

Margalefidinium polykrikoides blooms and their impacts on fish mortalities in Malaysia coastal waters

Normawaty Mohammad Noor¹, Asilah Al-Has¹, Aiminuliani Adam¹, Shuhadah Mustafa²,
Roziawati Mohd Razali³ & Anwar Iqbal⁴

¹Department of Marine Science, Kulliyah of Science, International Islamic University of Malaysia, Jalan Sultan Ahmad Shah, Bandar Indera Mahkota, 25200 Kuantan, Pahang, Malaysia

²Sabah Fisheries Biosecurity Office, Likas Fisheries Complex, 88400 Kota Kinabalu, Sabah, M

³Fisheries Research Institute, 1190 Batu Maung, Penang, Malaysia

⁴Scholl of Chemical Sciences, Universiti Sains Malaysia, 11800 USM Penang, Mala



Margalefidinium polykrikoides

- Harmful algal blooms (HABs), discolor seawater and known as red tide
- Distribution – wide and increase due to global warming (Griffith et al., 2019)
- Harmful to fish, shellfish and other marine life
- Resist to vast nutrient concentrations, mixotroph and allelopathic species
- Hence easily distributed to other areas

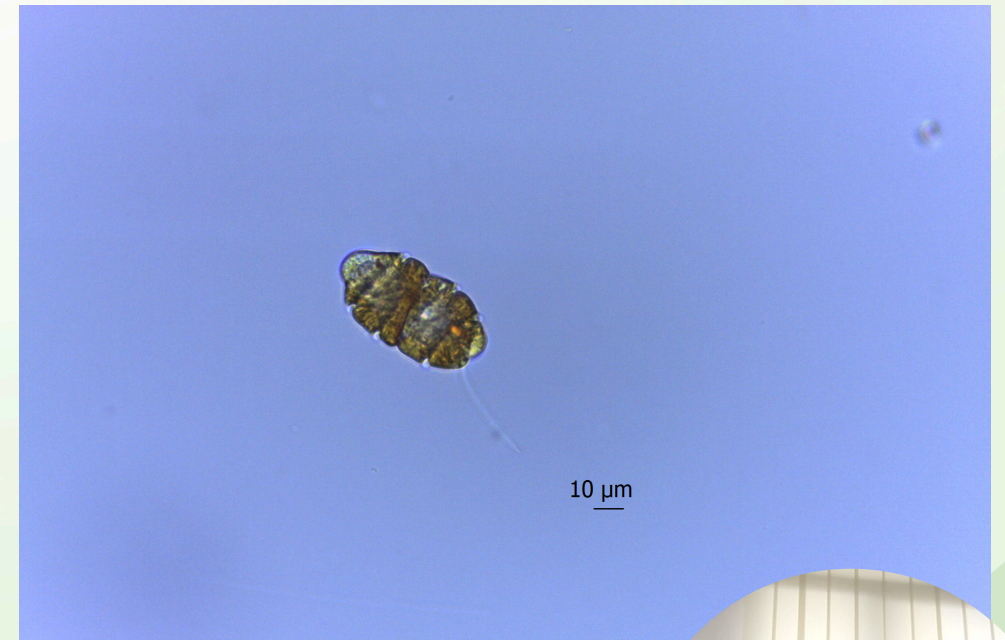
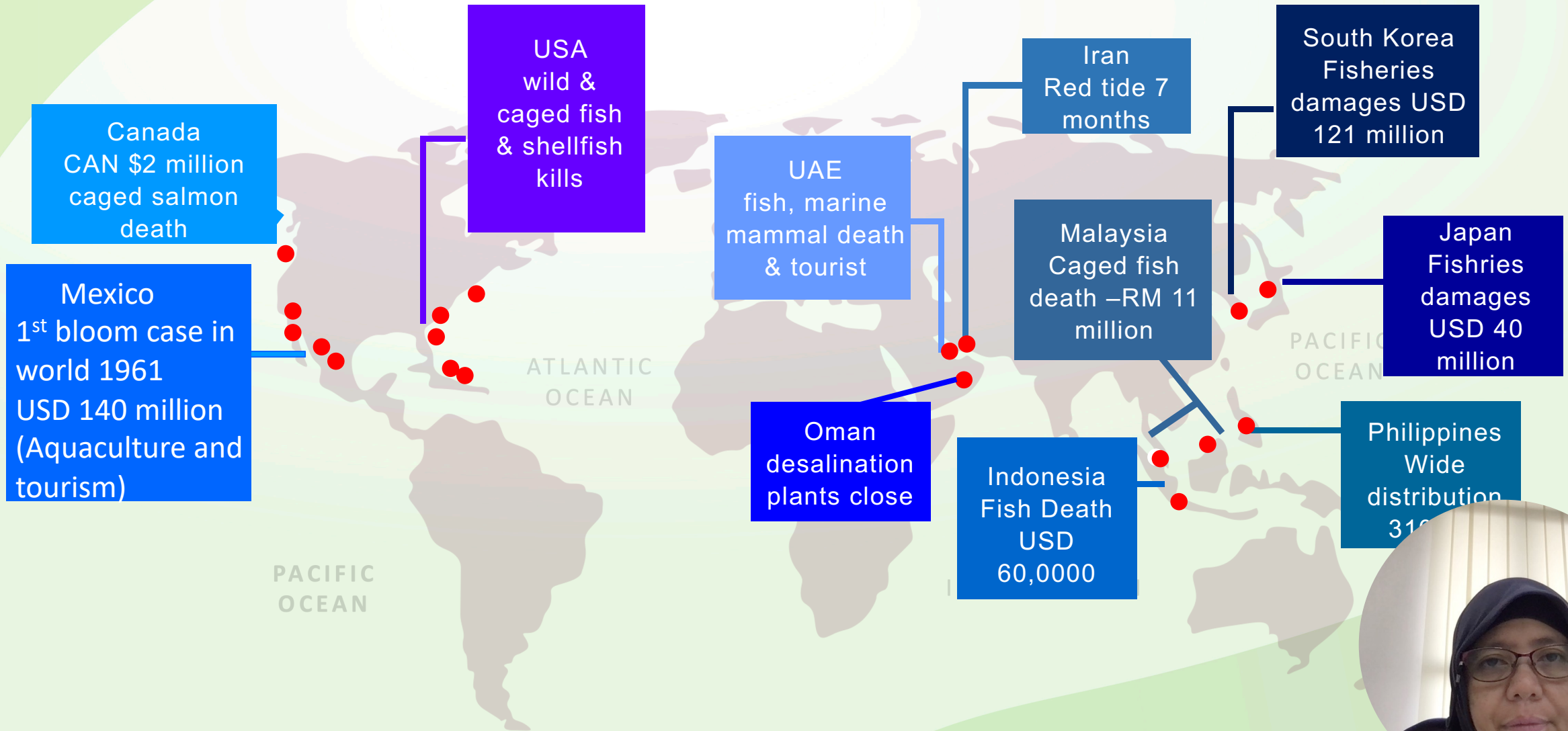


