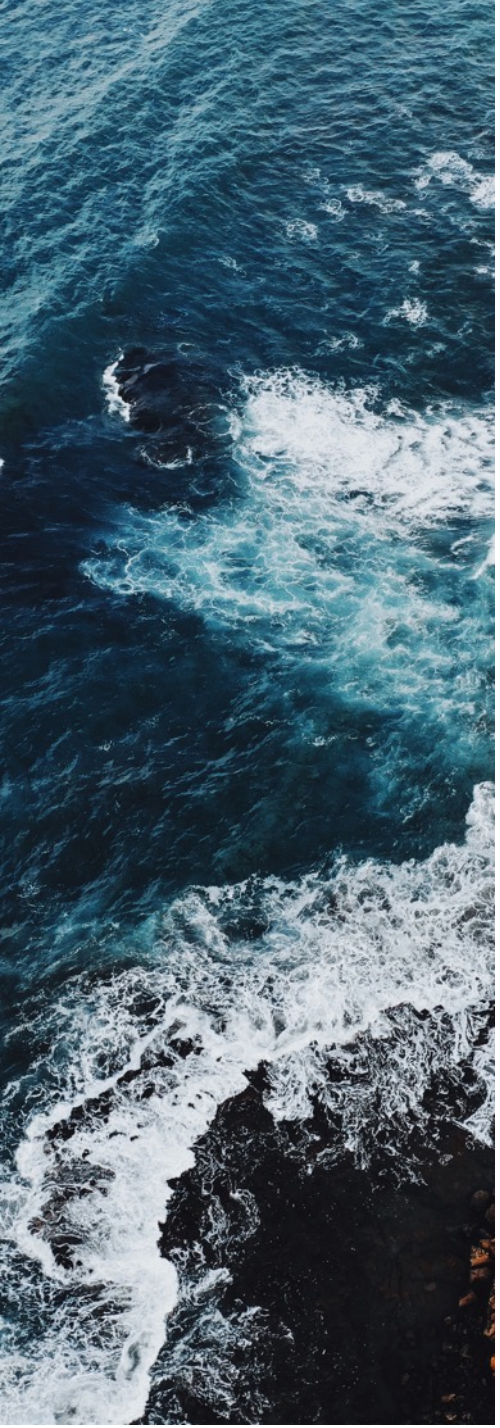
Biodiversity Conservation, Ecosystem and Human Health and Blue Economy

AILEEN TAN SHAU HWAI

Vice Chair, IOC Westpac; Universiti Sains Malaysia

Fourteenth Intergovernmental Session of the IOC Sub-Commission for the Western Pacific
4-7 April 2023, Jakarta, Indonesia

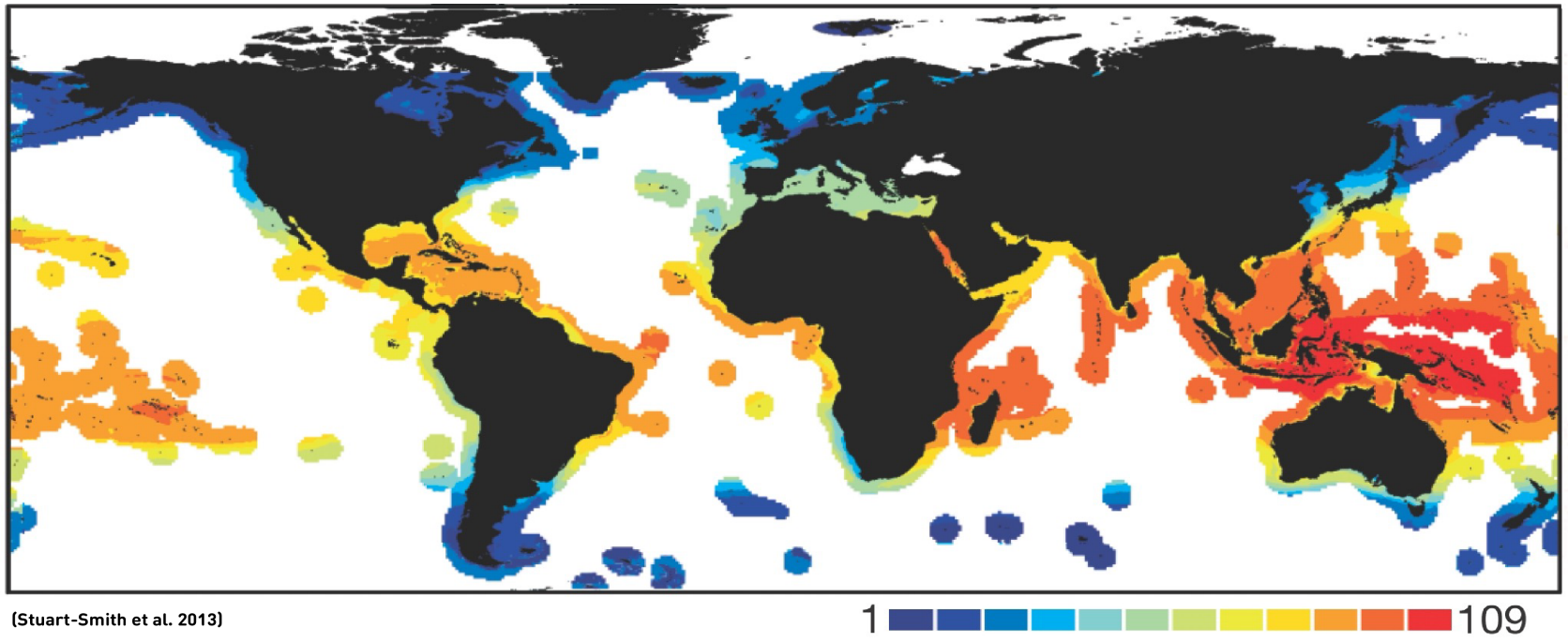


Presentation outline

- **Biodiversity conservation, ecosystem and human health, and Blue Economy**
- Why is biodiversity conservation **important**?
- **Our effort** in addressing marine biodiversity conservation, ecosystem, human health and blue economy
- A summary of **key achievements**
- **Key activities** since the last Session (April 2021)
- **Problems encountered and recommendation** for future development
- **Planned activities** for May 2023- April 2025

