FISHPHYTO-ECOLOGICAL DISASTER MITIGATION OF CFP AND HAB AT GILI MATRA MARINE TOURISM PARK LOMBOK-INDONESIA

PREPARED BY RIIM-4 CIGUATERA II INDONESIAN TEAM

SUHENDAR I SACHOEMAR

PICES PST MEETING, OCTOBER 30, 2024

INDONESIAN RESEARCH TEAM-RIIM4

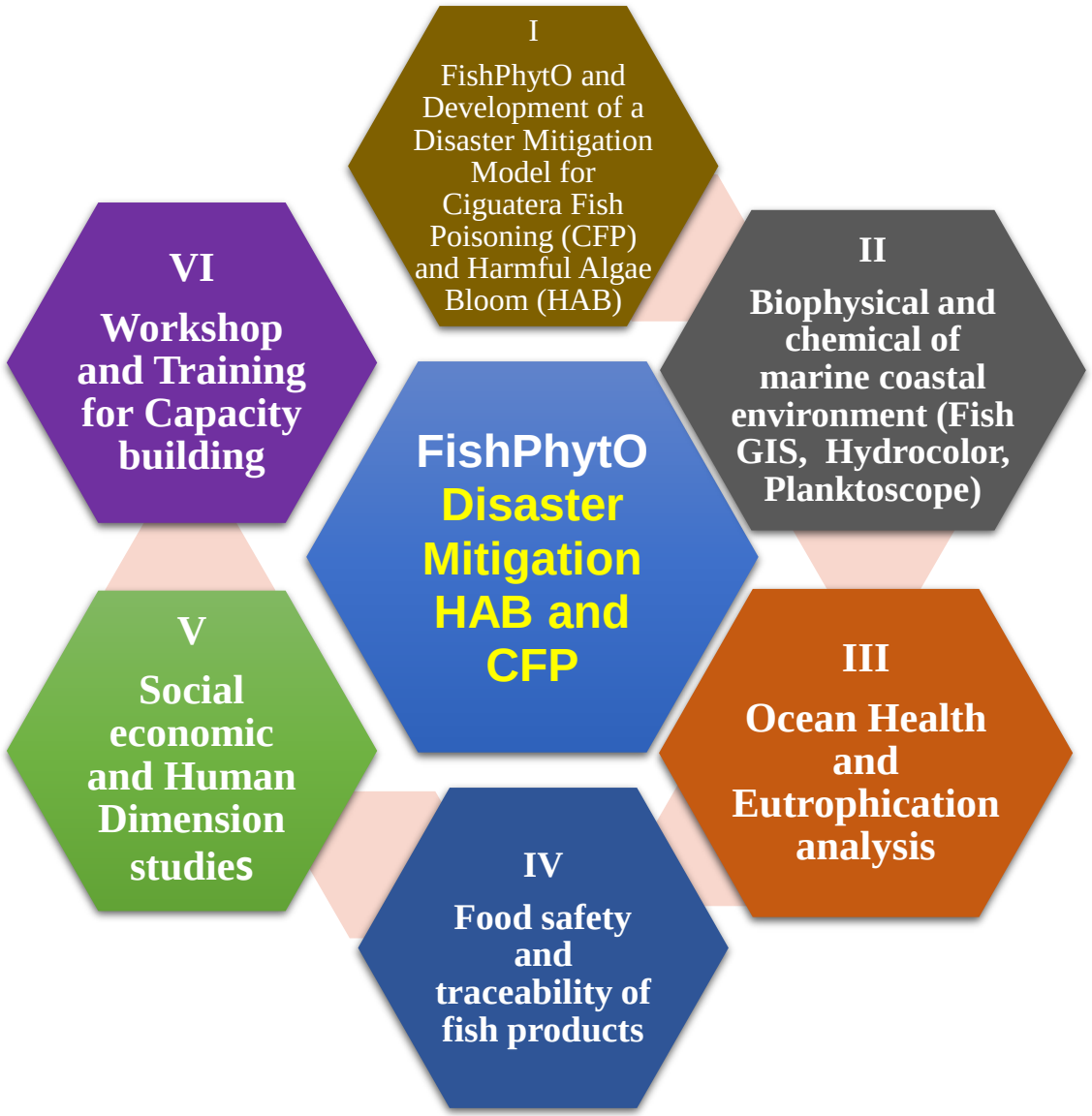
No.	Name	Institution
1	Prof. Suhendar I Sachoemar	RCECT-BRIN
2	Arief Rachman, M.Biol.Sc.	RCO- BRIN
3	Prof. Yudhi Soetrisno Garno	RCECT-BRIN
4	Dr. Joko Prayitno Susanto	RCECT-BRIN
5	Dr. Agung Riyadi	RCECT-BRIN
7	Dr. Ratu Siti Aliah	RCF- BRIN
8	Hilman Ahyadi, M.Si.	Mataram University
9	Diswandi, Ph.D	Mataram University
10	Dr. Yuliadi Zamroni	Mataram University
11	Setiarti Sukotjo, M.Sc	Institut Teknologi Indonesia (ITI)
12	Riardi Pratista Dewa, S.Kel, M.Env	RCECT-BRIN
13	Nurul Fitriya, M.Si.	RCO-BRIN
14	Rahman,SE,M.Par	Mataram University
15	Teguh Prayogo, MSc	RCECT-BRIN