Figure 1: Single cell of *M. pol*



Global distribution and its impacts

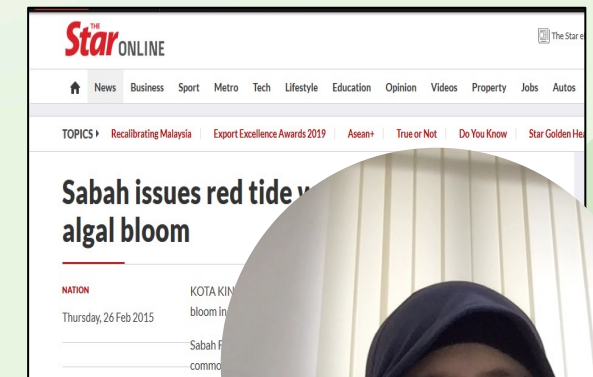


Distribution in Malaysia



M. Polykrikoides blooms in Sabah

- First outbreak in 2005 at Kota Kinabalu, Sabah (Anton et al., 2008)
- Massive death fish caged
- Nutrient, rainfall and temperature
- Monitor by Department of Fisheries Sabah (DOF)
- Red tide alert
- Public awareness



- Hence, monitoring of *M. polykrikoides* is important
- High cell number has high hemolytic activity (Aquino-Cruz et al., 2020)
- Cell > density 10^4 - 10^6 could kill fish and shellfish
- DOF will release red tide warning according to cell density (Table 1)

