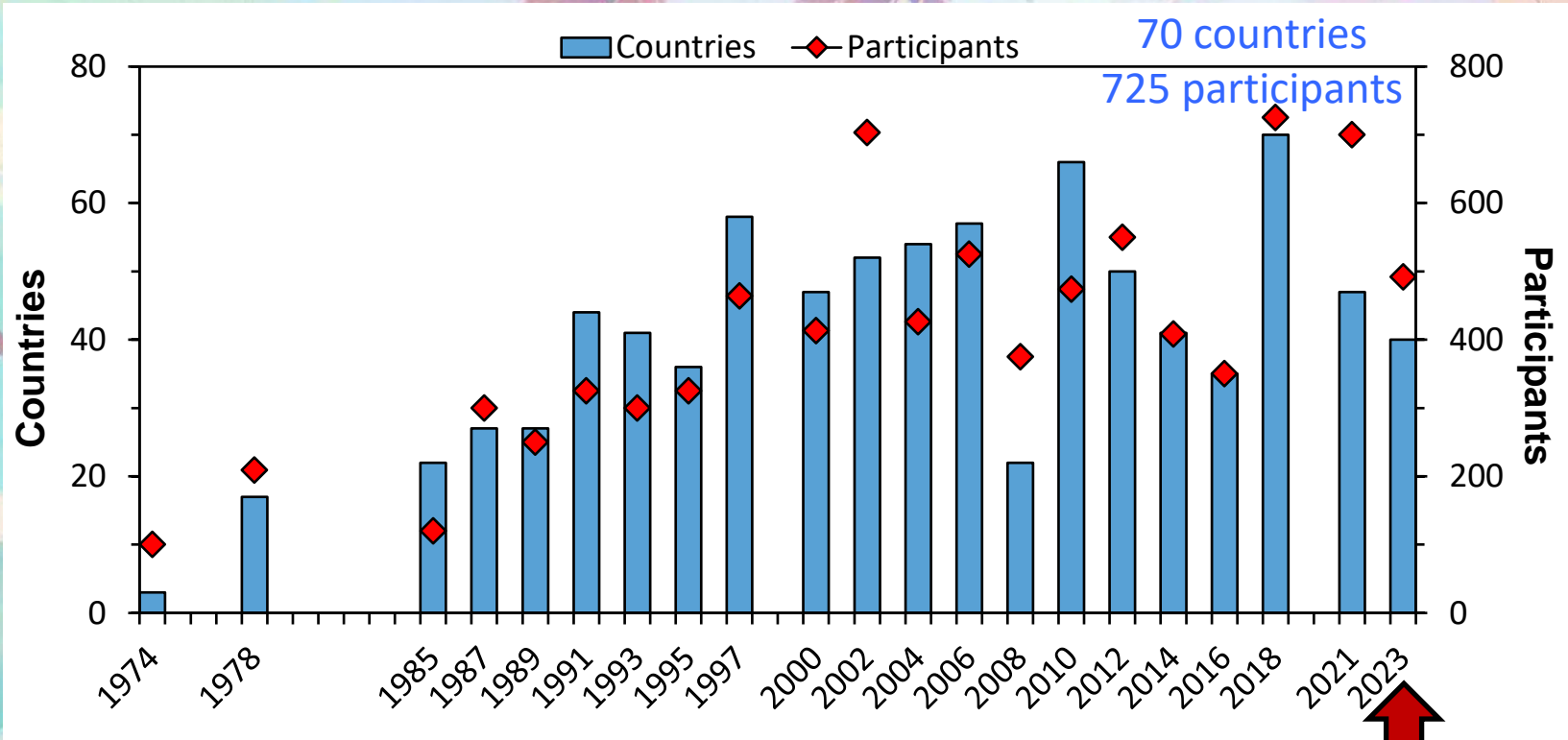
Elisa Berdalet and Tomohiro Nishimura

# Science highlights

- 6 days
- 3 parallel sessions
- 1 opening lecture
- 8 plenary sessions
- 36 parallel oral sessions  
(216 presentations)
- 3 ignite talk sessions  
(45 presentations)
- 2 poster sessions  
(244 posters)
- 5 workshops
- Young investigator networking session

...yay, we've made it to the end!