INTRODUCTION

FishPhytO (PICES). The overall objective of the new PICES-MAFF project, entitled "*Creating a phytoplankton-fishery observing program for sustaining local communities in Indonesian coastal waters*" (FishPhytO), is to establish, in collaboration with local fishers, research institutes and universities, a phytoplankton-fishery observing program in the Lombok Island region (Indonesia) using tools developed and modified/refined during the previous two PICES-MAFF projects (2017–2023) to enable the detection of toxic benthic Harmful Algal Bloom (HAB) species that can threaten tropical reef fisheries, and to record images of the fishery catches for enumeration of fish species and sizes. The long-term objectives are to: (1) provide local communities with the capacity and knowledge to sustainably manage their fisheries resources and ensure seafood safety, and (2) identify research needs for deploying these tools in PICES member countries.

BRIN Ciguatera. In general, the objectives: (1) Continuing the study and completing data related to benthic dinoflagellate communities that have the potential to cause environmental disasters in the form of HAB and CFP. (2) Studying in more depth the level of pressure from human activities, especially tourism and recreational fisheries on the Gili Matra islands that have the potential to cause environmental damage or trigger HAB or CFP, and calculating the potential economic losses due to these incidents. (3) Continuing the process of disseminating information and efforts to increase public awareness regarding the potential dangers of HAB and CFP environmental disasters4. Building a mitigation model/independent monitoring method with the Citizen Scientist concept by implementing smartphone-based technology and environmental quality monitoring applications that have been developed by partners (PICES) since 2018, namely Hydrocolor and FishGIS.

SCOPE OF ACTIVITIES



The scope of activities cover :

1. Development of a Disaster Mitigation Model for Ciguatera Fish Poisoning (CFP) and Harmful Algae Bloom (HAB)
2. Biophysical and chemical of marine coastal environment (Fish GIS,Hydrocolor, Planktoscope)
3. Ocean Health and Eutrophication analysis
4. Food safety and traceability of fish products
5. Social economic and Human Dimension studies
6. Workshop and Training for Capacity building

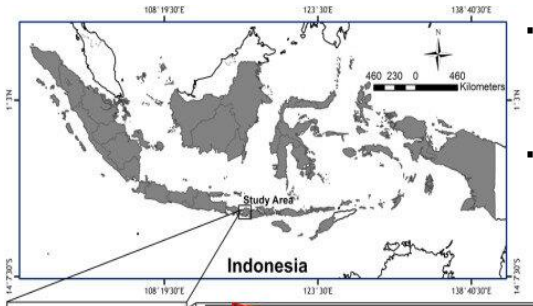
RESEARCH ACTIVITIES ON HAB AND CFP AT GILI MATRA LOMBOK

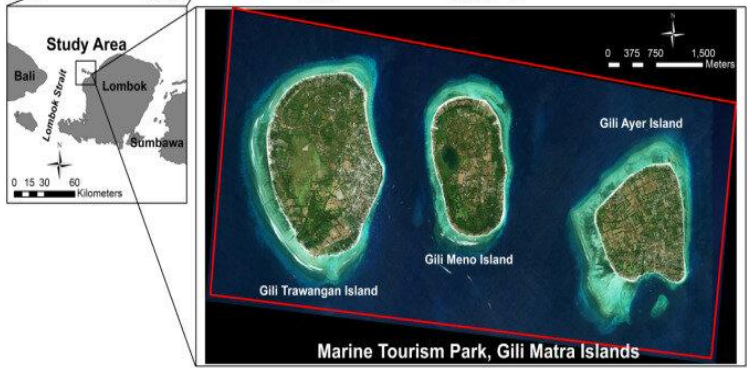
I. 2023/2024-2025/2026 (3 Years) : Research and Innovation for Advanced Indonesia RIIM) Development of a Disaster Mitigation Model for CFP and HAB-9 Stations

1. 4-7 March 2024 (Wet Season) - Southeast Monsoon
2. 6-9 August 2024 (Dry Season) - Northwest Monsoon
3. 4-8 May 2025 (Transition from Wet to Dry Season)
4. 6-9 October 2025 (Transition from Dry to Wet Season)
5. Workshop/General Lecture online (2024 and 2025)
6. Workshop/Training at Lombok in August 2026 (Budget and program proposed to IoC WESTPAC)

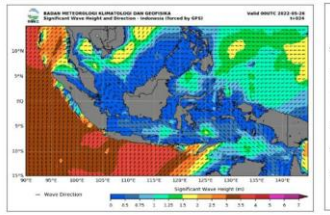
II. 2023/2024 (1 Year) : Utilization of Oceanographic Satellite and Landsat Data for Monitoring Eutrophication and Fisheries Resources Abundance

Data analysis of Aqua MODIS, SeaWiFs satellite imagery of Sea Surface Temperature (SST) and Sea Surface Chlorophyll-a (SSC), and Landsat/Sentinel Data

