PICES Projects for Creating Observing Program for Sustaining Local Communities in Indonesian Coastal Waters: FishGIS, Ciguatera and FishPhytO

Prof. Mitsutaku Makino
AORI U-Tokyo/OPRI Sasakawa Peace Foundation

A brief history of PICES-MAFF Projects

- **PICES Seafood Safety Project** (2007-), led by Vera + Mark + Charlie.
- **Marine Ecosyste Health and Human Well-being**: MarWeb (2012-), led by Makino + Ian Perry
- **Building Capacity for coastal monitoring by local small-scale fishers**: FishGIS (2017-): led by Makino + Mark
- **Building Local Warning Networks for the Detection and Human Dimension of Ciguatera Fish Pisoning in Indonesian Communities:** CIGUATERA (2020-): led by Makino + Mark
- **Creating a phytoplankton-fishery observing program for sustaining local communities in Indonesian coastal waters:** FishPhytO (2023-) : led by Makino + Mark

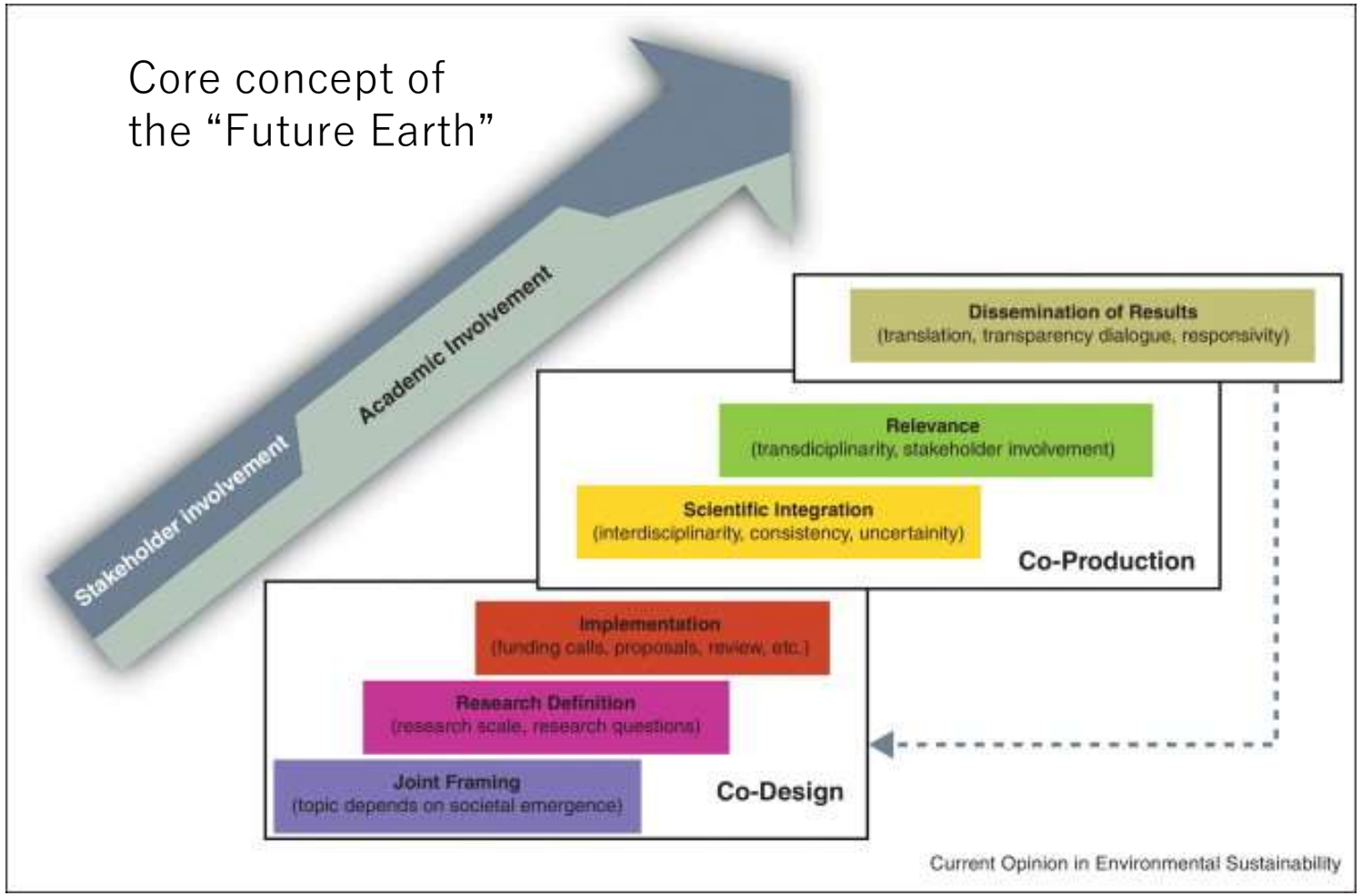
PICES Press Vol. 17 (2009)

PICES Press Vol. 24 (2016)

PICES Press Vol. 29 (2021)

PICES Press Vol. 31 (2023)

Transdisciplinary approach

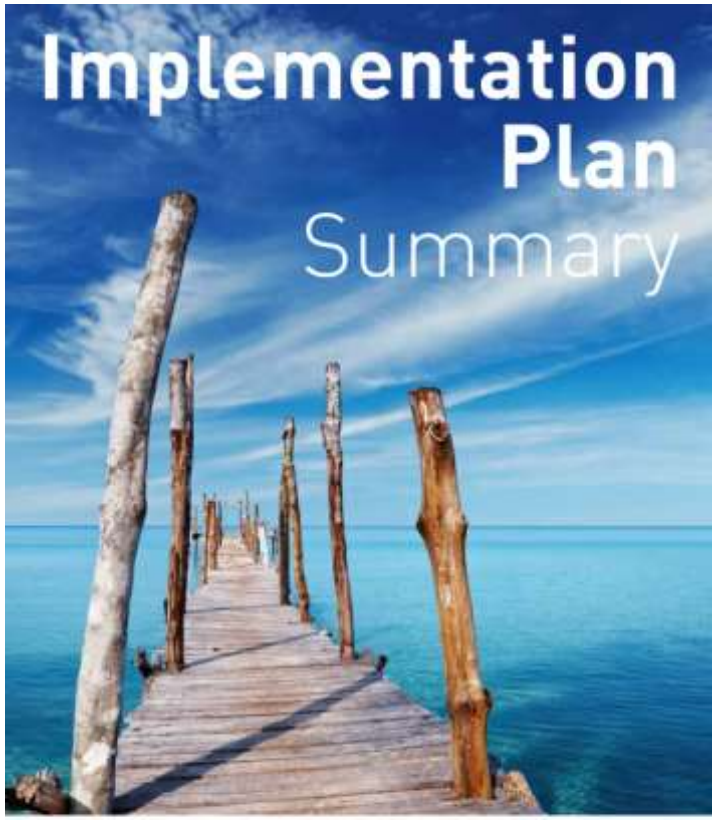


Mauser et al. (2013)

Co-design,
Co-production,
and Co-delivery
with
local people,
local researchers,
and
local government

“UN Decade of Ocean Science for the Sustainable Development (2021-2030): UNDOS”.