# Participation

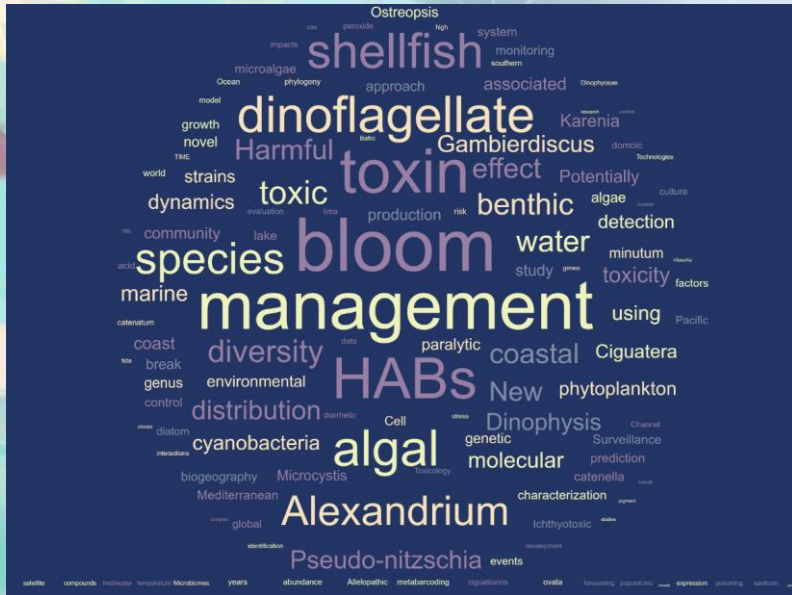


Years

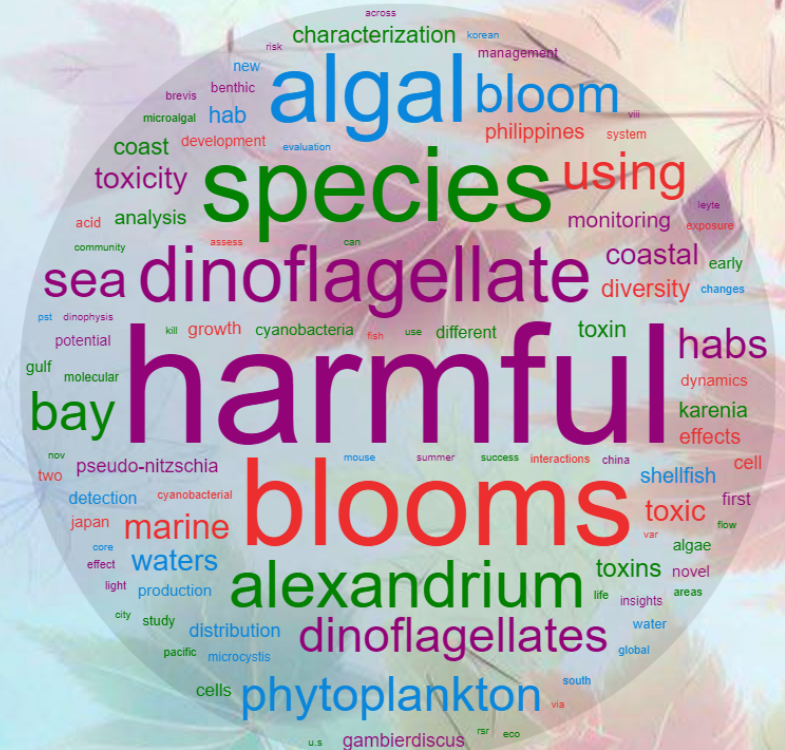
**40 countries, 492 participants!**

# Word cloud of the submitted titles

2021



2023



# Word cloud of the submitted titles

2021



2023



# Opening lecture & plenary session speakers



Yasuwo FUKUYO  
(JAPAN)