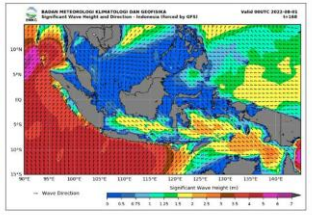




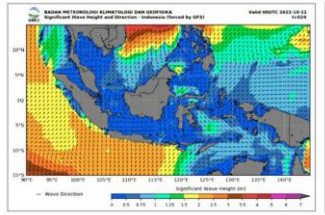
- Gili Matra Marine Tourism Park is located in Northern Coastal of Lombok and consists of three small islands : Gili Ayer, Gili Meno, and Gili Trawangan.
- Gili Matra Marine Tourism Park, hereinafter referred to as MTP Gili Matra, has an area of 2,954 Ha, consisting of 665 Ha of land and the rest is marine waters



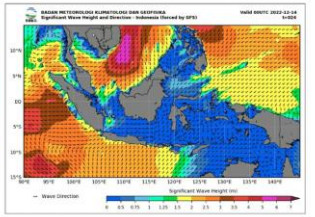
May 2022 (Transition I)



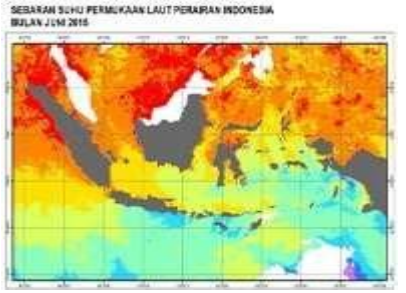
August 2022 (Dry Season/Southeast Monsoon)

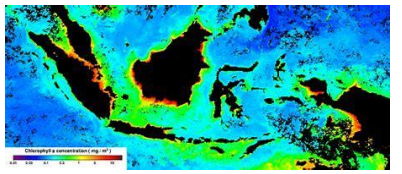


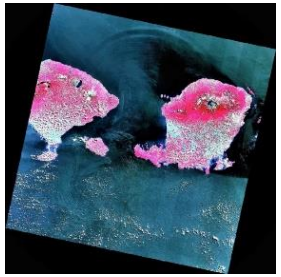
October 2022 (Transition II)

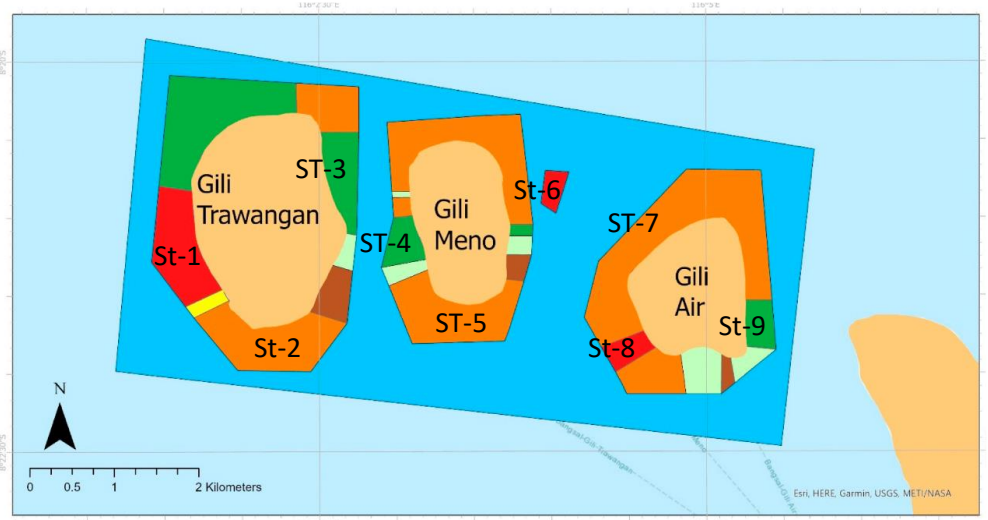


December 2022 (WetSeason/Northwest Monsoon)









OBSERVATION RESULT-Biophysical-chemical-Hydrocolor

WATER QUALITY DATA OF GILI MATRA MARINE PARK TOURISM AREA-LOMBOK

Sea Water Sampling (March 04-07, 2024)