2021 2030 United Nations Decade of Ocean Science for Sustainable Development



Approved by UNGA last December

TRANSFORMATIVE OCEAN SCIENCE

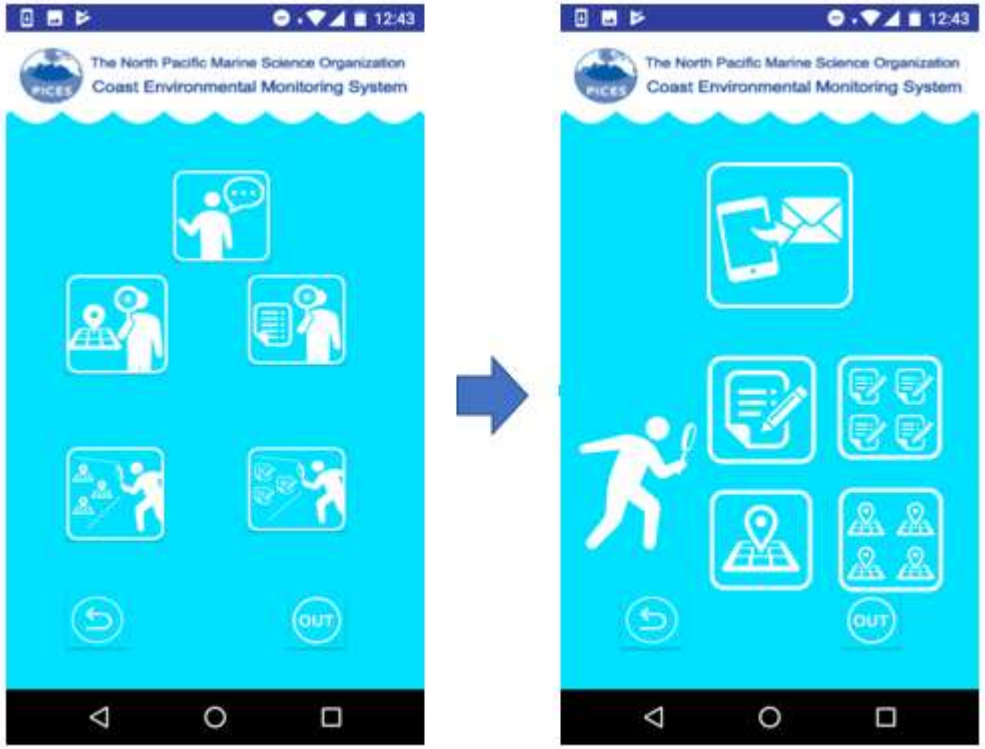
The notion of transformation is central to the Decade. The Decade, both in terms of action and outcomes, needs to move beyond business as usual to a true revolution in ocean science. In the context of the Decade, we need transformative ocean science that:

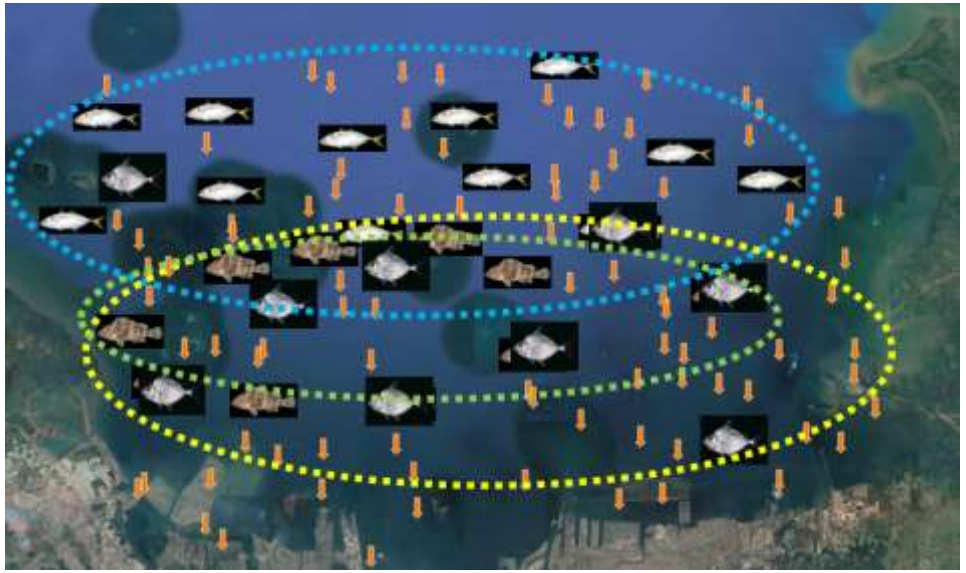
- uses the 2030 Agenda as a central framework to identify and address the questions that are most important to society;
- is co-designed and co-delivered in a multi-stakeholder environment and that involves the generators of knowledge and the users of knowledge;
- is solutions-focused;
- where needed, is big, audacious, forward-looking, and spans geographies;
- reaches across disciplines and actively integrates natural and social science disciplines as well as the arts and humanities;
- embraces local and indigenous knowledge holders;
- is transformative because of who is doing it or where it is being done, including in both less developed and developed countries;
- strives for generational, gender and geographic diversity in all its manifestations;
- is communicated in forms that are widely understood across society and that trigger behaviour change; and
- is shared openly and available for re-use.

- Action and outcome-oriented science (SDG 14),
- Co-design and co-deliver with stakeholders,
- Solution-focused,
- Multi-disciplinary,
- Local and indigenous knowledge,
- Inclusive,
- Shared openly,

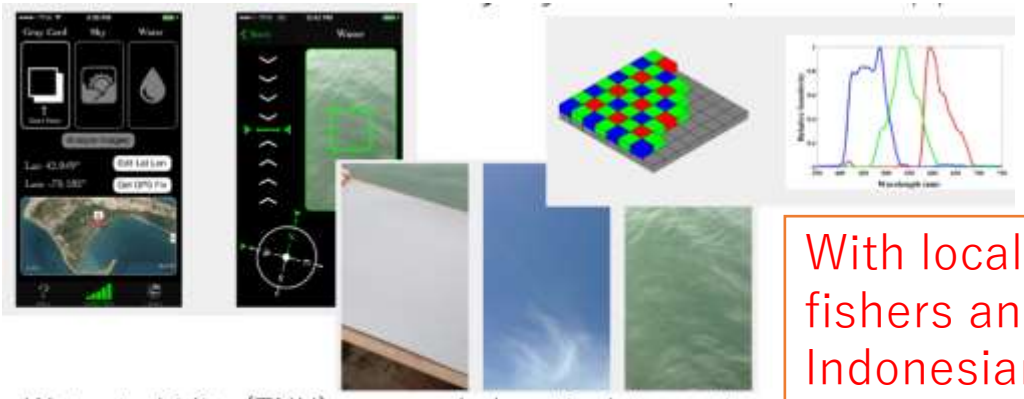
etc., etc.

We developed a Mobile Phone GIS app. to share all information gathered by local people





1. Coastal Water Quality



- Water turbidity (TNU), suspended particulate matter (g/cm3), chlorophyll concentrations, etc.