Richness of Species Diversity for Fishes

a Species density

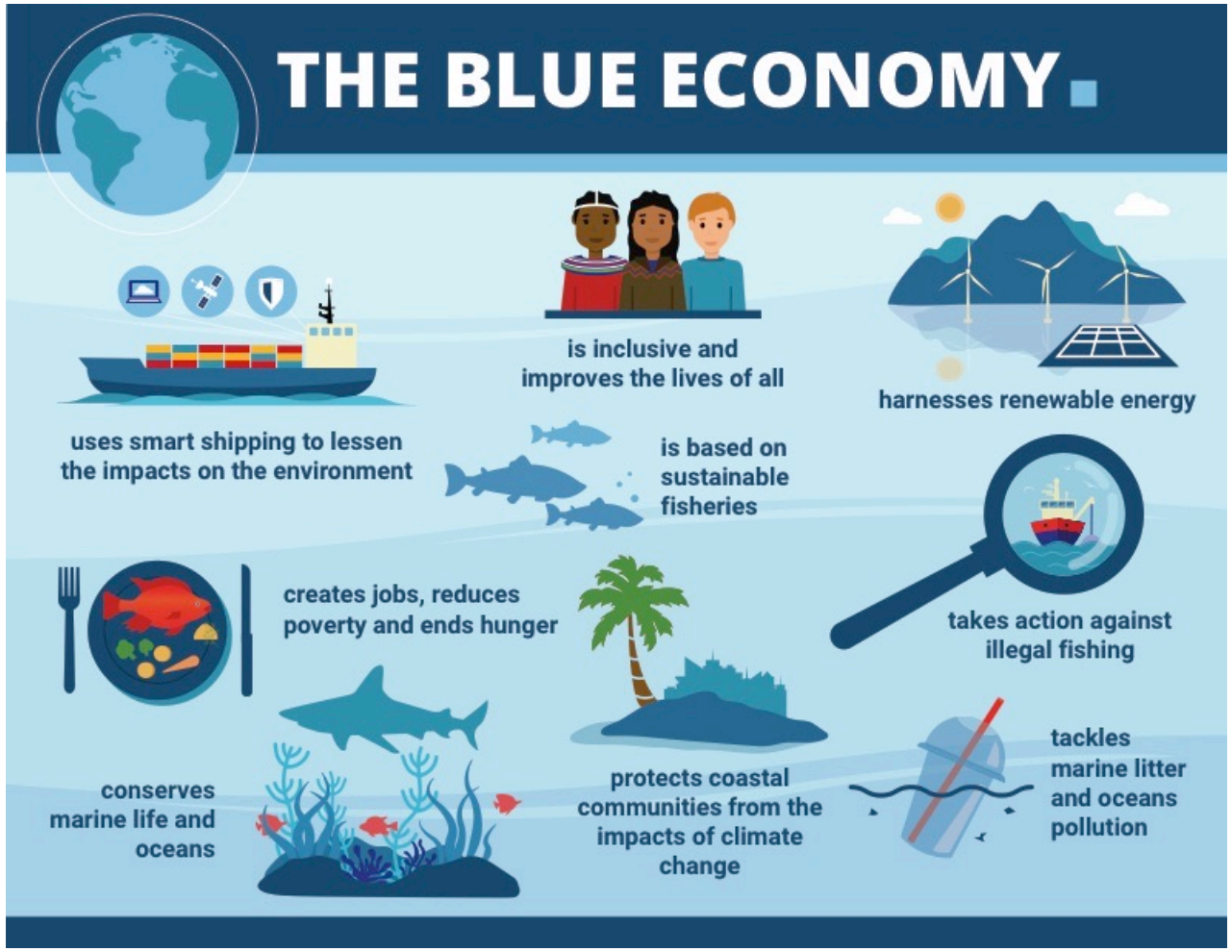


(Stuart-Smith et al. 2013)

Protein Source, Food security

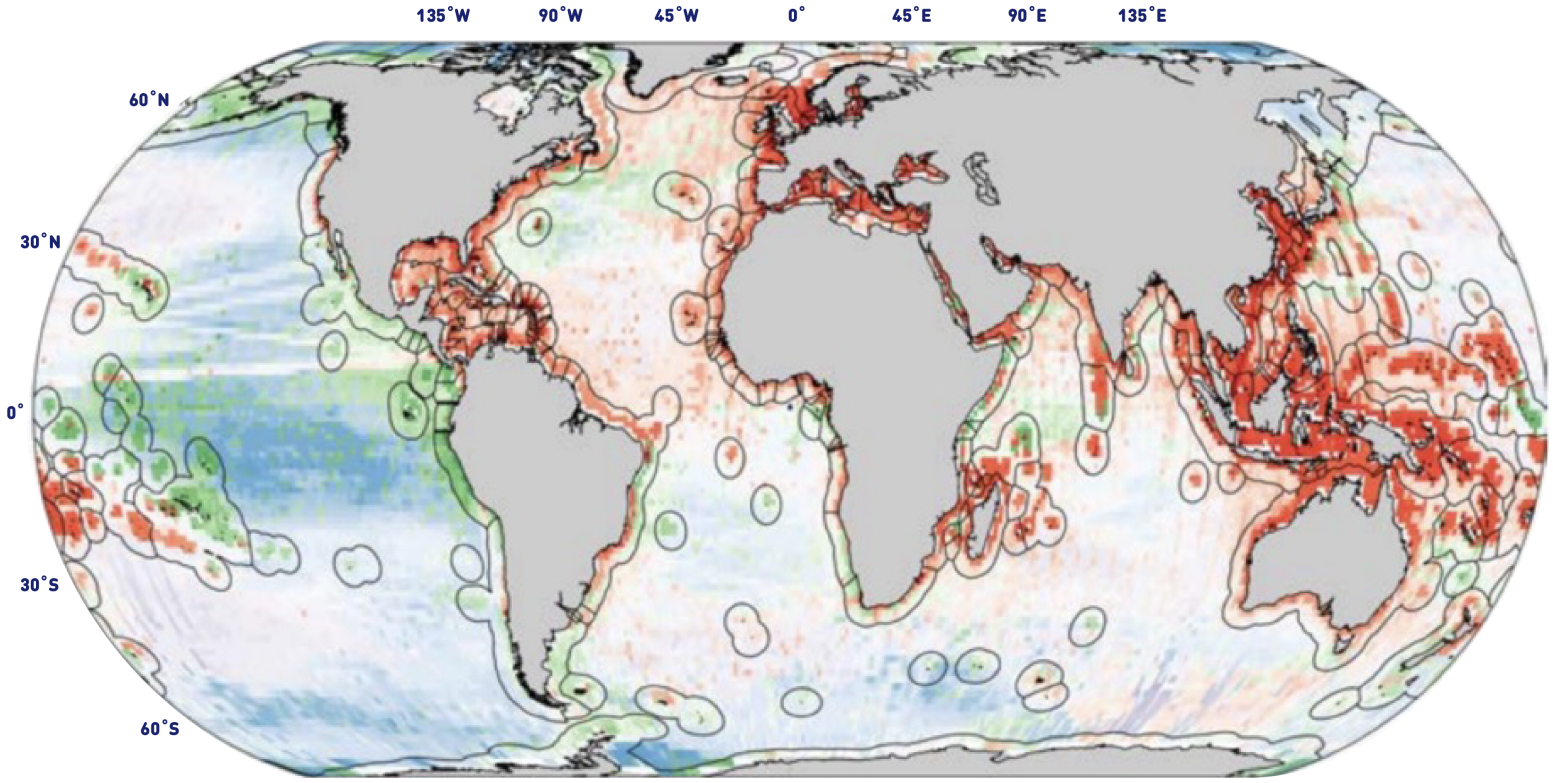
Cultural Value & Heritage

- Our forebears are great seafarers with life neatly intertwined with the sea
- Lost of biodiversity constitute lost of cultural heritage & our historical diversity



Lee et al., 2020
(Environment International)

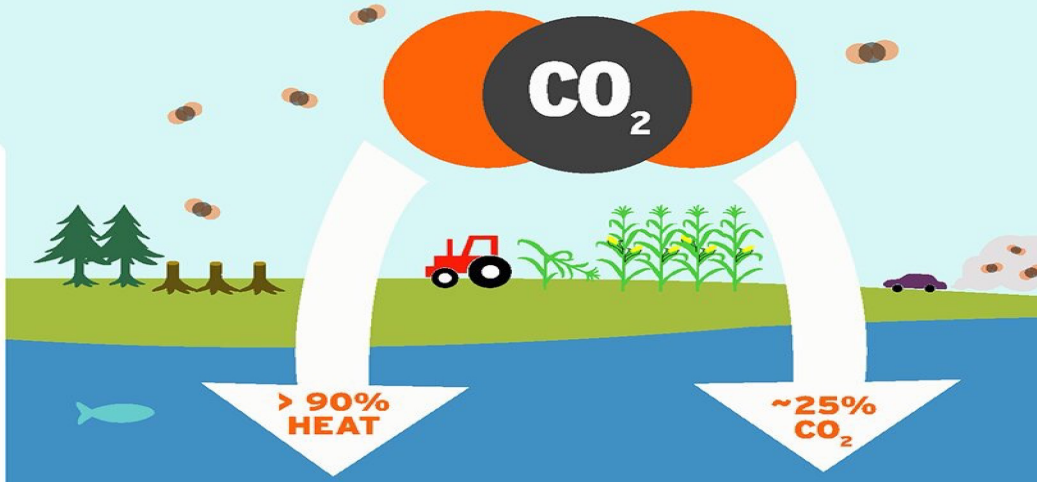
Marine Biodiversity in Relation to Human Impacts



Rogers et al., 2020

Future threats: Warmer, Breathless, and Acidic

Burning fossil fuels, deforestation and industrial agriculture release carbon dioxide (CO_2) and other heat-trapping gases into our atmosphere, causing our planet to warm. The ocean has buffered us from the worst impacts of climate change by absorbing more than 90 percent of this excess heat and about 25 percent of the CO_2, but at the cost of causing significant harm to marine ecosystems.



WARMER | **LESS OXYGEN** | **MORE ACIDIC**

SEA LEVEL
Sea level rise is accelerating, flooding coastal communities and drowning wetland habitats.

BLEACHING
Warm-water coral reefs (marine biodiversity hotspots) could be lost if the planet warms by 2°C (3.6°F).

TOXIC ALGAE
Larger and more frequent blooms are making fish, birds, marine mammals and people sick.

HABITATS
Lower oxygen levels are suffocating some marine animals and shrinking their habitats.