No.	Parameters	Unit	Sampling Stations (9 points)								
			1	5	16	6	9	10	12	14	15
I	**Physical Parameters**										
1	Temperature	°C	30.17	30.25	30.46	30.44	30.37	30.45	30.47	30.37	30.29
2	Turbidity	NTU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	TDS	g/L	28.37	28.30	28.15	28.28	28.39	28.33	28.40	28.29	28.11
4	Spesific Gravity		18.24	18.13	17.93	18.08	18.17	18.10	18.16	18.10	17.96
5	Depth	m	5.19	5.48	5.48	5.24	5.48	4.94	5.03	5.50	5.60
6	TSS	mg/L	0.199	0.213	0.212	0.198	0.199	0.196	0.213	0.221	0.198
7	Transparency	%	100	100	100	100	100	100	100	100	100
II	**Chemical Parameters**										
1	pH		8.25	8.44	8.37	8.85	8.94	8.79	8.41	8.64	8.87
2	ORP	mV	227.82	196.93	193.10	157.90	137.57	213.33	123.54	130.73	155.66
3	Conductivity	mS/cm	46.51	46.37	46.11	46.36	46.52	46.47	46.51	46.36	46.09
4	Salinity	ppt	30.20	30.10	29.90	30.08	30.21	30.15	30.21	30.07	29.88
5	DO	mg/L	7.07	6.13	6.28	5.90	6.39	7.00	5.87	6.89	10.63
6	Phosphate	mg/L	0.14	0.25	0.1	0.06	0.29	0.04	0.03	0.09	0.17
7	Nitrite	mg/L	0.009	0.002	0.007	0.003	0.004	0.001	0.001	0.003	0.006
8	Nitrate	mg/L	0.02	0.01	0.01	0.01	0.03	0.01	0.01	0.01	0.01
9	Ammonia	mg/L	0.07	0.21	0.11	0.18	0.24	0.1	0.18	0.2	0.17
10	Total Organic Matter (TOM)	mg/L	17.696	29.072	31.6	25.28	41.712	45.504	40.45	36.656	32.864
III	**Biological Parameters**										
1	Chlorophyll-a	µg/L	8.307	3.263	9.197	7.417	0.297	9.493	7.120	8.307	7.417
2	Plankton	Cell/l	315,000	177,000	116,000	115,000	82,000	129,000	82,000	35,000	178,000
IV	**Hydrocolor**										
1	Turbidity (NTU)		80	80	80	80	0	80	80	9	80
2	SPM (mg/l)		80	80	80	80	0	80	80	9	80
3	Chlorophyll-a (µg/l)		1.197	1.175	1.032	1.366	1.188	1.293	1.522	1.470	1.504
	Ref. Red		0.078	0.0995	0.052	0.0364	0.0008	0.265	0.2271	0.0123	0.0674
	Ref. Green		0.1571	0.1423	0.1208	0.075	0.0696	0.3956	0.4687	0.0186	0.1462
	Ref. Blue		0.203	0.1685	0.1778	0.0889	0.1104	0.4546	0.5123	0.0201	0.162
	BB- Red		3.68	9.96	1.53	0	-2.25	-3.13	0.89	0.09	2.54
	(Blue-Red)/(Green-Red)		1.580278	1.61215	1.828488	1.360104	1.593023	1.451761	1.180464	1.238095	1.200508

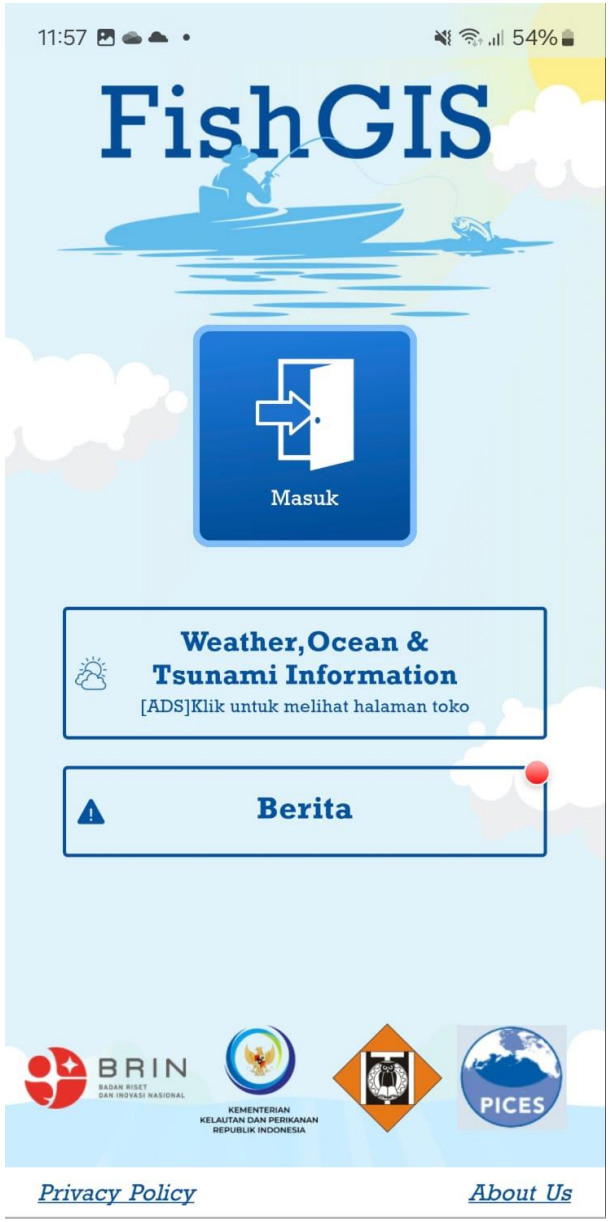
OBSERVATION RESULT-Biophysical-chemical-Hydrocolor