With local fishers and Indonesian Remote Sensing Team

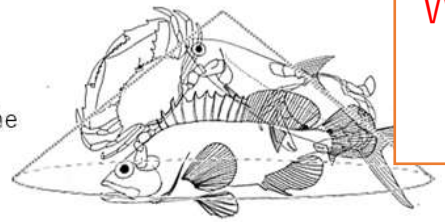
2. Phytoplankton (HAB)

- Magnification of 140x, resolution of 2 microns
- Photos by local people are used to predict the HAB (Harmful Algal Broom) by the Indonesian researchers.

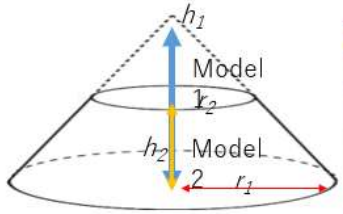
With local fishers/ schools

3. Catch estimate

Assuming conical shape for the pile



With local Fishers org.



$$W_{est} = \frac{1}{3}\pi h_1 {r_1}^2 \times d$$

$$W_{est} = \frac{1}{3}\pi h_2 ({r_1}^2 + r_1 r_2 + {r_2}^2) \times d$$

d=Density of fish body: 1.065-1.09997 (Red snapper, TSUCHIMOTO et al 1992)

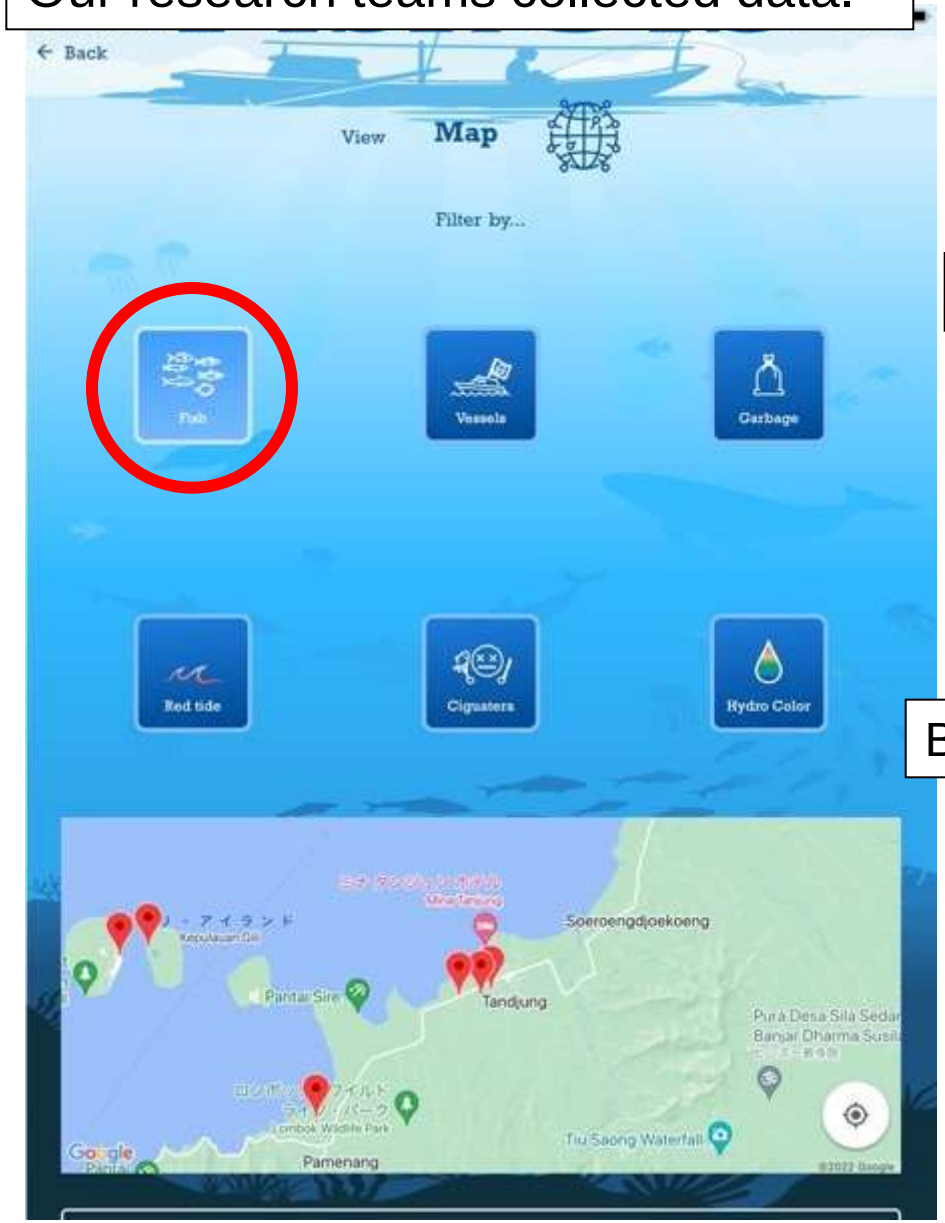
4. IUU

With local fishers/re sidents

5. Floating litter/plastic

Examples of **fish photos** collected by the *FishGIS* App

Our research teams collected data.



Barracuda?

Horse mackerel?

Bonito?

Horse mackerel?

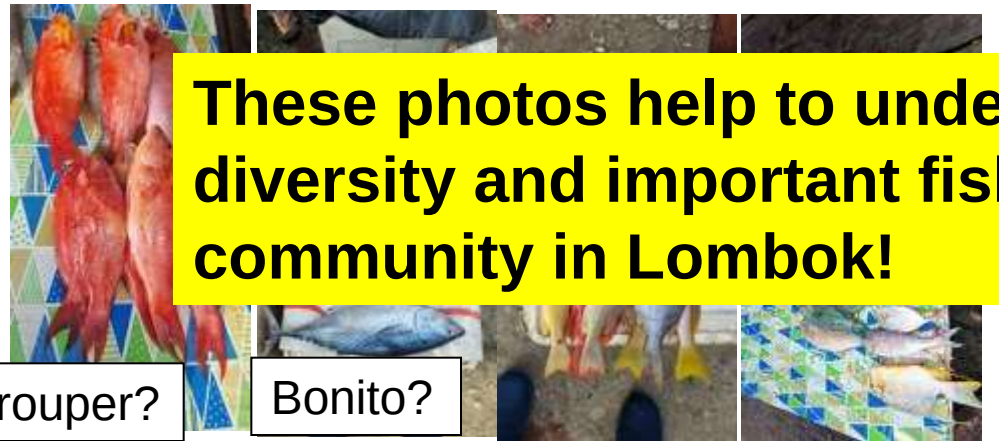
Bonito?

Tuna?

Bonito?

Grouper?

Sardines?



Grouper?

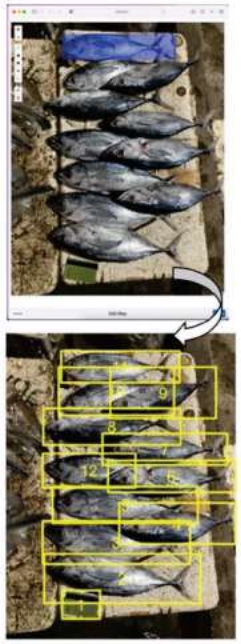
Bonito?