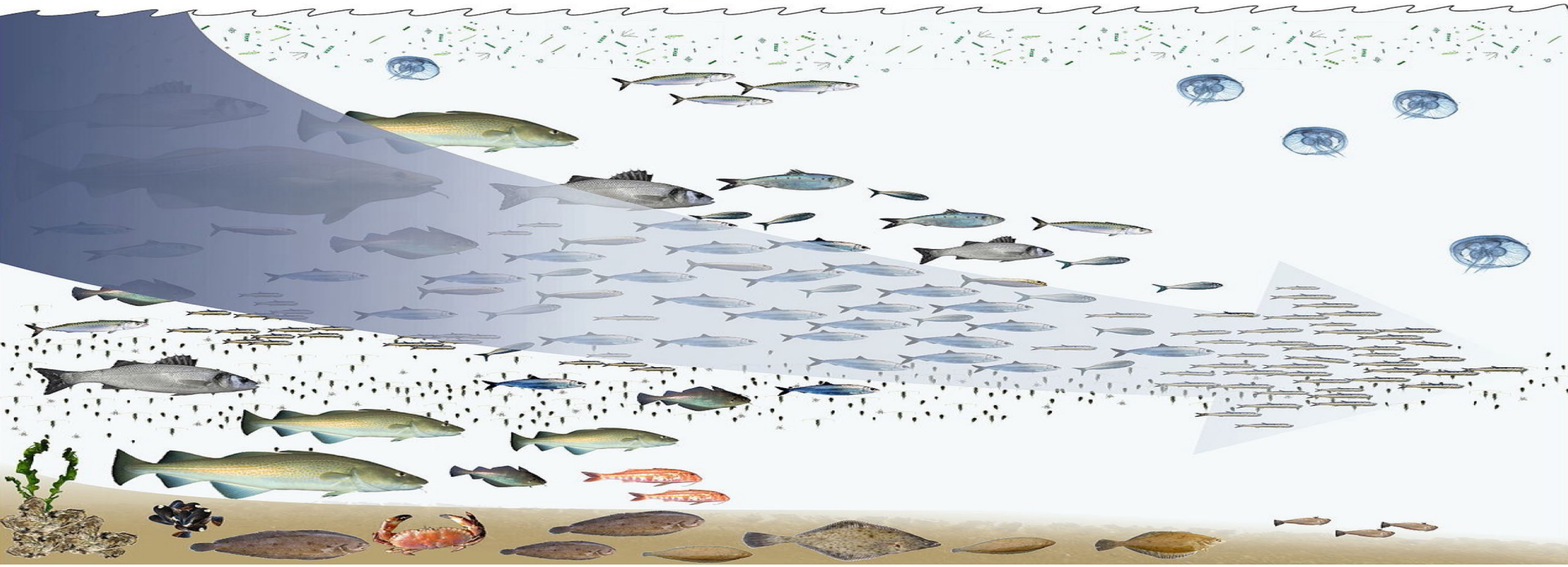
ACIDIFICATION
More acidic water harms animals that build shells, such as corals, clams, and oysters.

FISHERIES
Disruptions in fisheries affect the marine food web, local livelihoods, and global food security.

Source: IPCC, 2019: Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC)

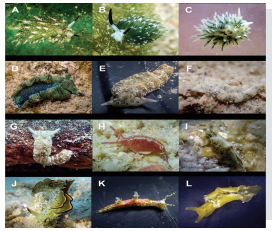
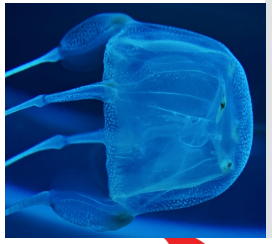
Monterey Bay Aquarium Research Institute | Monterey Bay Aquarium

~~Future~~ threats: Emptying of our Ocean

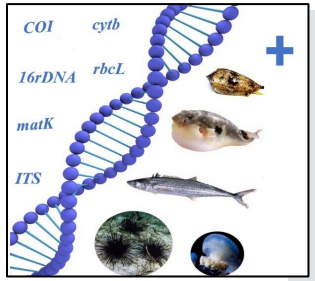
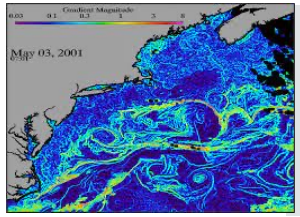


Projects supported by IOC-WESTPAC

Issue-based Solution-Oriented Projects

	**Coral Reef Resilience to Climate Change and Human Impacts**	Thamasak Yeemin Marine Biodiversity Research Group, Ramkhamhaeng University, Bangkok, Thailand
	**Coral Reef Restoration**	Suchana Chavanich Department of Marine and Coastal Resources (Thailand) and Chulalongkorn University
	**Harmful Algal Blooms**	Kazumi Wakita & Po Teen Lim Centre For Marine & Coastal Studies, Universiti Sains Malaysia, Malaysia
	**Harmful Jellyfish Research in the Western Pacific and Adjacent Seas**	Aileen Tan Shau Hwai Centre For Marine & Coastal Studies, Universiti Sains Malaysia, Malaysia

Projects

	Enhance the Capacity for Species Identification and Genetic Analysis on Marine Organisms in the Coral Reef Ecosystems in the Western Pacific -3rd Phase (DRMREEF-III)	Youn-Ho LEE Korea Institute of Ocean Science and Technology(KIOST)
	WESTPAC Ocean Remote Sensing Project for Coastal Habitat Mapping	Teruhisa KOMTSU Japan Fisheries Resource Conservation Association
	Distribution, Source, Fate and Impacts of Marine Microplastics in the WESTPAC (Asia Pacific Region)	Daoji LI East China Normal University
	Marine Toxins and Seafood Safety (IOC-WESTPAC-TMSS)	Dao Viet Ha Institute of Oceanography, Vietnam

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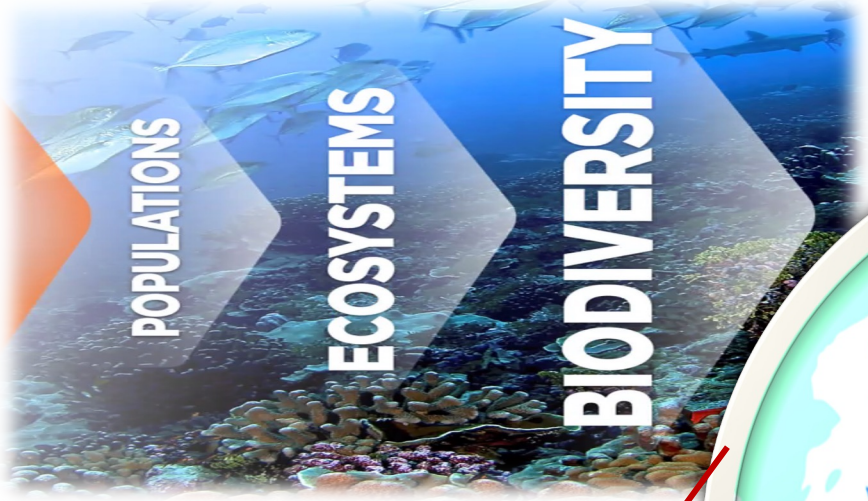


Harmful Algal Blooms

Marine Toxins and Seafood Safety (IOC-WESTPAC-TMSS)

Harmful Jellyfish Research in the Western Pacific and Adjacent Seas

WESTPAC Ocean Remote Sensing Project for Coastal Habitat Mapping

Distribution, Source, Fate and Impacts of Marine **Microplastics in the WESTPAC (Asia Pacific Region)**

Coral Reef Resilience to Climate Change and Human Impacts

Coral Reef Restoration

Enhance the Capacity for Species Identification and Genetic Analysis on Marine Organisms in the Coral Reef Ecosystems in the Western Pacific - 3rd Phase (DRMREEF-III)