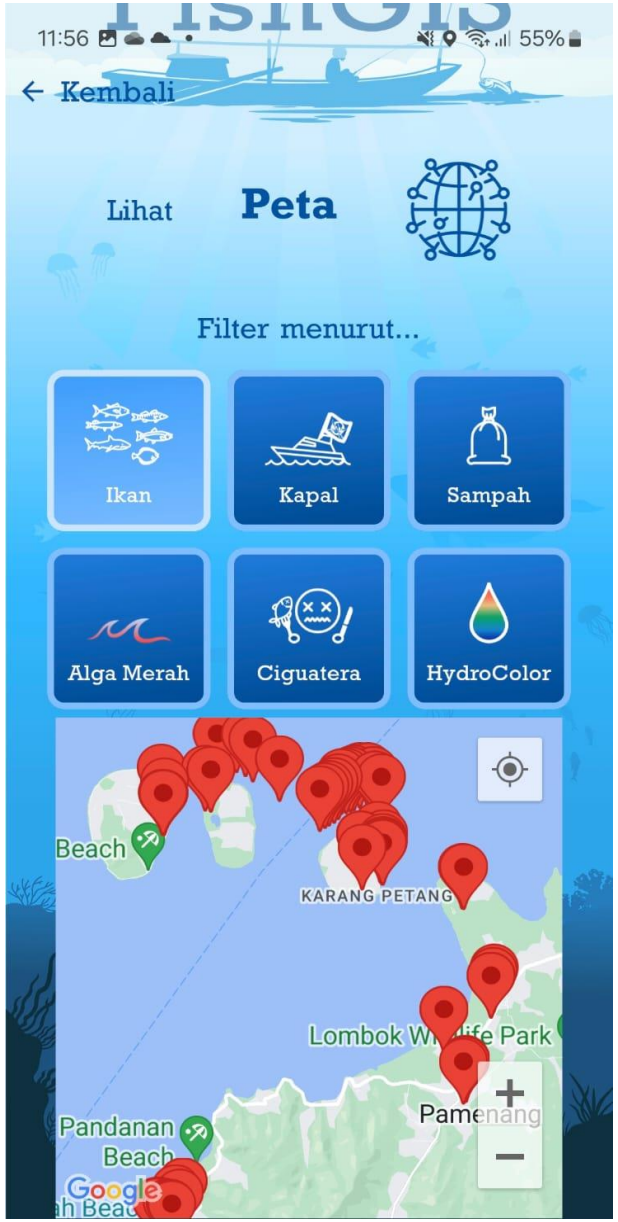
WATER QUALITY DATA OF GILI MATRA MARINE PARK TOURISM AREA-LOMBOK

Sea Water Sampling (Agustus 06-09, 2024)

No.	Parameters	Unit	Sampling Stations (9 points)								
			1	5	16	6	9	10	12	14	15
I	**Parameter Fisika**										
1	Temperatur	°C	28.23	28.46	28.68	28.41	28.41	28.50	28.49	28.63	28.57
2	Turbidity	NTU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.76	0.00
3	TDS	g/L	31.01	31.09	31.20	30.96	31.20	31.15	31.30	30.23	31.30
4	Spesific Gravity		21.71	21.71	21.78	21.59	21.80	21.75	21.90	21.05	21.86
5	Depth	m	2.00	1.26	2.52	5.22	2.40	2.68	4.31	4.66	5.35
6	TSS	mg/L	28.00	32.00	24.00	64.00	36.00	40.00	28.00	38.00	48.00
7	Transparency	%	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
II	**Parameter Kimia**										
1	pH		8.31	8.52	8.59	8.76	8.74	8.66	8.83	8.80	8.87
2	ORP	mV	98.00	101.00	108.32	69.15	104.00	91.00	94.54	116.28	90.77
3	Conductivity	mS/cm	51.67	51.82	52.05	51.59	51.97	51.94	52.18	50.46	52.14
4	Salinity	ppt	33.99	34.10	34.26	33.92	34.21	34.19	34.35	33.18	34.33
5	DO	mg/L	6.85	7.05	6.96	6.74	6.94	6.96	6.85	7.01	6.59
6	Phosphate	mg/L	0.039	0.000	0.016	0.021	0.028	0.013	0.031	0.020	0.013
7	Nitrite	mg/L	0.003	0.003	0.003	0.003	0.003	0.003	0.004	0.030	0.040
8	Nitrate	mg/L	0.085	0.071	0.058	0.081	0.068	0.077	0.069	0.067	0.051
9	Ammonia	mg/L	0.044	0.042	0.043	0.039	0.041	0.05	0.04	0.037	0.041
10	Total Organic Matter (TOM)	mg/l	3.1	3.0	2.7	2.7	3.0	3.4	2.5	3.0	2.5
11	Total Nitrogent	mg/l	1.18	0.96	1.15	1.07	1.16	0.97	1.06	1.16	1.04
III	**Parameter Biologi**										
1	Chlorophyll-a	µg/L	0.012	0.002	0.001	0.004	0.010	0.013	0.011	0.011	0.003
2	Plankton	Cell/l	136	59	80	28	58	125	70	38	84
3	Fecal Coliform	ind/100 ml	0	0	0	0	0	0	0	0	0
IV	**Hydrocolor**										
1	Turbidity	NTU	80	20	80	1	16	80	7	10	80
2	SPM	mg/l	80	19	80	1	15	80	7	10	80
3	Chlorophyll-a	(µg/l	1.334	1.887	1.357	1.114	1.524	1.580	1.330	3.054	0.0197
	Ref. Red		0.0009	0.0205	0.0741	0.0013	0.0181	0.0396	0.0099	0.0131	0.0544
	Ref. Green		0.0024	0.0418	0.1501	0.0033	0.0327	0.0793	0.0136	0.0176	0.1294
	Ref. Blue		0.003	0.038	0.1783	0.0047	0.0353	0.084	0.0151	0.0197	0.1434
	(Blue-Red)/(Green-Red)		1.4	0.821596	1.371053	1.7	1.178082	1.118388	1.405405	0.0197	0.0197