These photos help to understand fish diversity and important fishes for local community in Lombok!

Report images

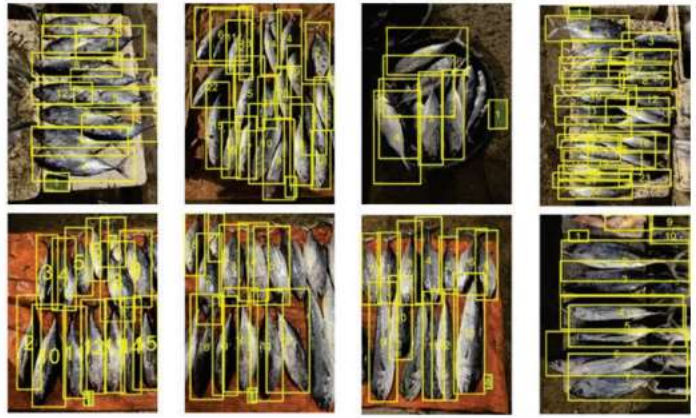
Work time per image:
less than 1 minute

Identify fish species



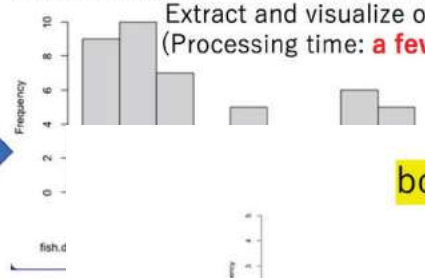
Work time per image:
a few minutes

Automatically measure body length from images (by R)

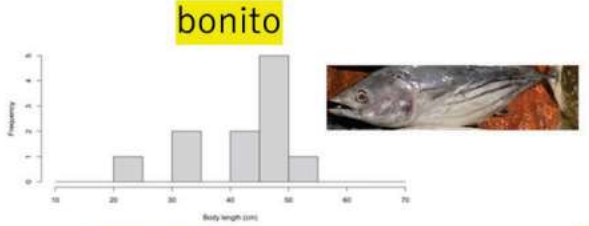


```
fish.dat[fish.dat$fish_species == "tuna" & fish.dat$photo_conditions == ".
```

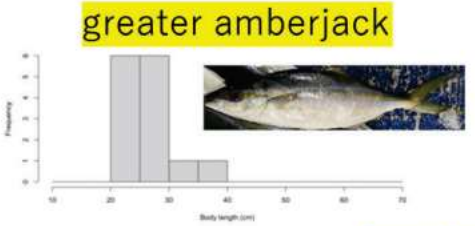
Extract and visualize of tuna data
(Processing time: **a few seconds**)