Table 1: Red tide warning in Sabah (Jipanin et al., 2019)

Warning Class	Scale	Cell density
Red tide attention	HAB blooms and potential fishery damages	Over 1000
Red tide alert	HAB blooms and fisheries damages	Over 7000
Warning lift	HABs are extinct, no risk of fisheries damages	When cell density safety level for 3 weeks

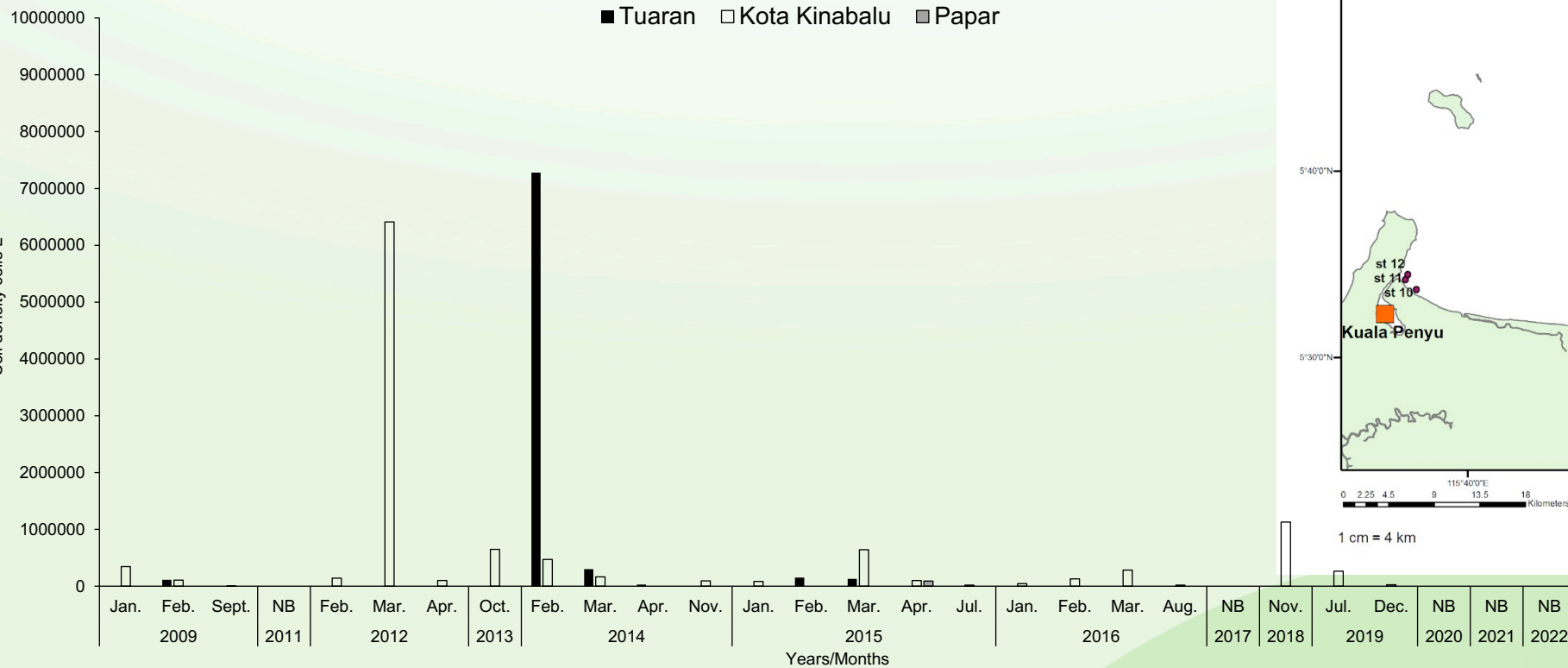
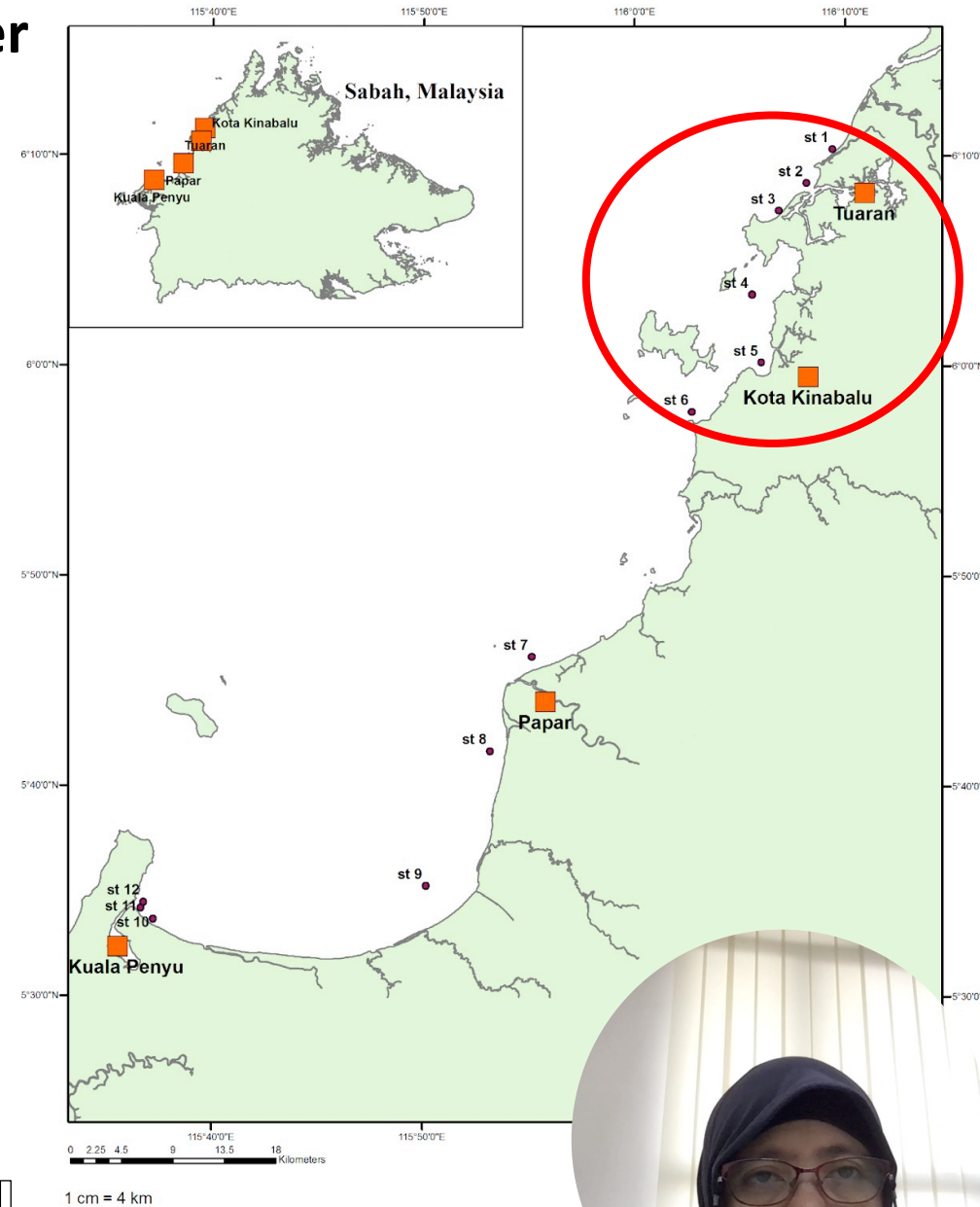