Luiz L Mafra JR  
(BRAZIL)



Mari YAMASHITA  
(JAPAN)



Masao ADACHI  
(JAPAN)



Po Teen LIM  
(MALAYSIA)



Dedmer van de WAAL  
(NETHERLANDS)



Kirsty SMITH  
(NEW ZEALAND)



Esther GARCES  
(SPAIN)



Vera TRAINER  
(USA)

# Ecology

- Increasing monitoring of HAB species blooms using metabarcoding in Japan (**Sildever**) and cyanobacteria in USA (**Gobler**).
- Increasing efforts in monitoring HAB species in the southernmost regions of Chile (**Frangopulos**).
- A single-cell multiplex PCR assay for the genotype frequency and toxin dynamics of *Pyrodinium bahamense* (**Cusick**).
- High diversity of HAB species was found on floating plastics in the Philippines (**Onda**).

# Ecology

- “Objectif Plancton”: a citizen science program to assess Phytoplankton communities' changes in France (**Schweibold**).
- New data on cyst production of toxic dinoflagellate in NW Africa, especially during upwelling relaxation (**Eldo**).
- New information on *Dinophysis* ecology using IFCB: Biophysical trapping, phase mating and interaction with a grazer (**Sung-Clarke, Ladds**).
- The ecological advantage of *Lepidodinium chlorophorum* (causing high biomass blooms and potentially harmful to oysters) may rely on the production of Transparent Exopolymer Particles (TEPs) facilitating positive bacterial interactions and nutrient availability (**Siano**).



# Biology and biogeography

- *sxtA* gene has not been laterally transferred between *Alexandrium* species and *Centrodinium punctatum* (**Murray**).
- A high diversity of dinoflagellates cysts was discovered in China by multiple assays (FISH-LM-SCS) and qPCR (**Tang**).
- *Karenia mikimotoi* tolerates unusually high irradiances (**Higo**).
- A comprehensive genomic study revealed that the mitochondrial genes were relatively unstable compared to plastidial genes in nine *Skeletonema* species (**Nagai**).

# Community/Species Interactions

- Grazing by *Paramecium* induces the heterocyst differentiation in *Dolichospermum*, being correlated with an increase of the filament length and promoting nitrogen fixation (**Huang**).
- Seaweed cultivation could enhance the biodiversity of the plankton community (**Chai**).
- Cells/cell-free media of or reactive oxygen species (ROS)/free fatty acids produced by several HAB species have allelopathic effects towards *Gymnodinium catenatum* (**Band-Schmidt, Encinas-Yanez**).

# Taxonomy

- Five new species of *Heterocapsa* are proposed from the Mediterranean Sea (**Sampedro**).
- Taxonomy of goniiodomin-producing *Alexandrium* species are re-evaluated (**Tillmann**).
- New toxins and toxic species from the IOC-taxonomic reference list are introduced (**Lundholm**).

# Microbiomes and Omics

- Important role of microbiome of dinoflagellates for coping with stress (**Islam**).
- The capacity for resolving HABs using full-length 18S rDNA in metabarcoding analysis (**Campbell**).
- Role of toxins and mixotrophy revealed by multi-omics (**John**).
- Secret messages encoded in invasive diatom *Cymbella janischii* (**Soto**).

# Prediction and Modeling

- Trophic-transfer models throughout a critical marine food chain are constructed to predict the exposure of STXs to walrus (**Charapata**).
- Machine and deep learning approaches are applied to various sea areas (**Ignacio, Yoshida, Fernández-Tejedor**).