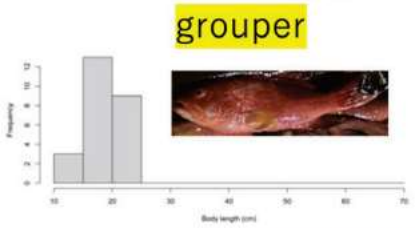
bonito



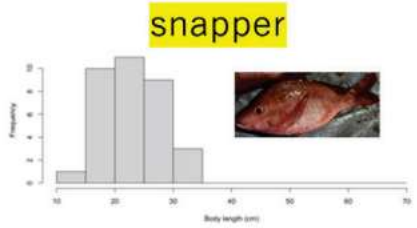
greater amberjack



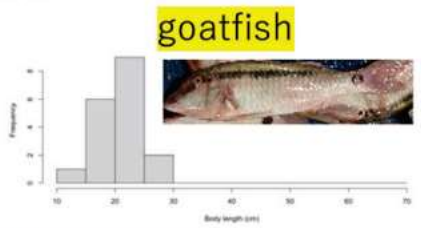
grouper



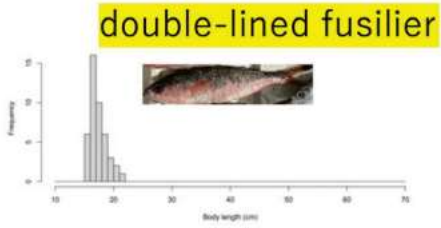
snapper



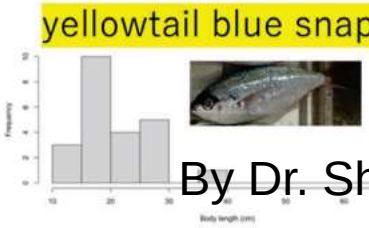
goatfish



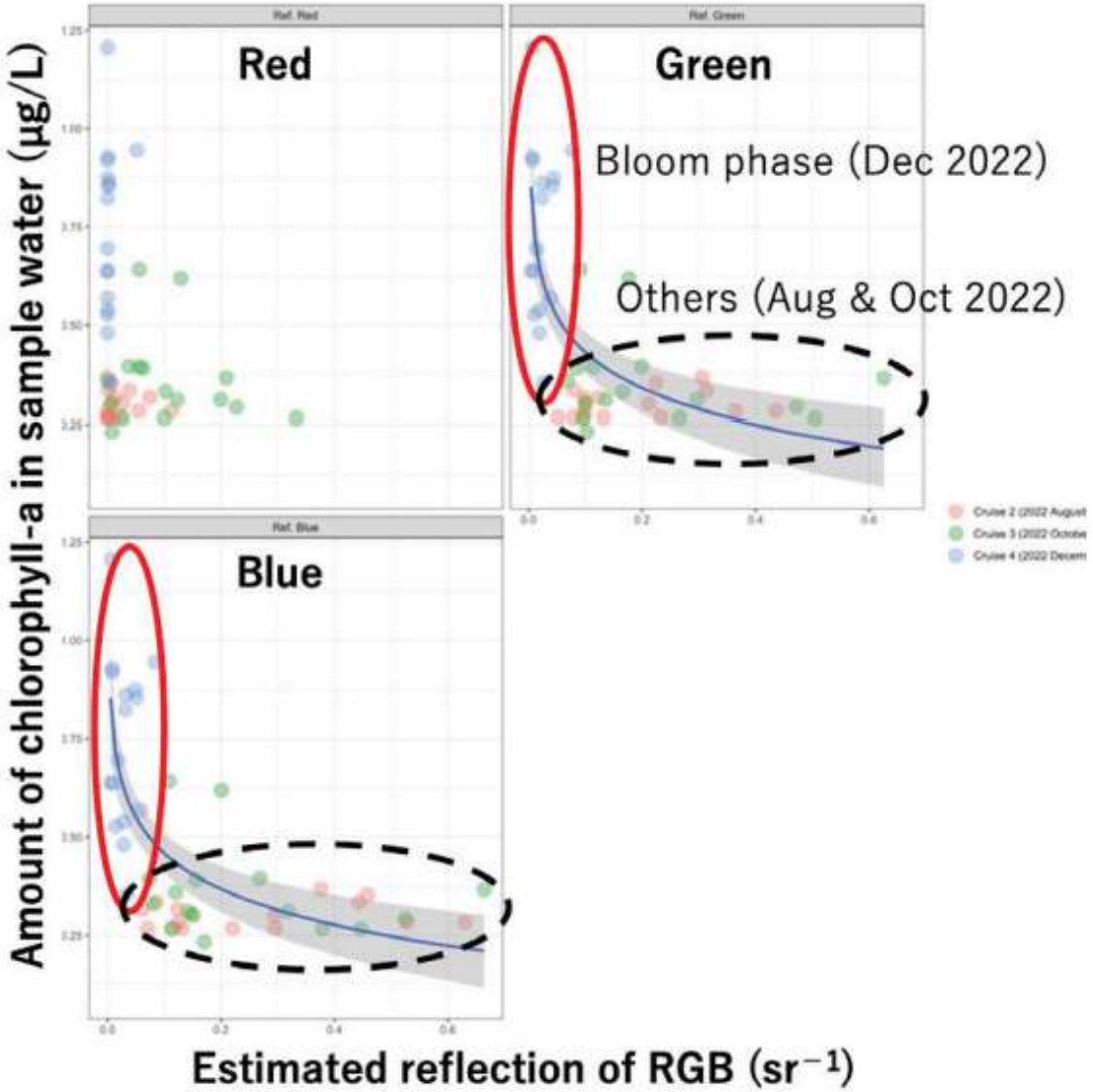
double-lined fusilier



yellowtail blue snapper

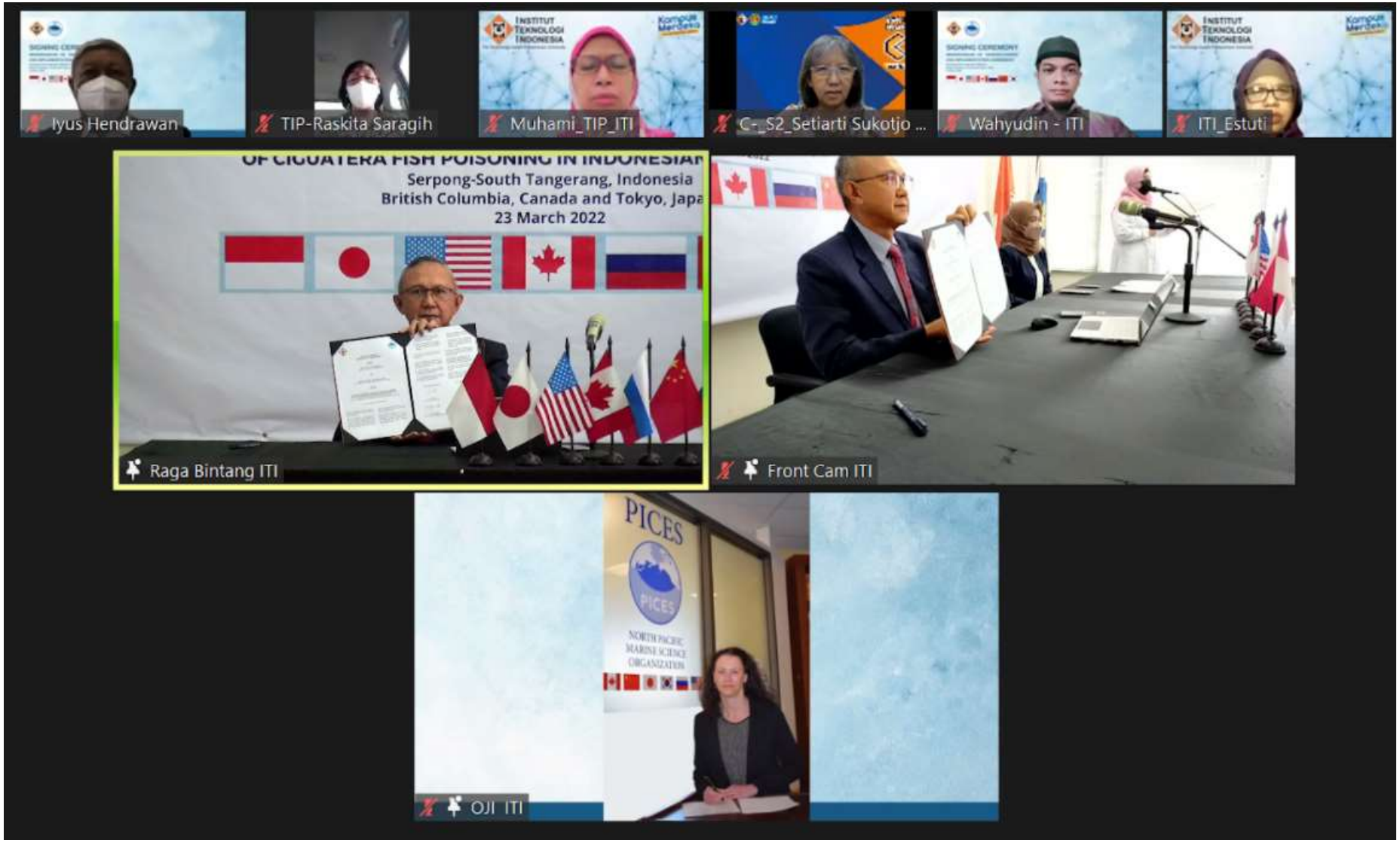


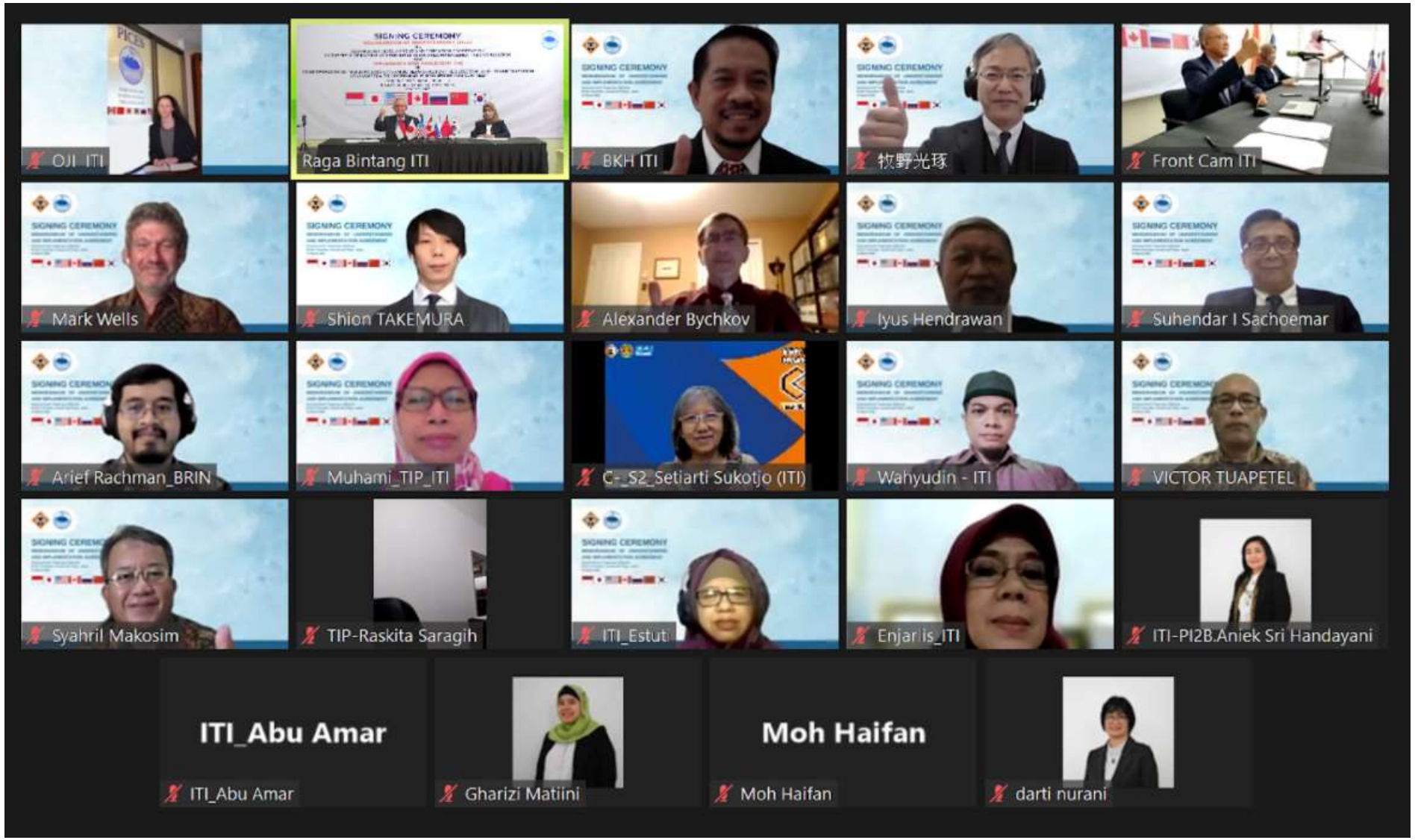
By Dr. Shion Takemura



Source: Survey Report II (Fig 11, Table 4) & III (Table 7)

By Dr. Shion Takemura


Iyus Hendrawan
TIP-Raskita Saragih
Muhami_TIP_ITI
C-_S2_Setiarti Sukotjo ...
Wahyudin - ITI
ITI_Estuti
Serpong-South Tangerang, Indonesia
British Columbia, Canada and Tokyo, Japa
23 March 2022
Raga Bintang ITI
Front Cam ITI
PICES
NORTH PACIFIC MARINE SCIENCE ORGANIZATION
OJI ITI


OJI ITI
Raga Bintang ITI
BKH ITI
牧野光琢
Front Cam ITI
Mark Wells
Shion TAKEMURA
Alexander Bychkov
Iyus Hendrawan
Suhendar I Sachoemar
Arief Rachman_BRIN
Muhami_TIP_ITI
C-_S2_Setiarti Sukotjo (ITI)
Wahyudin - ITI
VICTOR TUAPETEL
Syahril Makosim
TIP-Raskita Saragih
ITI_Estuti
Enjar is_ITI
ITI-PI2B.Aniek Sri Handayani
ITI_Abu Amar
ITI_Abu Amar
Gharizi Matiini
Moh Haifan