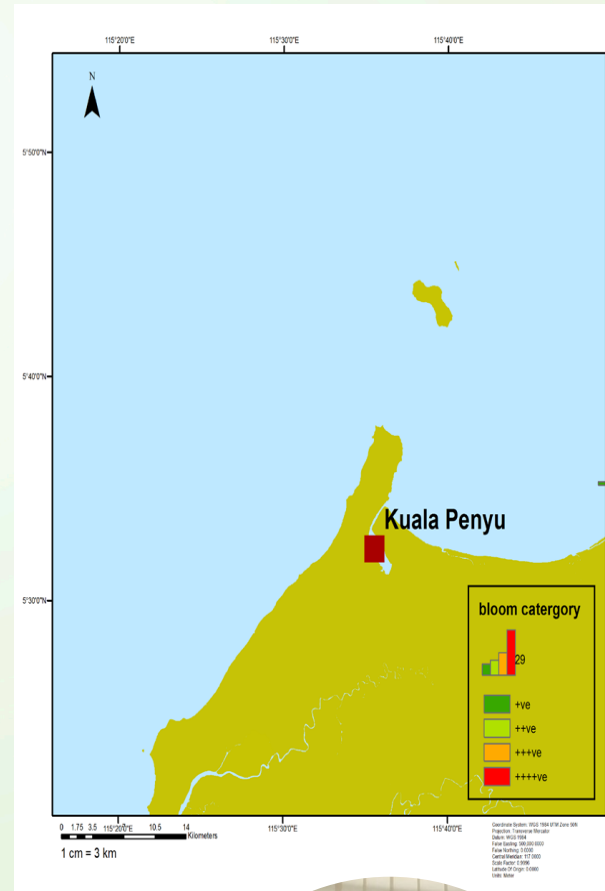
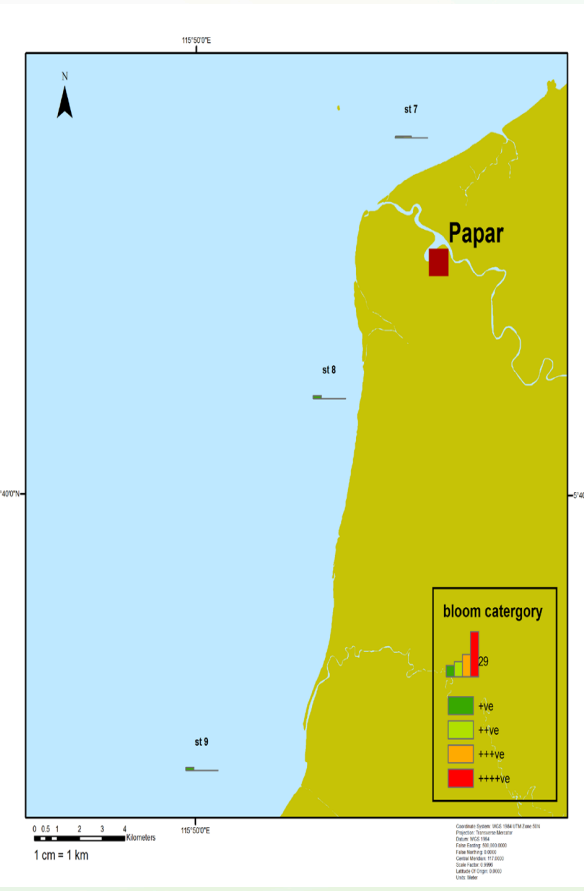
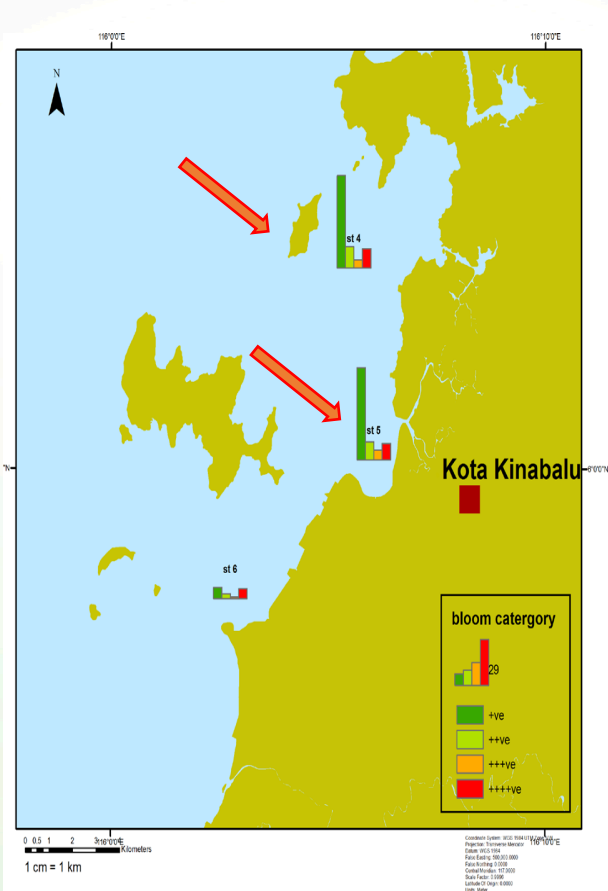
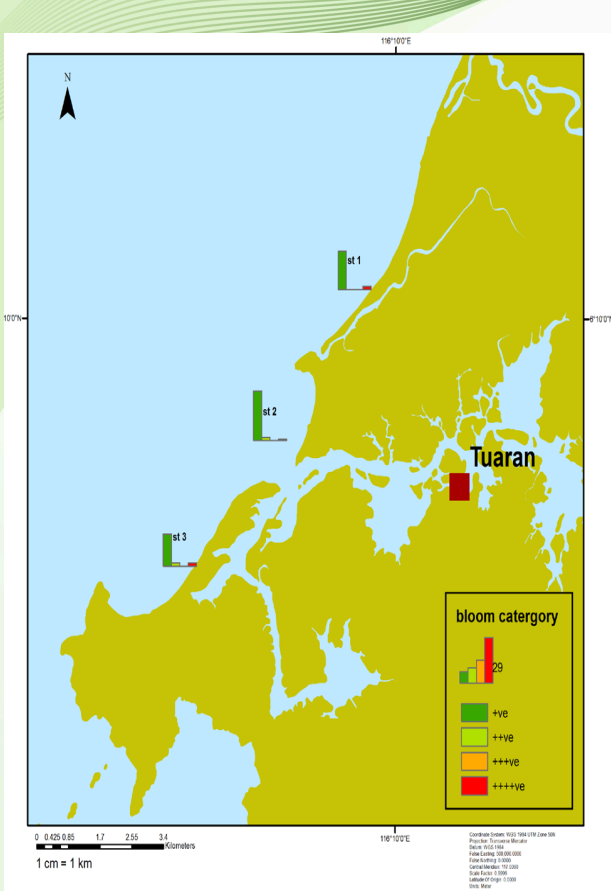
Occurrence of *M. polykrikoides* in Sabah's Coastal Water