# Monitoring and Mitigation

- A meta-analysis of chemical treatments of freshwater cyanoHABs showed that most were not fully effective (**Wilson**).
- Hydrogen peroxide was successfully used against *Prymnesium parvum* (**Jasser**).
- DINOSHIELD is a proposed new control for dinoflagellate blooms based on slow release of bacterial algicide (**Wang, Coyne**).
- A study from South Africa reported modified bioflocculation agent cyanobacteria using the Fruits of terrestrial plants (**Gambo**).

# Monitoring and Mitigation

- Exciting new nanopore field technology will be ready for commercialization soon (**Hatfield**).
- Chilean HAB monitoring spans many scales and incorporates sequencing technology for rapid taxonomic ID (**Fuenzalida**).
- PhytO-ARM is a new and exciting open-source design toolkit to aid in deployment and edge computing for IFCBs and other imagers on fixed and Lagrangian platforms (**Brosnahan**).
- Dissolved DA is not a primary contributor in mussel contamination (**Trapp**).

# Ciguatera and Benthic HABs

- Production of newly identified MTXs and C-CTXs from *Gambierdiscus cheloniae*, *G. honu*, *G. silvae* (**Murray, Mudge**).
- Growth experiments and modellings revealed predicted potential hotspots of *G. polynesiensis* distribution and CP outbreaks (**Nishimura, Briscoe**).
- Promising biosensor for the detection of P-CTXs in fish and seawater (**Campàs**).



# Cyanobacterial HABs

- The first toxic *Microcystis* blooms were reported in Malaysia and several new genera were isolated (**Ong**).
- A new toxic cyanobacterial species was isolated from microplastic particles (**Curren**).
- New imaging techniques provided more precise and species-specific information on cyanobacteria (**Kraft**) and a novel early warning system using cyanotoxin-encoding genes (**Lu**).

# Toxins, Biosynthesis and Detection Methods

- The colchicine mode of action affects STX production in dinoflagellates **(Cho)**.
- Several uncommon okadaic acid and pectenotoxin analogues were found in *Dinophysis norvegica* **(Miles)**.
- Early warning tool of *Pseudo-nitzschia* in environmental samples based on detection of gene expression **(Wood)**.
- Novel pinnatoxins from *Vulcanodinium rugosum* **(Hort)**.
- Candidate ichthyotoxin identified *Chrysochromulina leadbeateri* **(Larsen)**.

# Toxicology/Ichthyotoxic HABs

- In-depth revision required on regulatory limits and toxicological endpoints for many toxin groups, including CTX, OA and STX (**Botana**).
- DTX-1 provokes cell cycle arrest in *Tisochrysis affinis galbana* (**Qiu**).
- Ichthyotoxic algae are of different phylogenetic origin (**Hallegraeff**).
- The ichthyotoxic subject into rivers not only marine ecosystems (**Varga**).
- Associated bacteria are very important to understand toxin production (**Lee**).

# Surveillance and Management

- Effective analysis method for the genetic complex *Alexandrium* genus: Biomark HD real-time qPCR System **(Cucchi)**.
- From researchers to volunteers, from qPCR to drones and satellites including the unintentional dogs, exciting and effective approaches to HABs monitoring in the USA **(Bonner)**.
- PCR analysis of *sxtA4* and *sxtG* gens is a promising tool for the early detection of SXT in aquaculture sites **(Gaiani)**.
- Natural sciences cannot be isolated from society: in the Philippines, HABs cause major economic losses to small-scale fishing communities **(Silaras, Yap-Dejeto)**.

# HABs in a Changing World

- New evidence on unexpected variability of HABs due to climate change, making it difficult to predict when/where HAB events will occur in a future ocean (**Glibert, Isada, Heiser, Rodríguez**).
- Conceptual models were raised to account for the massive occurrence of toxic *Alexandrium catenella* blooms in the Alaskan Arctic (**Anderson**).
- Warmer conditions may favour toxic *Pseudonitzschia multiseries* producing more dissolved domoic acid (**Kudela**) while rising pCO<sub>2</sub> has no effect on either its growth or toxin production (**Cochlan**).