Moh Haifan
darti nurani

RESEARCH TOPIC AND FUNDING OF PICES
RESEARCH ON THE DETECTION AND HUMAN DIMENSION OF CIGUATERA FISH POISONING IN INDONESIA

RESEARCH TOPIC AND FUNDING OF BRIN
POTENSI ANCAMAN FENOMENA CIGUATERA FISH POISONING (CFP) DAN MARAK ALGA BERBAHAYA (MAB) DALAM KAITANNYA DENGAN AKTIVITAS MANUSIA DI KAWASAN TAMAN WISATA PERAIRAN (TWP) KEPULAUAN GILI MATRA

RESEARCH ORGANIZATION

RESPONSIBLE FOR ACTIVITIES
Mitsutaku Makino

PENANGGUNG JAWAB KEGIATAN
Shinta Leonita

ACTIVITY COORDINATOR
Alex Bychkov

KOORDINATOR KEGIATAN
Suhendar I Sachoemar

IMPLEMENTING TEAM LEADER
Marks Well

KETUA PELAKSANA KEGIATAN
Arief Rachman

Participation Research Institute and University (Researcher and Student)
1.PICES; 2. ITI; 3. BRIN ; 4. UI; 5. UNRAM

Activities
1.Research :
Survey (3 x PICES, 2 x BRIN and data analysis.
2. Workshop and DIsemination

Output
1. Report for PICES and BRIN
2. Scientific Publications
3. Report of Result Survey (PEE)

CIGUATERA CHARACTERISTIC

1. Ciguatera Identification & DNA
Riani Faza, Aryo, Emily, Widia

2. Machine Learning and AI
Setiarti Sukotjo, …….

COASTAL MARINE ENVIRONMENT

1. **Fish-GIs, Hydrocolor Tech. Env. Mon**
Shion san, Koguchi san, …….