A total of twelve monitoring stations by DOF

From 2009 – 2022, Most effected area Sabah coastal areas (red circle)

Aquaculture and resident areas





- Highest occurrence of bloom in Kota Kinabalu in Station 4 and 5
- The stations were located close to one another at a semi-sheltered bay suggested the nutrient effluents from the Likas River and Inanam river contribute to *M. polykrikoides* blooms.



MyRedTides

- An online WebApps using ARCGIS
- Training to the Fisheries Department, Sabah
- To update HABs information particularly the *M. polykrikoides* bloom
- Provide a warning systems on the day of bloom
- Hence, the stakeholder and public could be informed about the



Educational Workshop on the Introduction to ArcGIS for Harmful Algal Bloom (HAB) Data Management

M. NORMAWATY^{1*}, A. ASILAH¹, A. ZUHAIRI¹, M. SHUHADAH²

¹Department of Marine, Kulliyah of Science, International Islamic University Malaysia, Bandar Indera Mahkota, 25200, Kuantan, Pahang, Malaysia

²Department of Fisheries Sabah, 88100, Kota Kinabalu, Sabah, Malaysia

*Corresponding author: normahwaty@iium.edu.my

Introduction

Harmful Algal Blooms (HAB) are a yearly problem in Sabah and are caused by mainly 2 important species viz. *Pyrodinium bahamense* and *Margalefidinium polykrikoides*. Since the first reported HAB occurrence i.e. in 1976, the Department of Fisheries Sabah has conducted a monthly environmental monitoring program. However, data collected are not fully analyzed and shared efficiently with the respective shareholders and communities. Therefore, an educational workshop was conducted to train the Fisheries staff to manage and present data collected in a more efficient and informative way using ArcGIS. ArcGIS allows the development of a visual public information map, data can be presented faster and easier facilitating better community engagement and understanding. The workshop was held from 26th July to 28th July 2021 using an online virtual format due to COVID-19 restrictions. This informative event was attended by staff from the Department of Fisheries, Sabah, Fisheries Research Institute, Penang, and students from Department of Marine Science. A total of 17 participants attended the educational workshop.

Organization

The workshop has been organized by the Department of Marine Science, Kulliyah of Science, International Islamic University Malaysia.