KEY ACHIEVEMENTS

Establishment & Strengthening of the WESTPAC Network

Capacity Development especially for young scientists

Standardization of research methodology

Trans-boundary research & Collaboration

WESTPAC-XIV, 4-7 April 2023, Jakarta, Indonesia

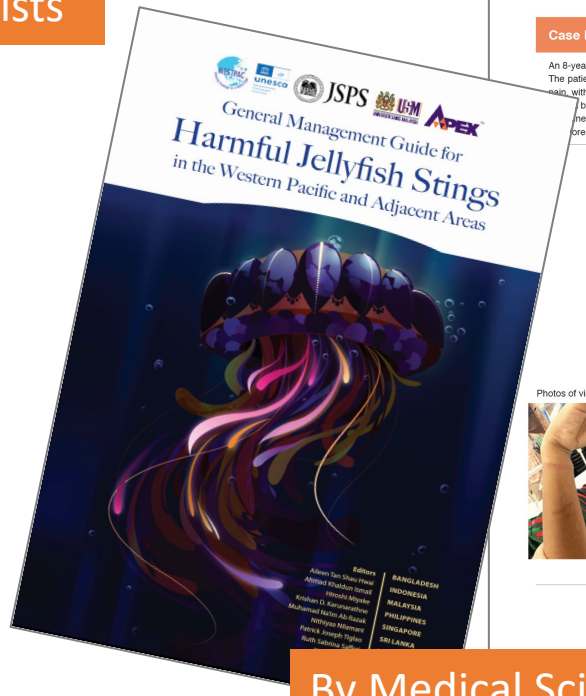
KEY ACHIEVEMENTS – *Joint Publications*

BOOKS

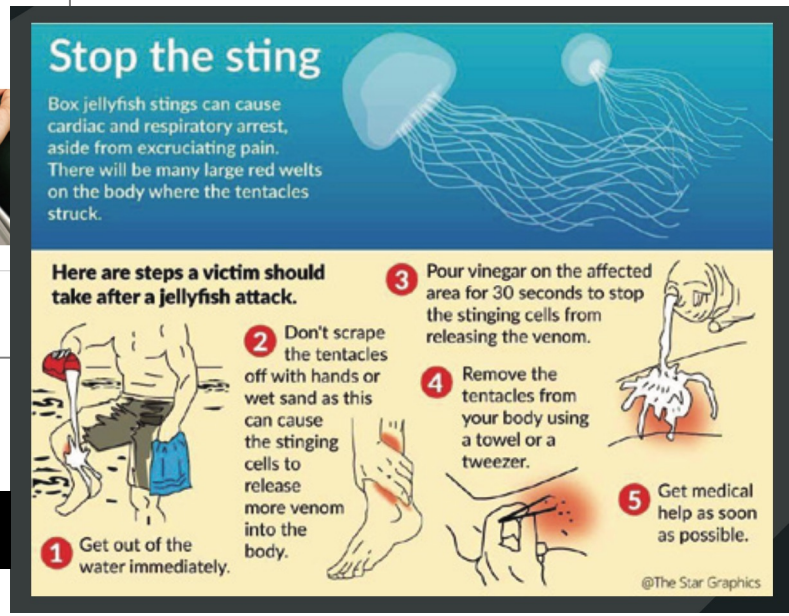
WESTPAC-XIV, 4-7 April 2023, Jakarta, Indonesia

KEY ACHIEVEMENTS – *Multi-disciplinary involvement*

By Marine Biologists



By Medical Scientists, with Marine Biologists



CO-DESIGN AND CO-PRODUCE SOLUTIONS

WESTPAC-XIV, 4-7 April 2023, Jakarta, Indonesia

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OUTREACH PROGRAMS

Science to Policy makers
Science to the Public

Involvement of policy makers and industry partners


星洲日报ePaper

14/02/2021

古城 社區報 Melaka Edition

螫傷遊客 戲水小心

公主海灘出現水母

須用白醋沖洗傷口

設警示牌提供白醋

女子登山掉落坡地受傷

11消拯員出動救人

張崇桔：下水前須警惕

雖漂亮但有毒

epaper.sinchew.com.my/sinchewepaper/mobimax/reader/magazine/index.php?params=%7B"ct"%3A"gVFDgcg8NaHngS6zMH0m26EzBqltg%5C%2FuDZXfGkiuM... 1/2

KEY ACHIEVEMENTS

Solution-Oriented Science and Science into Action

Winning the OCEAN HACKATHON® 2022 using data generated from long term monitoring

Winner of **Ocean Hackathon® 2022** at Kuala Lumpur, Malaysia (National Level) and Brest, France (International level). It is a 48-hour non-stop event during which teams develop a prototype to tackle a challenge. This event was organized by the Embassy of France. The jellyfish team proposed a challenge to develop the first prediction model for the jellyfish distribution and appearance in Penang Island, Malaysia, a mobile application called **Jelly Go**.

JELLY GO!

SCAN ME

Main Features of Our JELLY GO!

- **Prediction** for Monthly Jellyfish Abundance
  (Ind./m^3 ➡ No. of Jellyfish in 1 Olympic-sized Swimming Pool)
- **Emergency Action Plan** for Medical Teams, Front Liner & Public
- **Citizen Science** & Information

Remarks:
2.000 x10^{-3} Ind./m^3 = 20 jellyfish/10 million liters
or **20 jellyfish** in **10ML sea water** (ML = million liter or Megaliter)
or **20 jellyfish** in **4 Olympic-sized swimming pool**
or **5 jellyfish** in **1 Olympic-sized swimming pool**
(Olympic-sized swimming pool measuring 50m long & 25 m wide contains 2.5ML or 2.5 million liters of water)

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Prediction for Monthly Jellyfish Abundance

JELLY GO!

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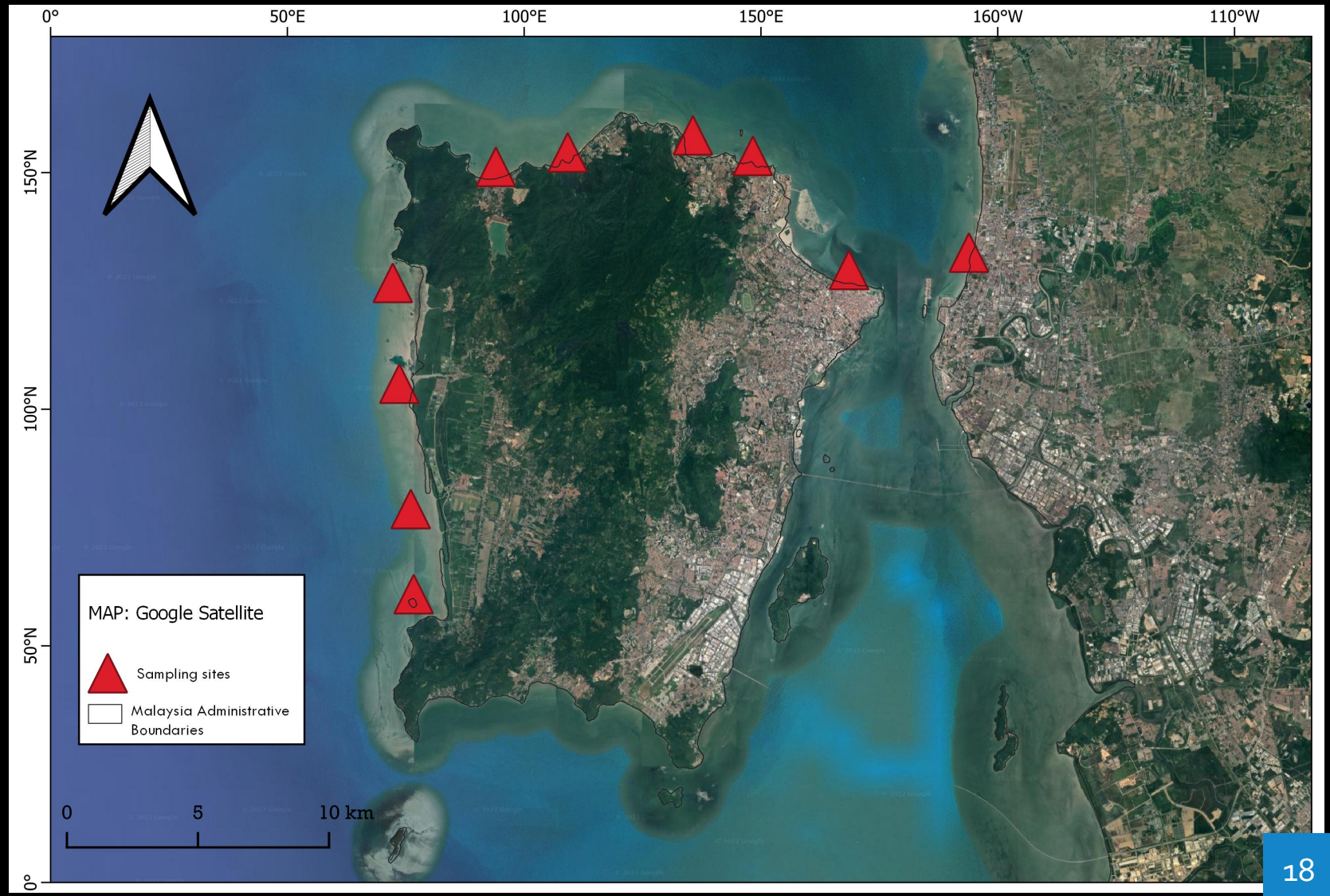

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Data Source: Monthly Sampling for Environmental Parameters (*in-situ*) and Jellyfish Abundance (Ind.x10^{-3}/m^3)

Prediction for Monthly Jellyfish Abundance (2)