2. Water Quality
Hanny, Suci, Eky

3. **Environmental-DNA**
Ratu Siti Aliah, Novi, Eky

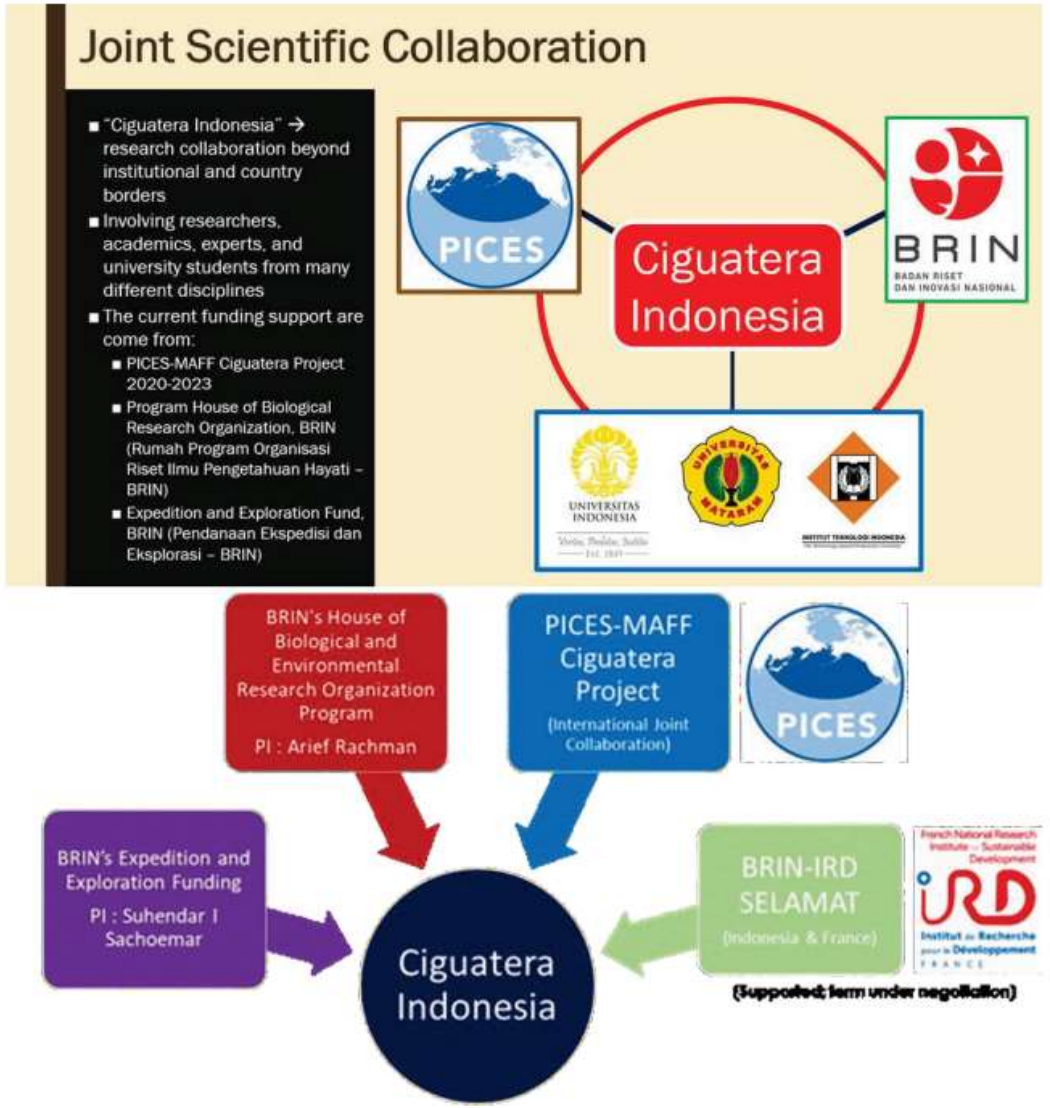
HUMAN DIMENSION, SOCIAL ECONOMIC TREACIBILITY AND FOOD A-SAFETY

1. Human Dimension
Tojo san, ……

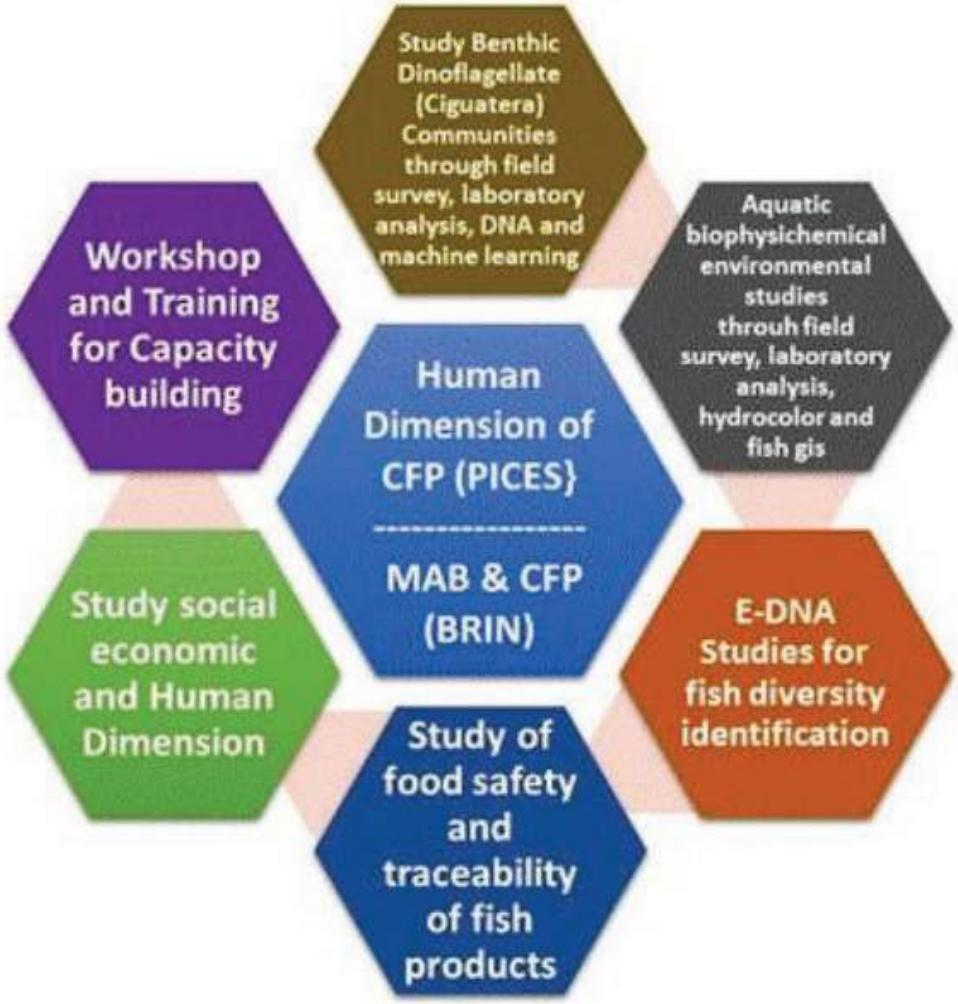
2. Social Economic
Andi,…….

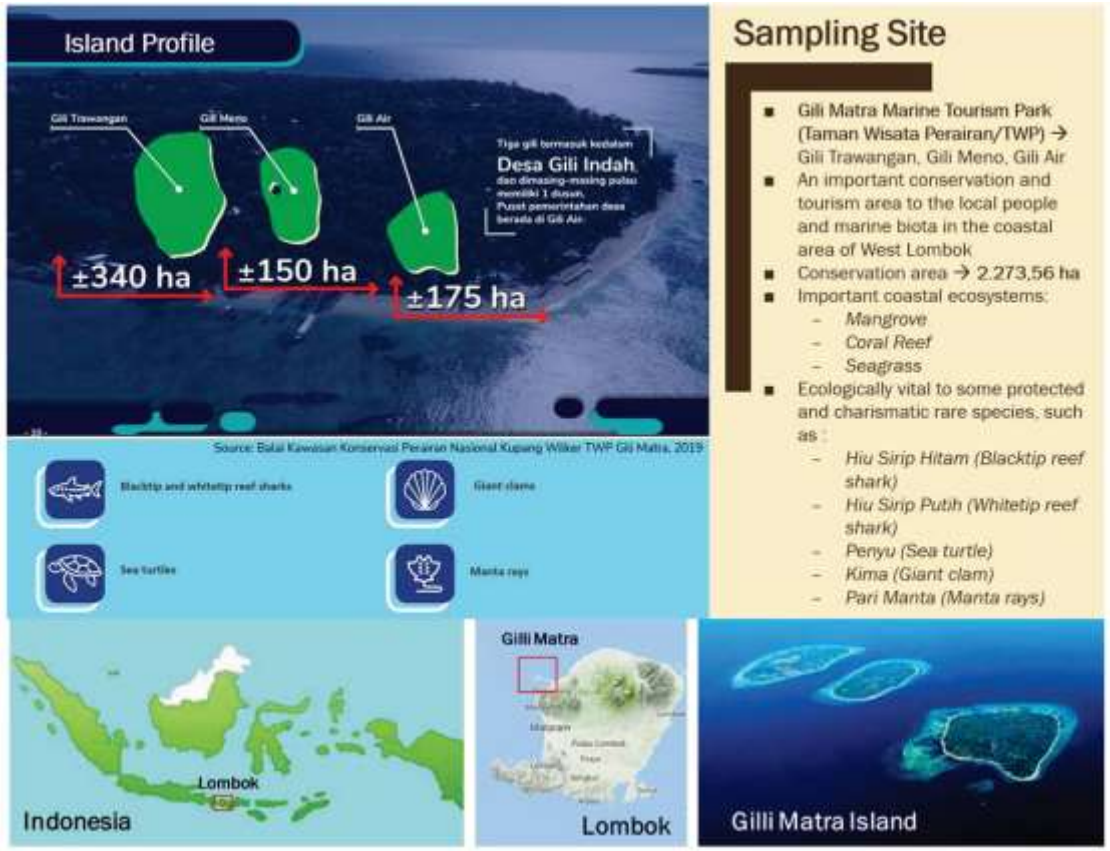
3. **Treacibility and Foof Safety**
Muhami, Haryanti