Figure 1 Participants during the workshop



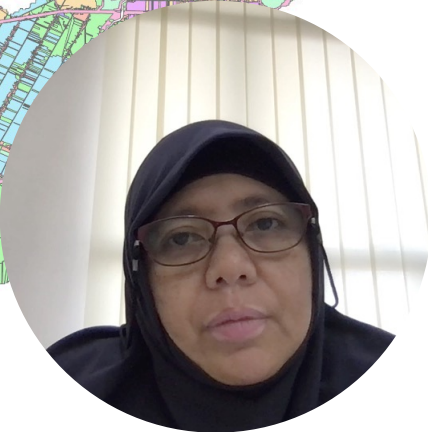
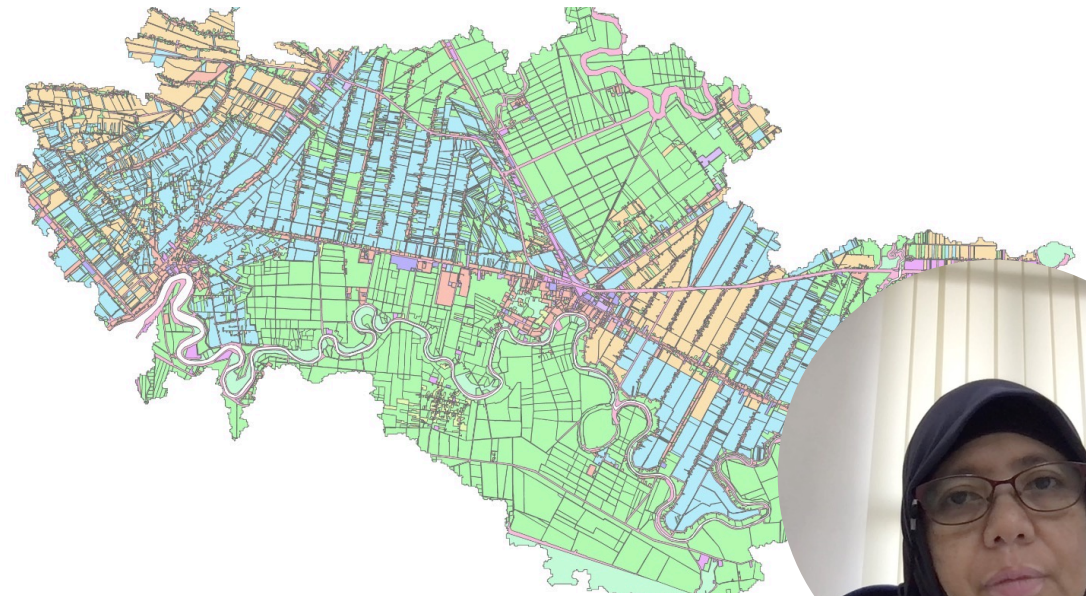
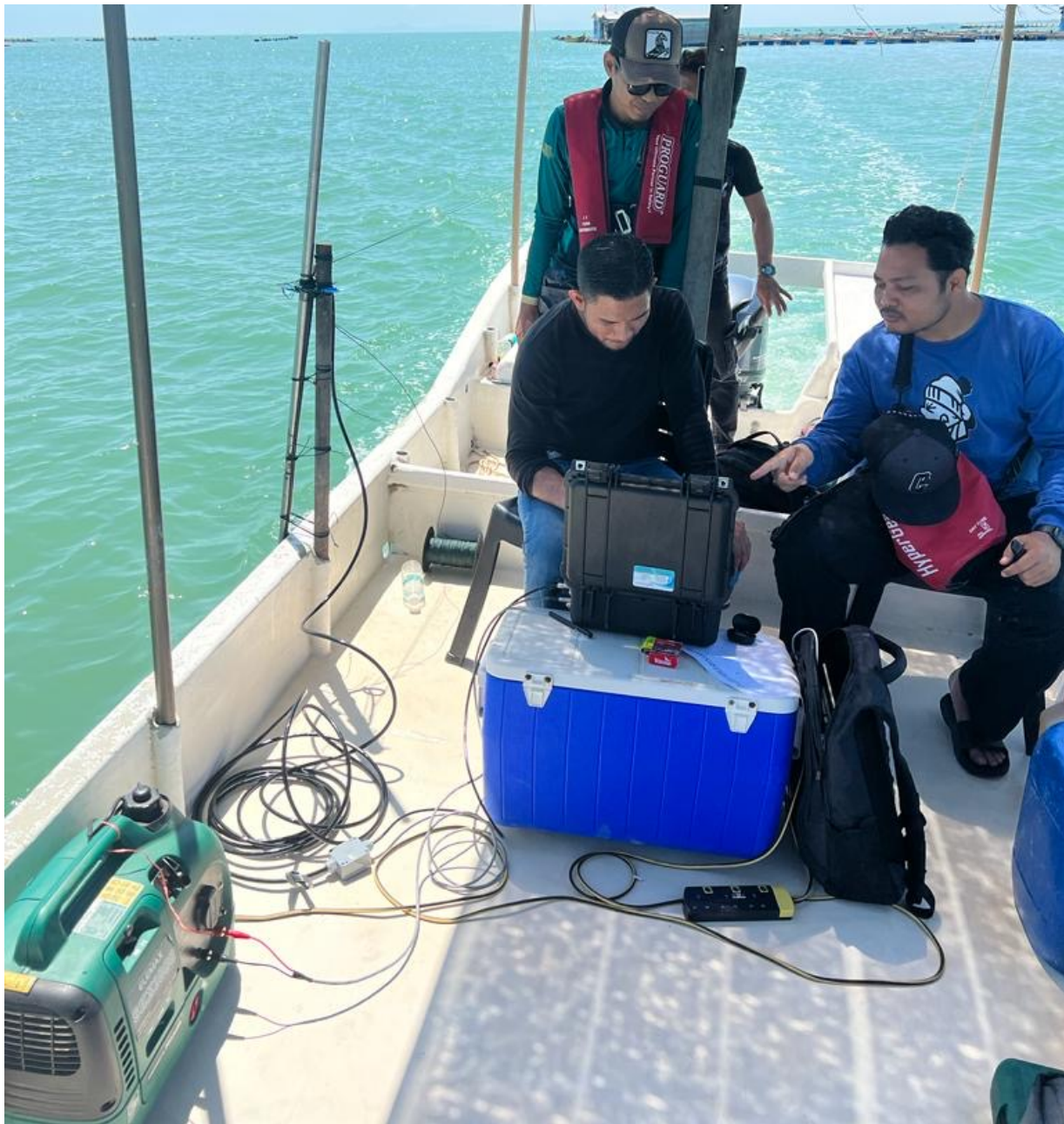
M. Polykrikoides blooms in Peninsular Malaysia