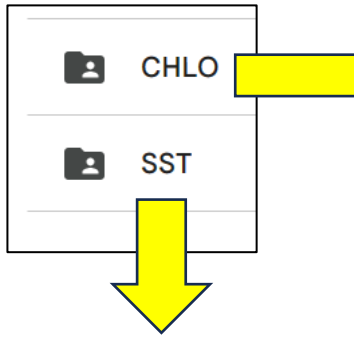
OBSERVATION RESULT-FISH GIS

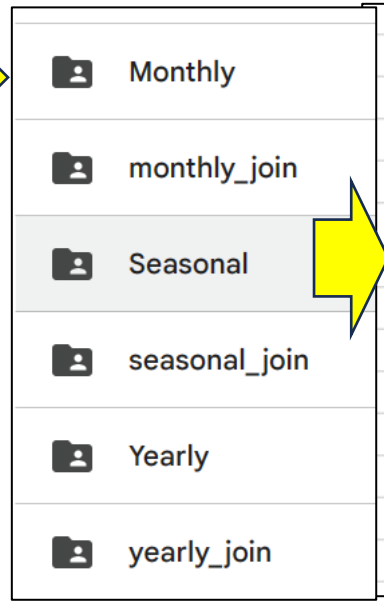


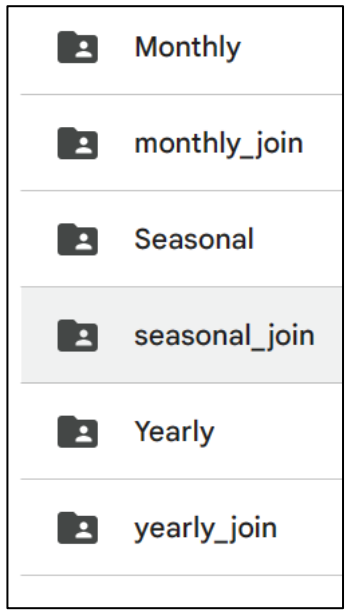


OBSERVATION RESULT- Ocean Color

DATA OCEAN COLOR MODIS







DIGITAL DATA

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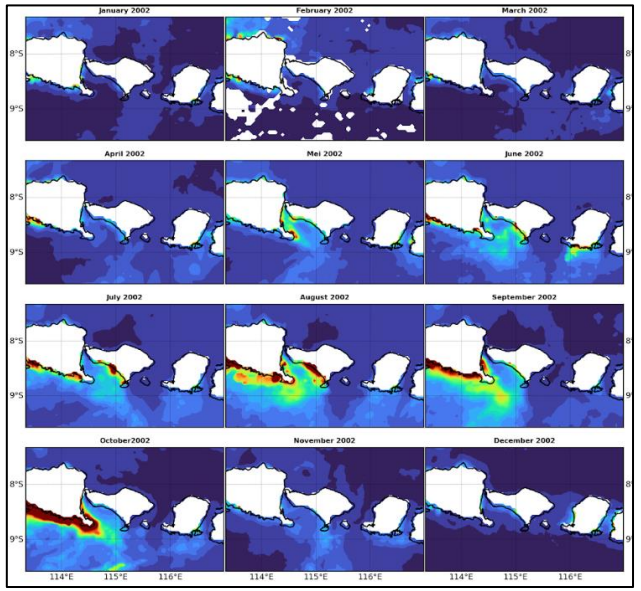
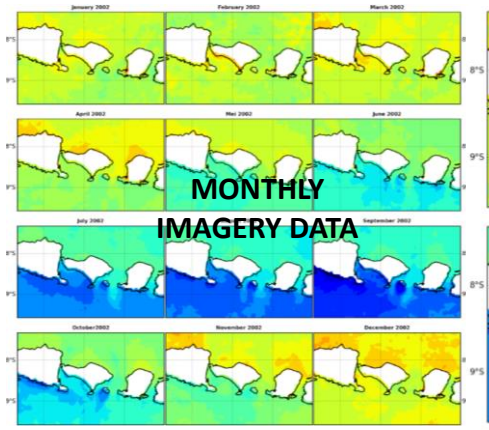
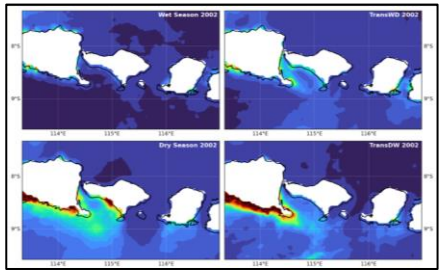
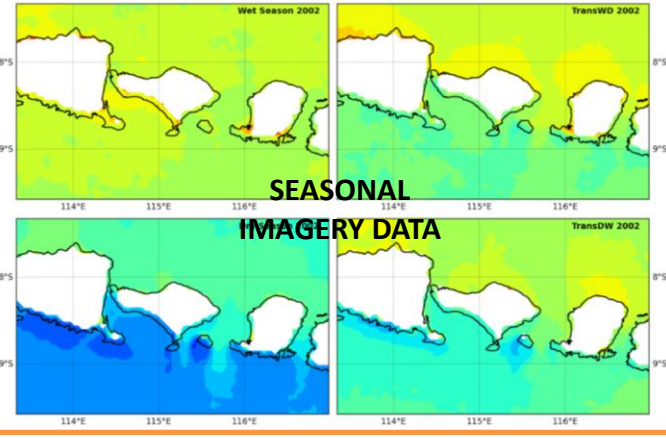
MONTHLY IMAGERY DATA