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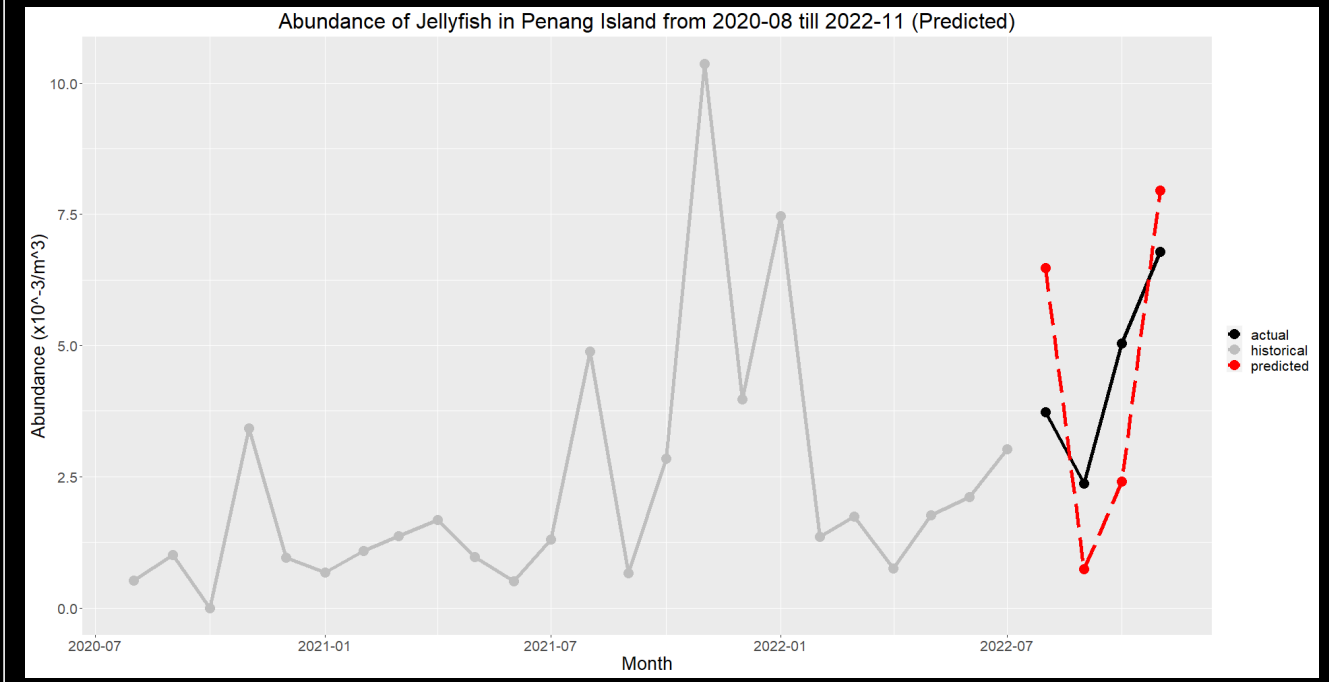
```r
#combine with new (actual) data----
newForecast <- tibble( #create new dataframe for 4 new months
  Month = seq(from = as.Date("2022-08-01"), to = as.Date("2022-11-01"), by = "month")) %>%
  cbind(newAbundance) #combine with forecast values

#read actual data and average by month
actual <- extra4Months <- read_csv("extra4Months.csv", col_types = cols(Month = col_date(format = "%d/%m/%Y"))) %>%
  dplyr::select(Month, Abundance) %>%
  group_by(Month) %>%
  summarise(across(everything(), mean), .groups = "drop") #find mean for each variable by month

#merge actual and forecast
comparison <- actual %>%
  left_join(newForecast) %>%
  rename(actualAbundance = Abundance,
         predictedAbundance = newAbundance)

#plotting actual and predicted
ggplot() +
  geom_line(df, mapping = aes(x = Month, y = Abundance, color = "gray"), size = 2) +
  geom_point(df, mapping = aes(x = Month, y = Abundance, color = "gray"), size = 5) +
```

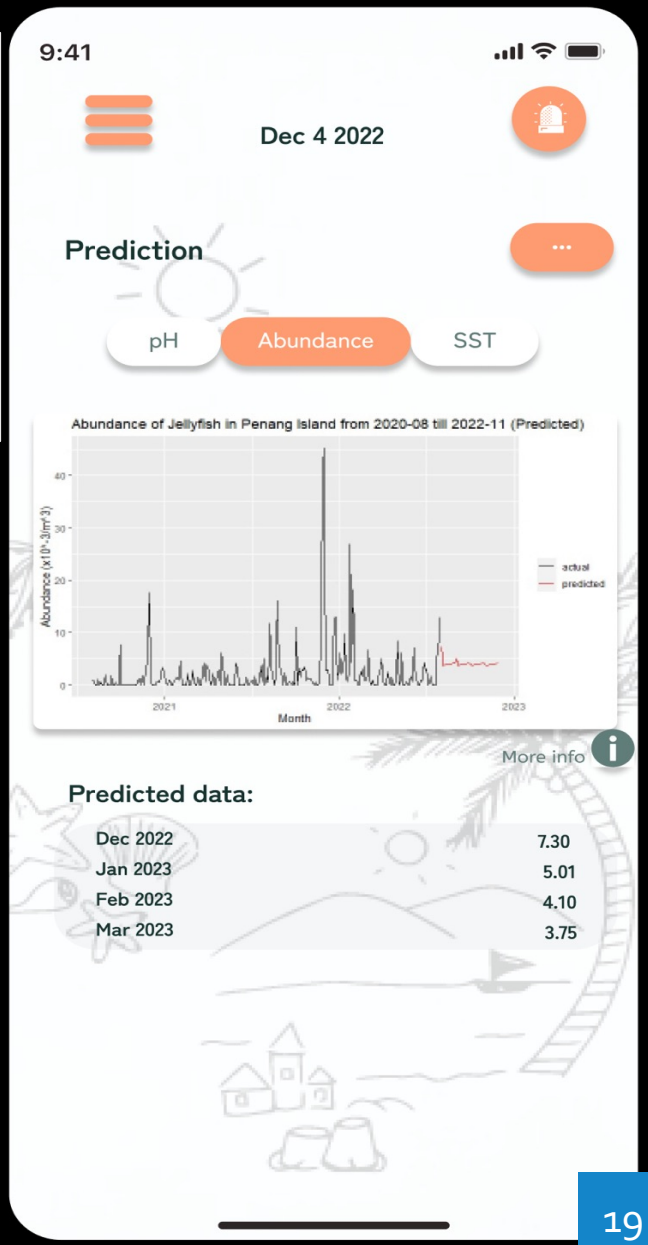
```
> # meanSD <- mean(comparison$SD) #mean of sd
> # cat("The mean standard deviation is:", format(round(meanSD, 2), nsmall = 2))
>
> rmse <- sqrt(mean((comparison$predictedAbundance - comparison$actualAbundance)^2)) #rmse
> cat("The RMSE is:", format(round(rmse, 2), nsmall = 2))
The RMSE is: 2.15>
```

- Vector Autoregression Model on R

```r
VARselect(dfTime,
          lag.max = 1,
          season = 12 #monthly
          )

#create a VAR model----
var.a <- VAR(dfTime,
             season = 12,
             lag.max = 1,
             ic = "AIC"
             )
#summary(var.a)

#forecast, plot and extract forecasted values----
fcast <- predict(var.a, n.ahead = 4) #forecast 4 months in the future
par(mar = c(2.5, 2.5, 2.5, 2.5)) #multiple graphs in a single plot
plot(fcast) #plot forecast for all variables

#extract forecast values
new <- fcast[["fcst"]][["Abundance"]]
newAbundance <- new[,1]
```