- First reported in Tanjung Piandang, Kuala Kurau and Kuala Gula located in Perak coastal waters and Straits of Tebrau, Johor in 2013 (Harun et al., 2015)
- Bloom in 2020 cause massive death fish caged
- RM 11 million (Roziawati et al., 2020)
- Monitor by the Fisheries Research Institutes (FRI), Penang
- Collaboration with IIUM to develop an **Early Warning System (EWS) for HAB**
- As effective way to share current information about HAB to the stakeholders



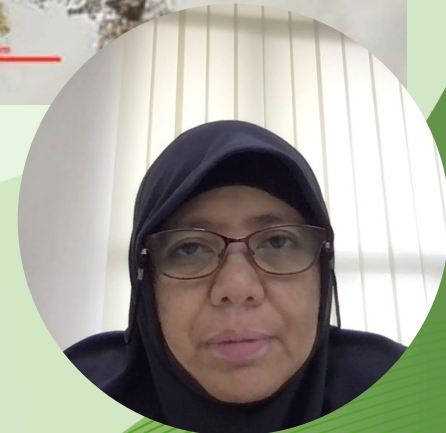
Death fish from fish cage Sungai Kerian (Roziawati et al., 2020)





Application of chitosan-silica film for mitigation of HAB (Iqbal et al., 2019)

- Develop an environmental friendly way to mitigate HAB
- *Alexandrium tamiyavanichii*
- Capture, mitigate and flocculate the cells via electrostatic attraction
- Suitable because of its biodegradable and cost effective



Conclusion

Blooms of *Margalefidinium polykrikoides*, a fish killer cause losses to the aquaculture industry and will impact food security. Hence, monitoring and mitigation of this HABs is important to minimize the impact and conserve the marine environment for future generation.



Thank you