# Emerging issues

- Significant progress in understanding the mechanisms of action of inhaled microcystin (**Lee**) and portimine causing dermatitis in Senegalese fishermen associated with a bloom of *Vulcanodinium rugosum* (**Hess, Plessis**).
- New insights into cellular processes underlying slow depuration of domoic acid in King scallops (**García-Corona**).

# Ignite Talks Session 1

- A large-scale *Alexandrium catenella* bloom was first detected in the northern Bering Sea using an Imaging FlowCytobot (**Fachon**).
- The new Phagomyxa-like parasitoids have been detected and isolated from the Korean coastal waters (**Jeong**).
- Ciguatoxin accumulation in herbivorous fish from Okinawa was investigated to elucidate their dietary preferences using metabarcoding analysis (**Araki**).

# Ignite Talks Session 2

- Various topics from freshwater lakes to tropical oceans such as fifth nucleotides, viruses, bacteria, silicate skeletons and even plastic wastes were reported (**Jolly, Ochotorena, Fujita, Yamada, Yu**).
- Problems of HABs are widely growing from freshwater to ocean, and two countermeasures use carbon nanostructures to remove HAB toxins and modified clay spreading to remove HAB species (**Alfonso, Toyoda**).



# Ignite Talks Session 3

- Various topics: the perspectives of detection, red tide, environment, parasites, ichthyotoxin, and life cycles, and on toxins from the perspectives of effects on organisms and model organisms, environmental cycles, and shellfish toxin profiles.

# Session chairs, thanks for the great support!!

- Po Teen Lim
- Ying Zhong Tang
- Kazumi Matsuoka
- Sandric Chee Yew Leong
- Christopher Bolch
- Christine Band-Schmidt
- Albert Rene
- An Suk Lim
- Nina Lundholm
- Haifeng Gu
- Kirsty Smith
- Uwe John
- Ian Jenkinson
- Misty B Peacock
- Michael L. Brosnahan
- Chui Pin Leaw
- Keigo Yamamoto
- Yuji Tomaru
- Wayne Litaker
- Marie-Yasmine Dechraoui Bottein
- Leonardo Guzmán
- Dedmer van de Waal
- David Berthold
- Mikolaj Kokocinski
- Paulo Vale
- Bernd Krock
- Chris Miles
- Philipp Hess
- Henrik Enevoldsen
- Mark Wells
- Rencheng Yu
- Raphael M Kudela
- Marta Estrada
- Elisa Berdalet
- Lum Wai Mun
- Shauna Murray
- Toshiya Katano
- Esther Garcés
- Raffaele Siano
- Christopher J. Gobler
- Hyeon Ho Shin
- Satoshi Nagai
- Alexis Fisher
- Takashi Kamiyama
- Urban Tillmann
- Mitsunori Iwataki
- Nansheng Chen
- Shinya Sato
- Goh Onitsuka
- Clarissa Anderson
- Ichiro Imai
- Donald Anderson
- Mengmeng Tong
- Gustaaf Hallegraeff
- Mònica Campàs
- Sam Murray
- Sing Tung Teng
- Chi-Yong AhnIngunn Samdal
- Maura Manganelli
- Shigeru Sato
- Thomas Ostenfeld Larsen
- Pearse McCarron
- Aifeng Li
- Seung Ho Baek
- Marc Suddleson
- Haruo Yamaguchi
- William P Cochlan
- Keith Davidson
- Garry Benico
- Yoichi Miyake
- Luis Botana
- Shotato Naruse
- Shizuka Ohara

# Thanks, and a thumbs up to the organisers!!

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- Mitsunori Iwataki
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- Ryoji Matsushima
- Yoichi Miyake
- Satoshi Nagai: Vice Chair
- Keizo Nagasaki
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- Natsuko Nakayama
- Goh Nishitani
- Shizuka Ohara
- Setsuko Sakamoto
- Toshiyuki Suzuki: Vice Chair
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- Yuji Tomaru

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