- Multivariate Time Series Forecasting





Mean (comparison S.D.) ± 1.45

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Emergency Action Plan

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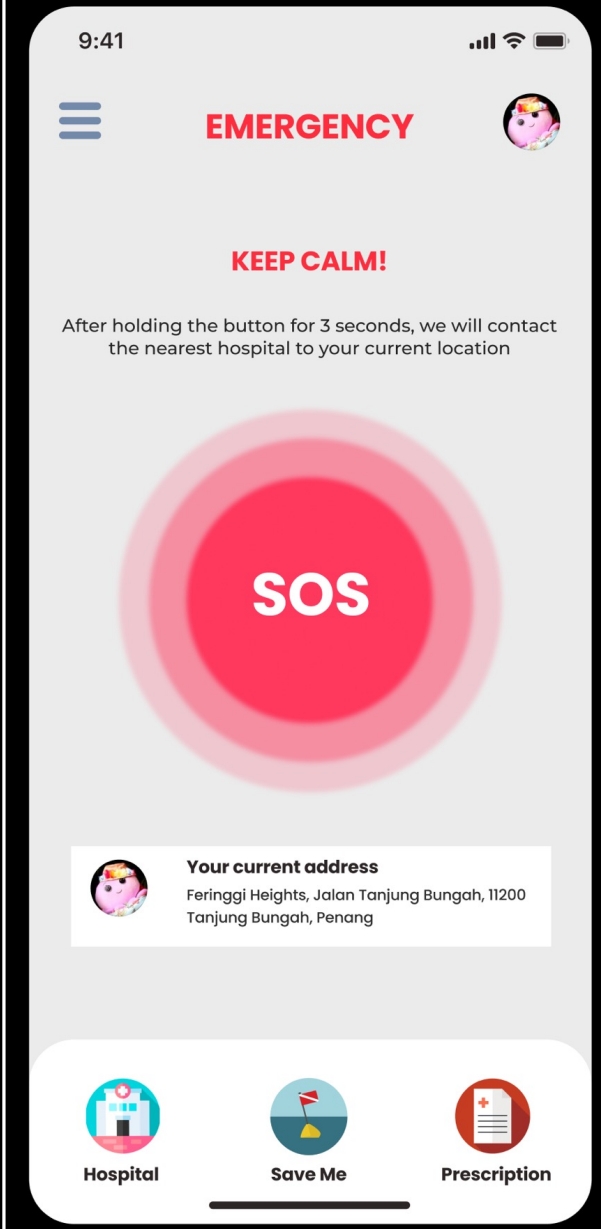

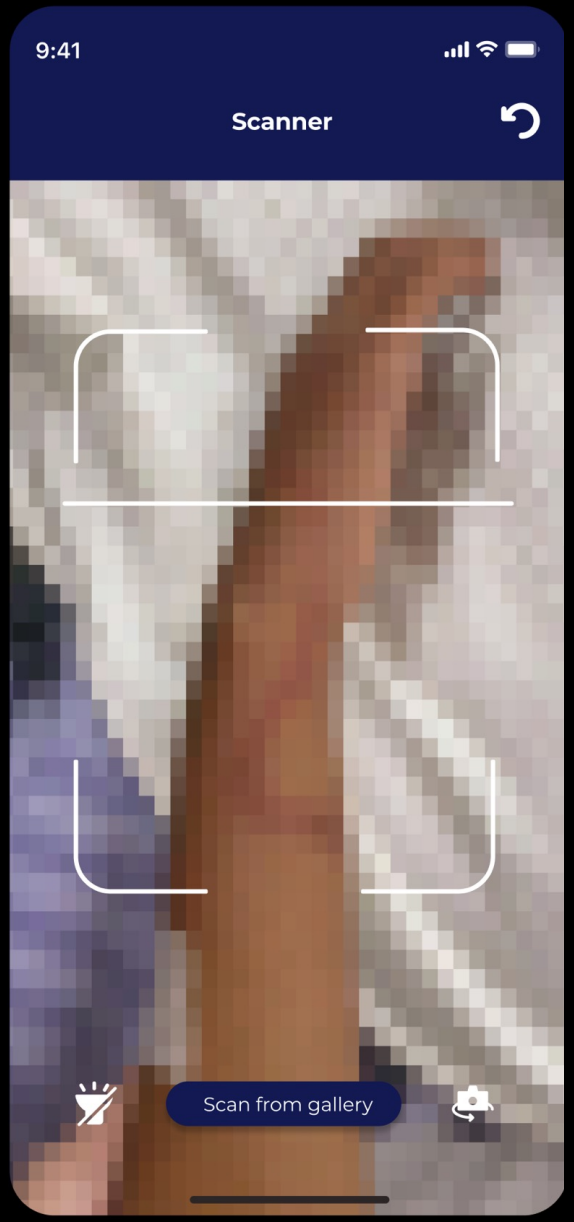

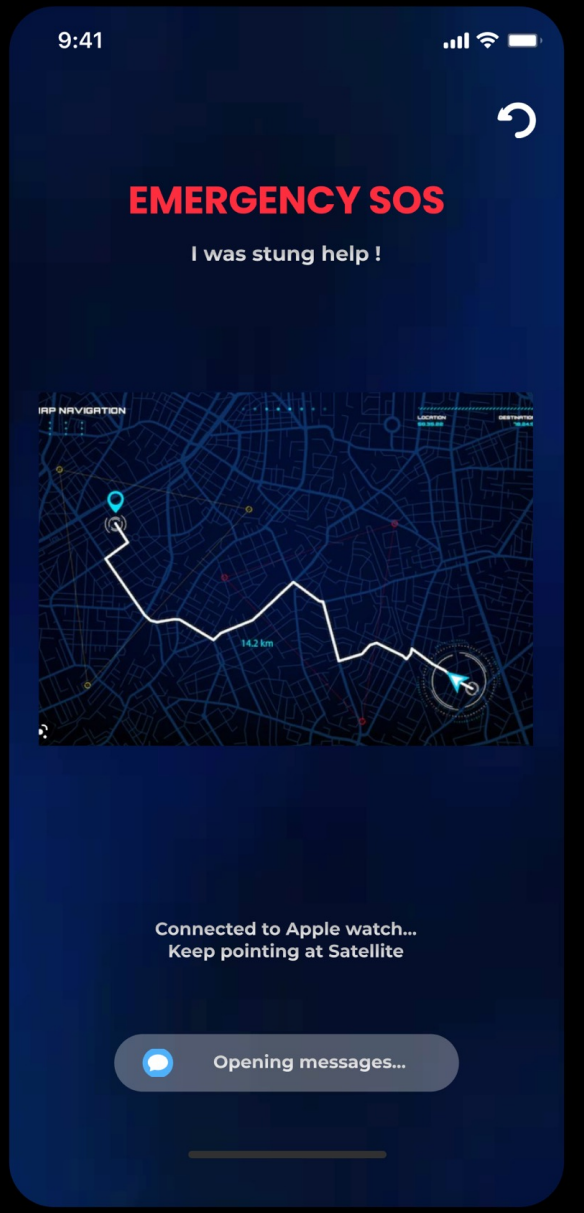

Our Response Teams

Our Reference Partner

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Citizen Science

JELLY GO!