Field study in Lombok



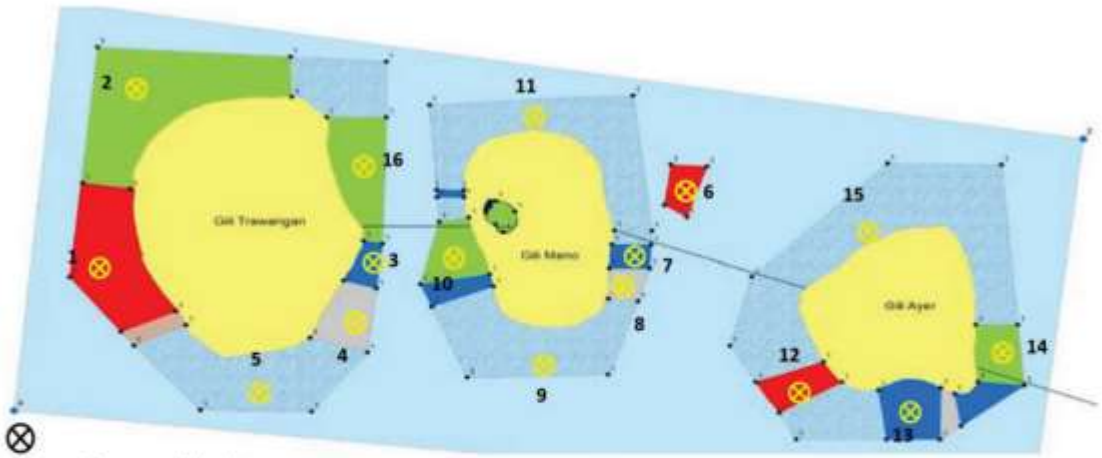
Scope and field survey

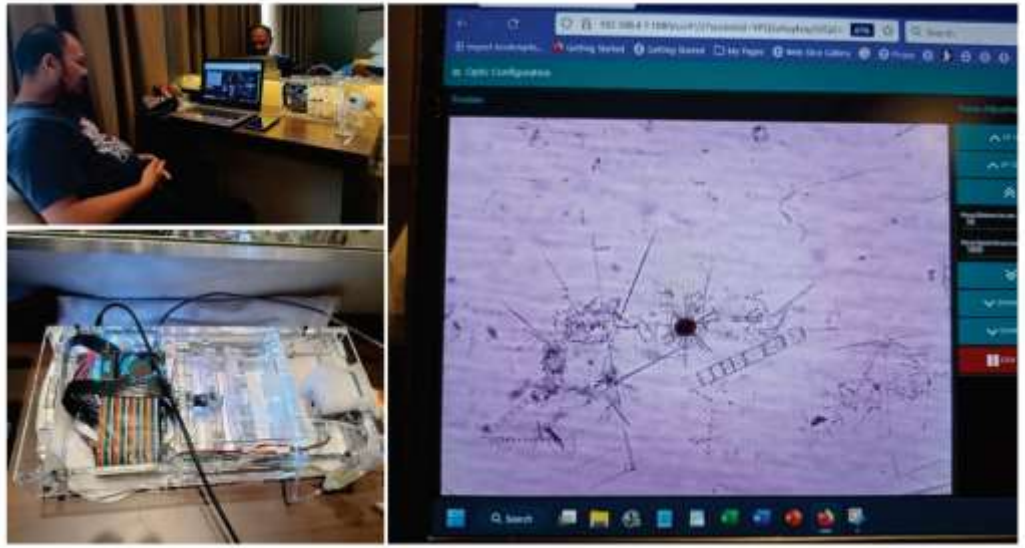




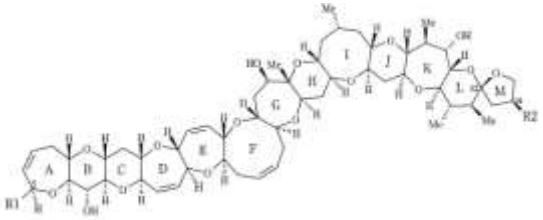
- First survey (Survey I) on May 23–28, 2022
- Second survey (Survey II) on August 1–5, 2022
- Third survey (Survey III) on October 10–16, 2022
- Fourth survey (Survey IV) on December 12–18, 2022
- Fifth survey (Survey V) on February 20–25, 2023

(Rachman, 2019)





Hibi et al. (2018)



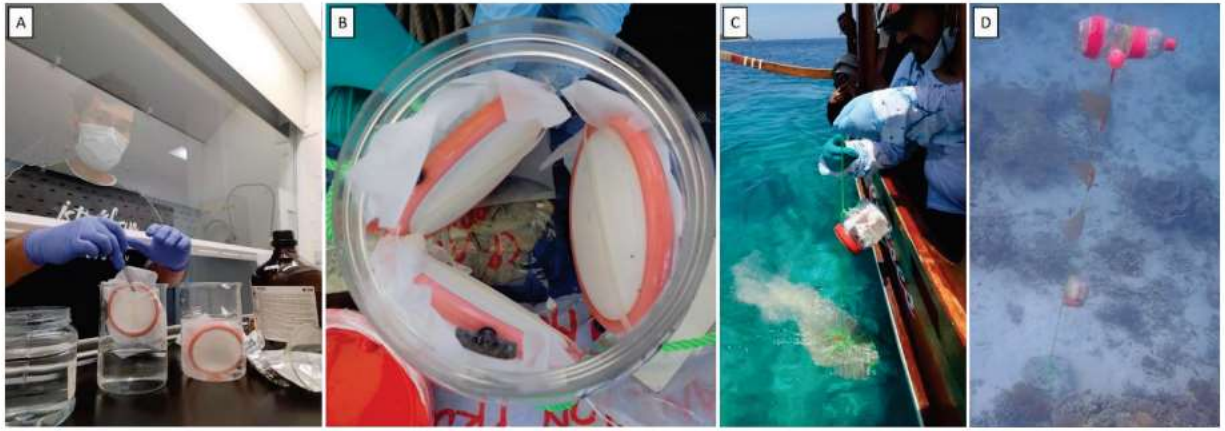


Fig. 5.6 New method to collect ciguatoxin directly from the water column. (A) preparing the SPATT filters in the laboratory, (B) SPATT filters inside the plastic container/cage, (C) deployment of the SPATT rig from the boat, (D) SPATT rig in the water at a depth of 4–5 m.

Capacity building is the Key






- Strong supports from the communities – fishers are teaching fishers

  -> **Sense of ownership, pride and sustainability of the activity.**

Thank you very much!!