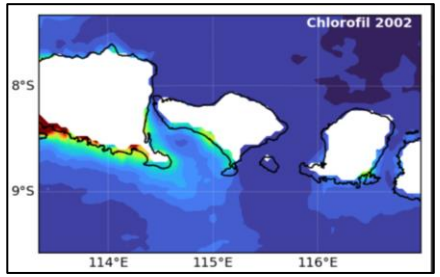


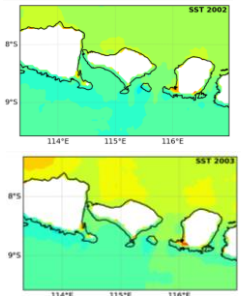
SEASONAL IMAGERY DATA





ANNUAL IMAGERY DATA

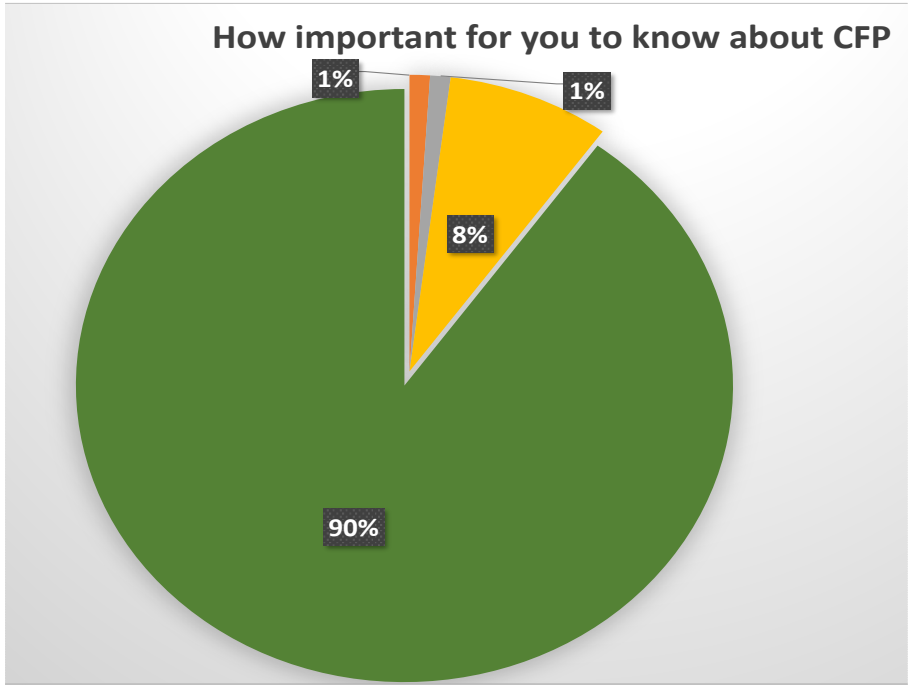


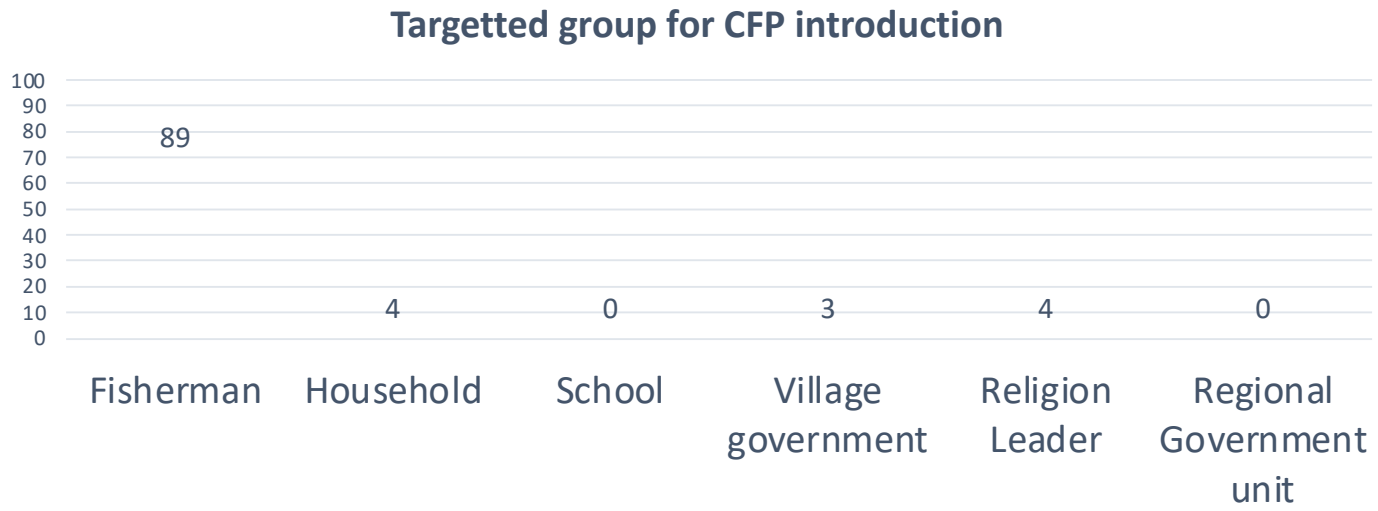


ANNUAL
IMAGERY DATA

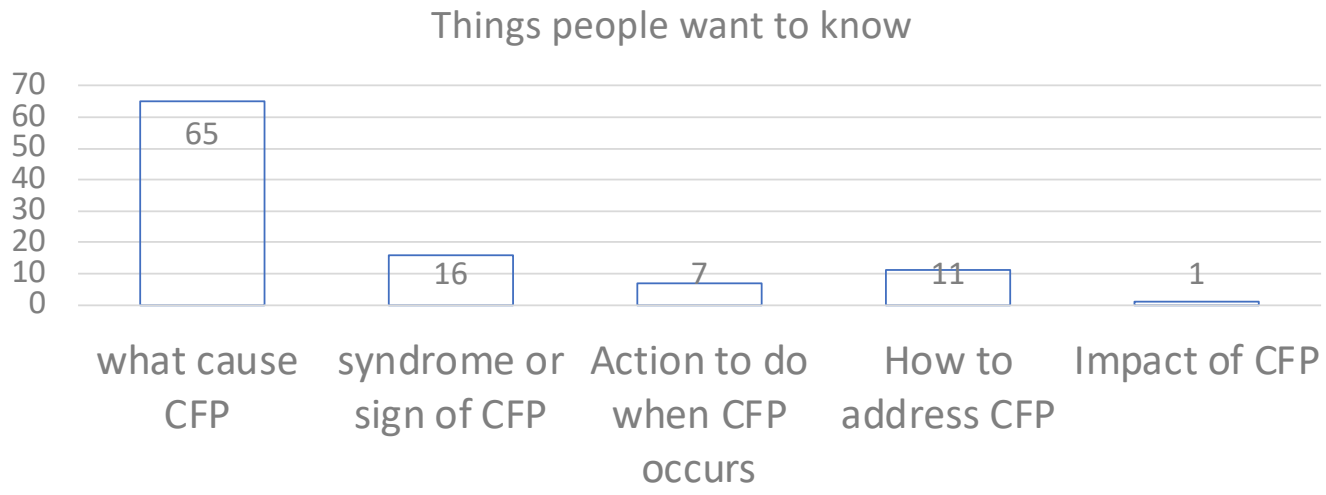
OBSERVATION RESULT-Social Aspect

How important of the CFP





Things that people want to know related to CFP



Planned activities – 2026 HAB mitigation in Lombok Island-Proposed to IOC WESTPAC

Program	Plan				Funding Required		Remark
	Activities	Objectives	Expected outputs/outcomes	Date and place	IOC	Other sources (i.e. from national or international)	
Harmful Algae Bloom (HAB) and Ciguatera Fish Poisoning (CFP) Disaster Mitigation Research (R&D)	1. HAB and CFP Disaster Mitigation Research	To develop HAB and CFP Disaster Mitigation Model	Prototype model/ model of HAB and CFP Disaster Mitigation as a guidance to reduce HAB/CFP disaster risk	Jan- Dec 2024-2025 Lombok, Indonesia	-	20,000	RIIM Project BRIN and in-kind others
	2. HAB and CFP Mitigation Workshop	To disseminate HAB and CFP Disaster Mitigation Model	Dissemination of HAB and CFP disaster mitigation models to various stakeholders	August 2026/ Lombok, Indonesia	16,425		
	3. Reporting	Report of Workshop	Documentation of workshop results as a reference for policy determination	December 2026	3,000		

FUTURE ACTIVITY PLANS

Field Survey 2025

1. 4-8 May 2025 (Transition from Wet to Dry Season)
2. 6-9 October 2025 (Transition from Dry to Wet Season)
3. Encouraging students of Mataram University and others to use Fish GIS/Hydrocolor for their research.

Workshop/General Lecture/Training

1. Workshop/General Lecture online (2024 and 2025 and 2026)
2. Workshop/Training at Lombok offline in August 2026 (If proposal approved by IoC WESTPAC)

Others

1. Developing disaster mitigation model of HAB and CFP
2. Publishing scientific paper

Suhendar I Sachoemar, D.Sc

Professor of Coastal Marine Environment and Fisheries Resources Management.

1. Research Center for Environmental and Clean Technology
   National Research and Innovation Agency (BRIN)

2. Dept. of Agricultural Industrial Technology, Institute Technology of Indonesia (ITI),

3. Expert Council of PPI (Indonesian Research Association)

E-mail : suhendarsachoemar@yahoo.com
Mobile :+62-82122014795

THANK YOU