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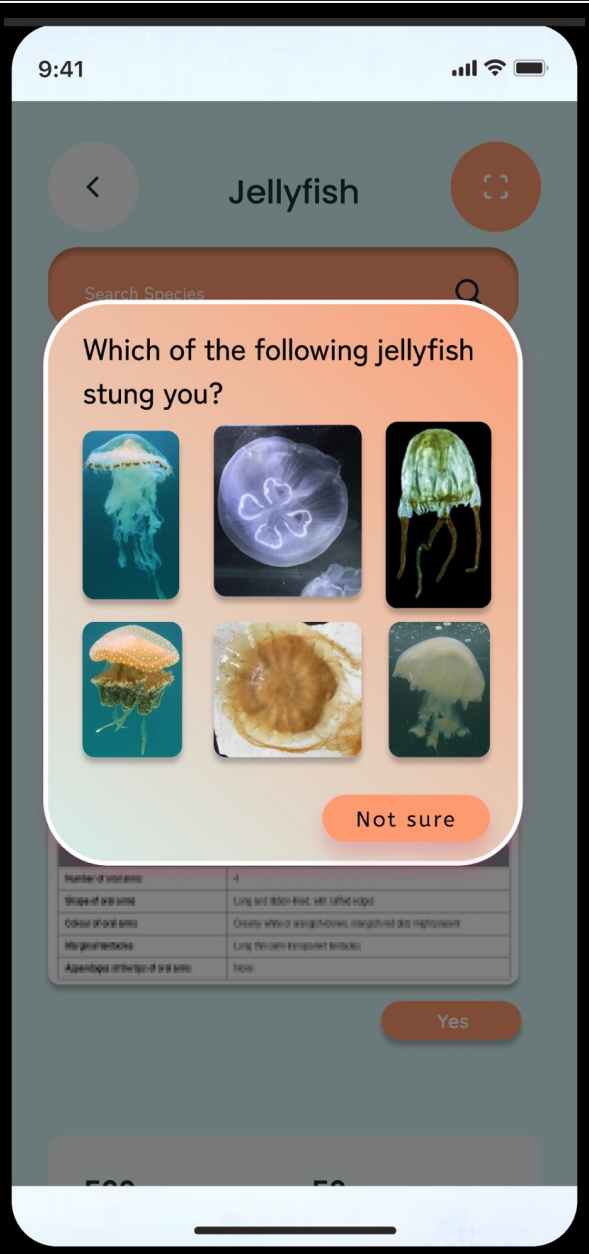
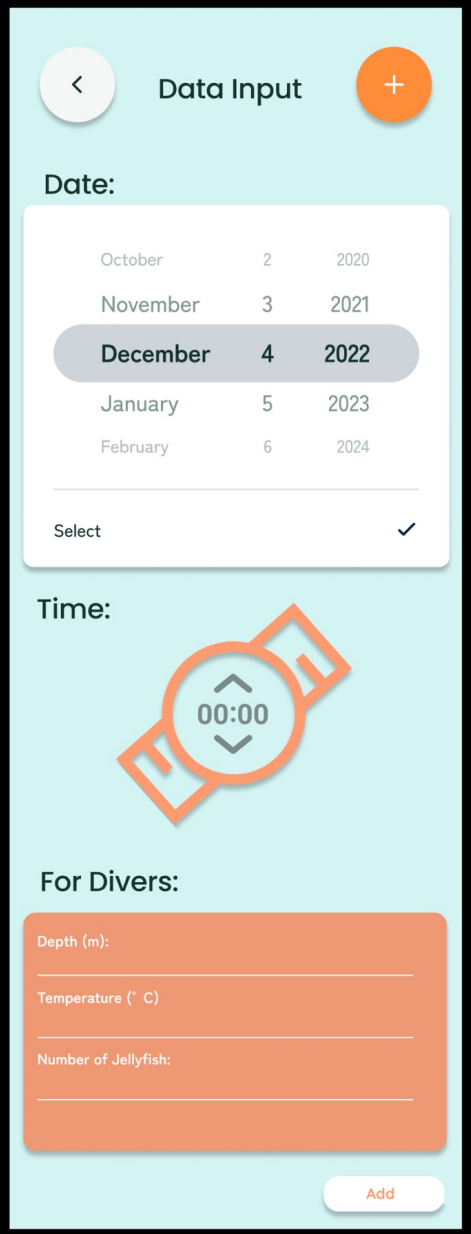
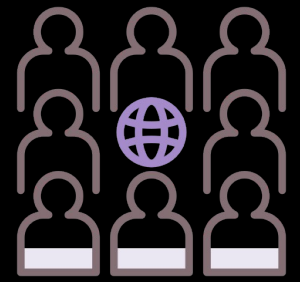




Our Partner

MALAYSIAN ASSOCIATION OF HOTELS
PERSATUAN HOTEL MALAYSIA

檳城旅業公會
PENANG HOTELIERS ASSOCIATION



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KEY ACHIEVEMENTS

Establishment of the WESTPAC Marine Biodiversity Portal

WESTPAC-XIV, 4-7 April 2023, Jakarta, Indonesia

KEY ACHIEVEMENTS – *Joint Publications*

PUBLICATION in JOURNALS

Science of The Total Environment
Volume 690, 10 November 2019, Pages 821-830

Microplastics in fishes from the Northern Bay of Bengal

M. Shahadat Hossain [a], Faisal Sobhan [b], Mohammad Nasir Uddin [c], S.M. Sharifuzzaman [a], Sayedur Rahman Chowdhury [a], Subrata Sarker [d], M. Shah Nawaz Chowdhury [a]

ZooKeys 1042: 73–188 (2021)
doi: 10.3897/zookeys.1042.64474
https://zookeys.pensoft.net

RESEARCH ARTICLE

ZooKeys

An updated inventory of sea slugs from Koh Tao, Thailand, with notes on their ecology and a dramatic biodiversity increase for Thai waters

Rahul Mehrotra[1,2], Manuel A. Caballer Gutiérrez[3,4], Chad M...
Spencer Arnold[5], Coline Monchanin[2,6], Voranop ...

frontiers | Frontiers in Marine Science

Variation of Carbon–Nitroge... Contents and Allelopathic D... of Renieramycin M–Produci... Sponge Xestospongia sp. i... of Thailand

Udomsak Darumas[1†], Gad Elsayed Mohamed Salem[2†], Khanit... Voranop Viyakarn[2,4] and Suchana Chavanich[2,4,5*]

[1]School of Science, Walailak University, Nakhon Si Thammarat, Thailand, [2]Reef Biolog... of Marine Science, Faculty of Science, Chulalongkorn University, Bangkok, Thailand, [3]... Faculty of Pharmaceutical Sciences, Chulalongkorn University, Bangkok, Thailand, [4]Center of Excellence for Marine Biote... Chulalongkorn University, Bangkok, Thailand, [5]Center of Excellence for Marine Biote... Faculty of Science, Chulalongkorn University, Bangkok, Thailand

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Contents lists available at ScienceDirect

Harmful Algae

journal homepage: www.elsevier.com/locate/hal

A massive bloom of *Karenia* species (Dinophyceae) off the Kamchatka coast, Russia, in the fall of 2020

Tatiana Y. Orlova [a,*], Anatoly I. Aleksanin [b,c], Ekaterina V. Lepskaya [c], Kseniya V. Efimova [a], Marina S. Selina [a], Tatiana V. Morozova [a], Inna V. Stonik [a], Vasily A. Kachur [b,c], Alexander A. Karpenko [a], Kirill A. Vinnikov [b], Andrey V. Adrianov [a], Mitsunori Iwataki [d,*]

Orlova et al. (2022)

Contents lists available at ScienceDirect

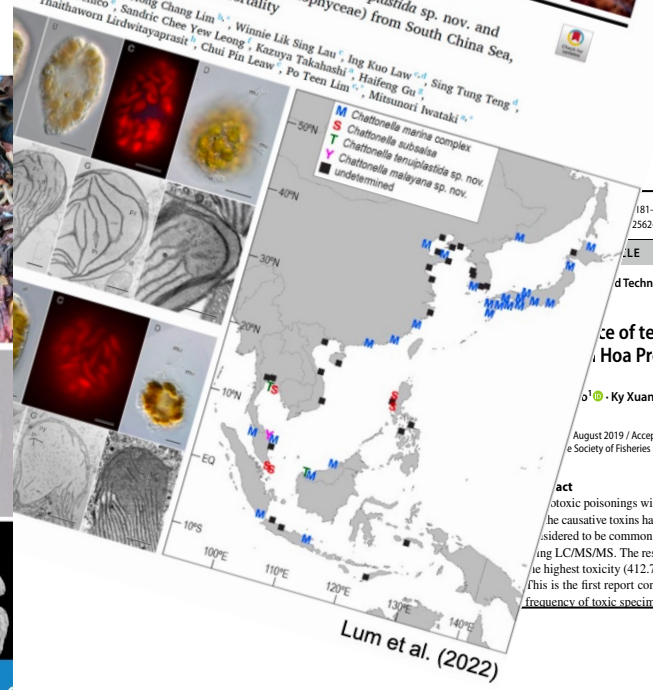
Harmful Algae

journal homepage: www.elsevier.com/locate/hal

Original Article

Description of two new species Chattonella tenuiplastida sp. nov. and Chattonella malayana sp. nov. (Raphidophyceae) from South China Sea, with a report of wild fish mortality

Wai Mun Lum [a], Hong Chang Lim [b,*], Winnie Lik Sing Lau [c], Ing Kuo Law [c,d], Sing Tung Teng [d], Garry Benico [a], Sandric Chee Yew Leong [e], Kazuya Takahashi [d], Haifeng Gu [d], Thaithaworn Lirdwitayaprasit [b], Chui Pin Leaw [c], Po Teen Lim [c], Mitsunori Iwataki [d,*]



Lum et al. (2022)

Fisheries Science
https://doi.org/10.1007/s12562-022-01638-6

ORIGINAL ARTICLE

Food science and Technology

Ciguatoxin in moray eels raising the risk for seafood safety in Viet Nam

Ha Viet Dao[1,2] · Hy Ho Khanh Le[1] · Thao Thi Thu Le[1] · Ky Xuan Pham[1] · Minh Quang Bui[3] · Leo Lai Chan[4]

Received: 31 May 2022 / Accepted: 31 August 2022
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Abstract

...suspected ciguatera fish poisoning (CFP) cases caused by the consumption of moray eels, popular seafood for locals ...been reported in Viet Nam. However, little is known about ciguatoxins (CTXs) in these marine fish. In ...six moray eel species were collected for CTX detection from Ly Son Island (site 1), Ninh Hai ...and Spratly Islands (site 4), where suspected CFP from moray eel consumption have ...uid chromatography–mass spectrometry (LC/MS) analysis in 12 specimens belong- *fimbriatus*, *G. flavimarginatus*, *G. javanicus*, and *G. undulatus*), accounting for about ...ably, CTX-1B levels detected in all toxic specimens were beyond the safety threshold highest occurrence was observed at site 4 (15.6%) ($n=45$), followed by site 1 (10.0%) whereas no CTX-1B was detected in any specimens ($n=18$) from site 3. These results

...181–186
...2562-019-01375-3
...LE
...d Technology

...ce of tetrodotoxin in three *Nassarius* gastropod species ...Hoa Province, Vietnam

...o[1] · Ky Xuan Pham[1] · Ben Xuan Hoang[1] · Masato Tanioka[2] · Ryuichi Watanabe[3] · Toshiyuki Suzuki[3]

...August 2019 / Accepted: 10 October 2019 / Published online: 12 November 2019
...e Society of Fisheries Science 2019

...act

...otoxic poisonings with fatal symptoms caused by consumption of *Nassarius* gastropods have been reported in Vietnam ...he causative toxins have not been confirmed. In the present study, *Nassarius conoidalis*, *N. glans* and *N. pullus*, which are ...sidered to be common causative species, were collected in Khanh Hoa province, Vietnam in May 2016 for toxin analysis ...ng LC/MS/MS. The results confirmed that TTX is a dominant toxin in these gastropods. Among them, *N. glans* exhibited ...e highest toxicity (412.7 ± 107.3 MU/g), followed by *N. conoidalis* (144.8 ± 82.0 MU/g) and *N. pullus* (19.6 ± 9.8 MU/g). ...This is the first report confirming TTX in these species. All specimens in this study were hightly toxic, indicating that the ...frequency of toxic specimens of the three *Nassarius* species is extremely high. Further, their toxicities were all beyond the

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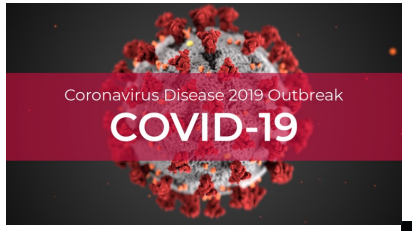
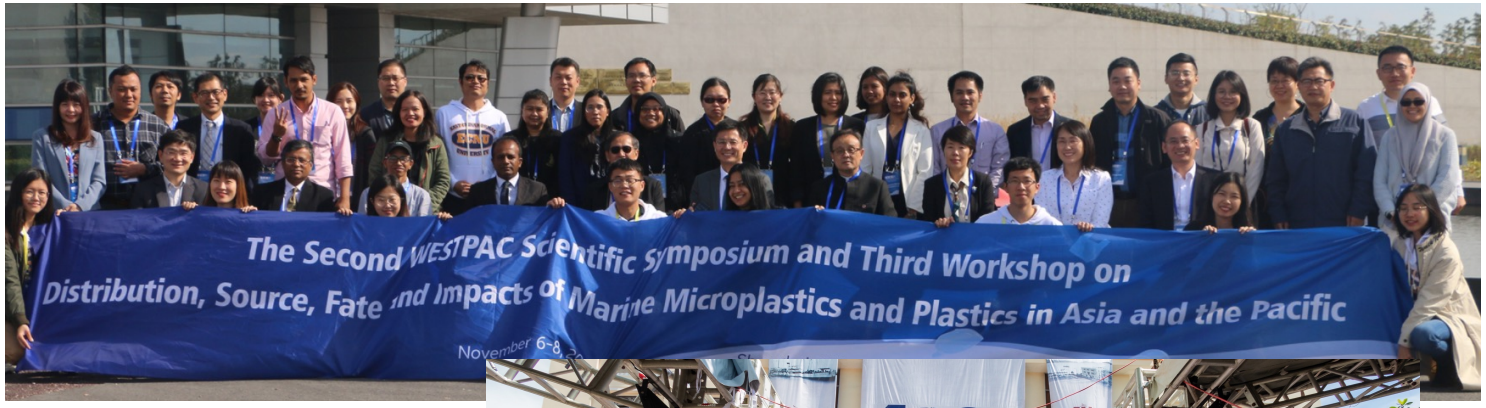
KEY ACTIVITIES *(since April 2021)*



WEBINARS

KEY ACTIVITIES *(since April 2021)*

WORKSHOPS *(International)*



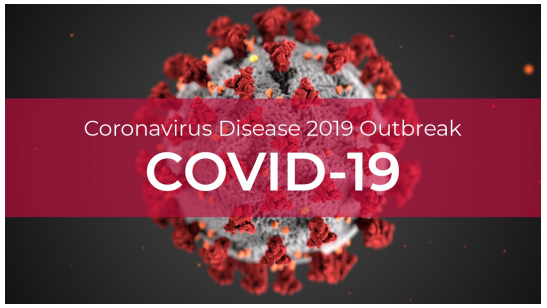
WESTPAC-XIV, 4-7 April 2023, Jakarta, Indonesia

KEY ACTIVITIES *(since April 2021)*

WORKSHOPS *(National)*

WESTPAC-XIV, 4-7 April 2023, Jakarta, Indonesia

PROBLEMS ENCOUNTERED



- The long-term impacts of the COVID-19 pandemic in terms of socio-economic and logistic problems
  - Face-to-face and on-site workshops and training courses could not take place due to international or domestic travel restrictions imposed by Covid 19 pandemic.

- Lack of recognition of the work and activities by countries outside of the region in the subject related to the research in the Western Pacific region

- **Continuous fundings to support continuous research in own country. Recommendations to explore more opportunities from other related international parties/NGOs/organisation for funding opportunity**

PROBLEMS ENCOUNTERED

- **Lack of data in database, hampering the effort to understand long term changes in the ocean in all member states (especially due to climate change)**
- **Data sharing are restricted due to data ownership issue by different member states**
- **Transboundary issue concerning the export of toxin contaminated seafood to neighbouring countries**
- **Inequal resources, knowledge and capacity on research and long-term monitoring among member states.**

RECOMMENDATIONS

- **INCREASE NETWORKING / ENGAGEMENT WITH MEMBER STATES**
  - *To conduct physical or hybrid events; and if necessary continue with online meetings*
  - *To conduct regular seminars/ workshops & Joint Publications with member states*

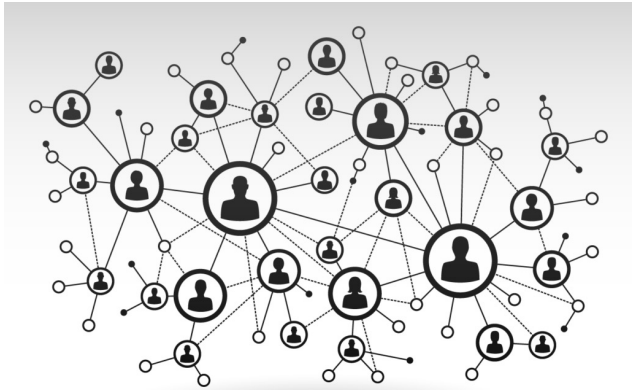
- **DATA SHARING**
  - *Promote Data Submission to recognized platforms by member states ie OBIS & Promote Data Sharing among member states*

- **CONTINUOUS FUNDINGS**
  - *Need to explore funding opportunities from other related international parties / organizations*

- **CAPACITY DEVELOPMENT**
  - *Involvement & Commitment of ECOP*

BRIN
BADAN RISET DAN INOVASI NASIONAL

PLANNED ACTIVITIES *(May 2023 – April 2025)*



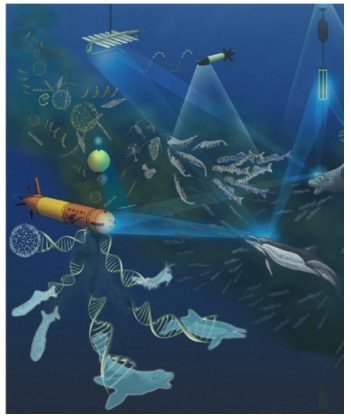
NETWORKING

- **Strengthening Networking**
  - *Joint field activities*
  - *Symposium / Series of seminars*
- **Capacity development training**
  - *Workshops*
  - *Summer schools*
- **Science to Action**
  - *Communicating science to a broader audience ie policy makers, stakeholders & public*

Translating Science into Action

WHAT CAN WE DO?

- **Continue Engaging** with scientists, policy makers & public
- **Continue Supporting** Marine Science & Technology
- **Continue developing healthy STIE** (*Science Technology Innovation & Economy*) in Marine Biodiversity, Conservation, Ecosystem, Human Health & Blue Economy



ThankYou

Aileen TAN

aileen@usm.my