Toxic benthic microalgae in the South Pacific

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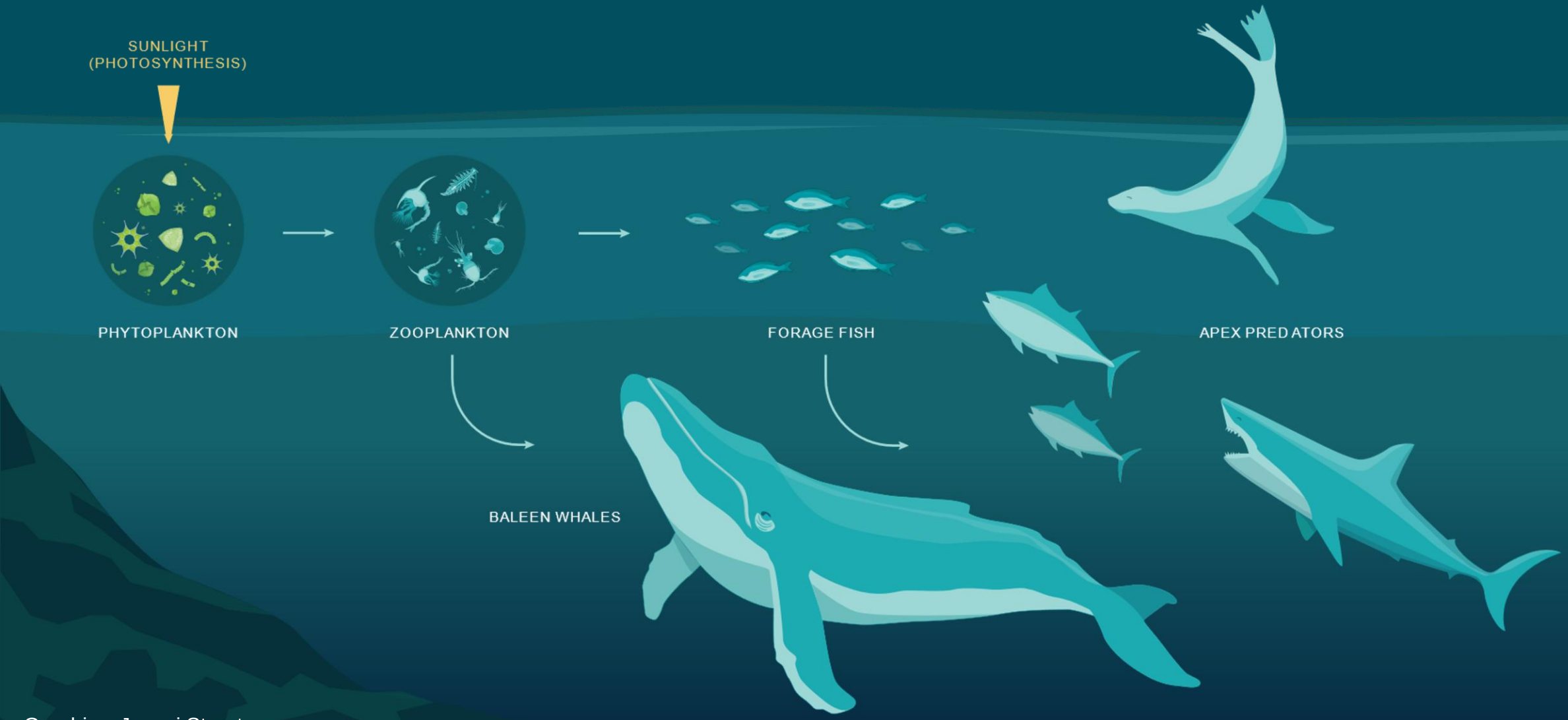
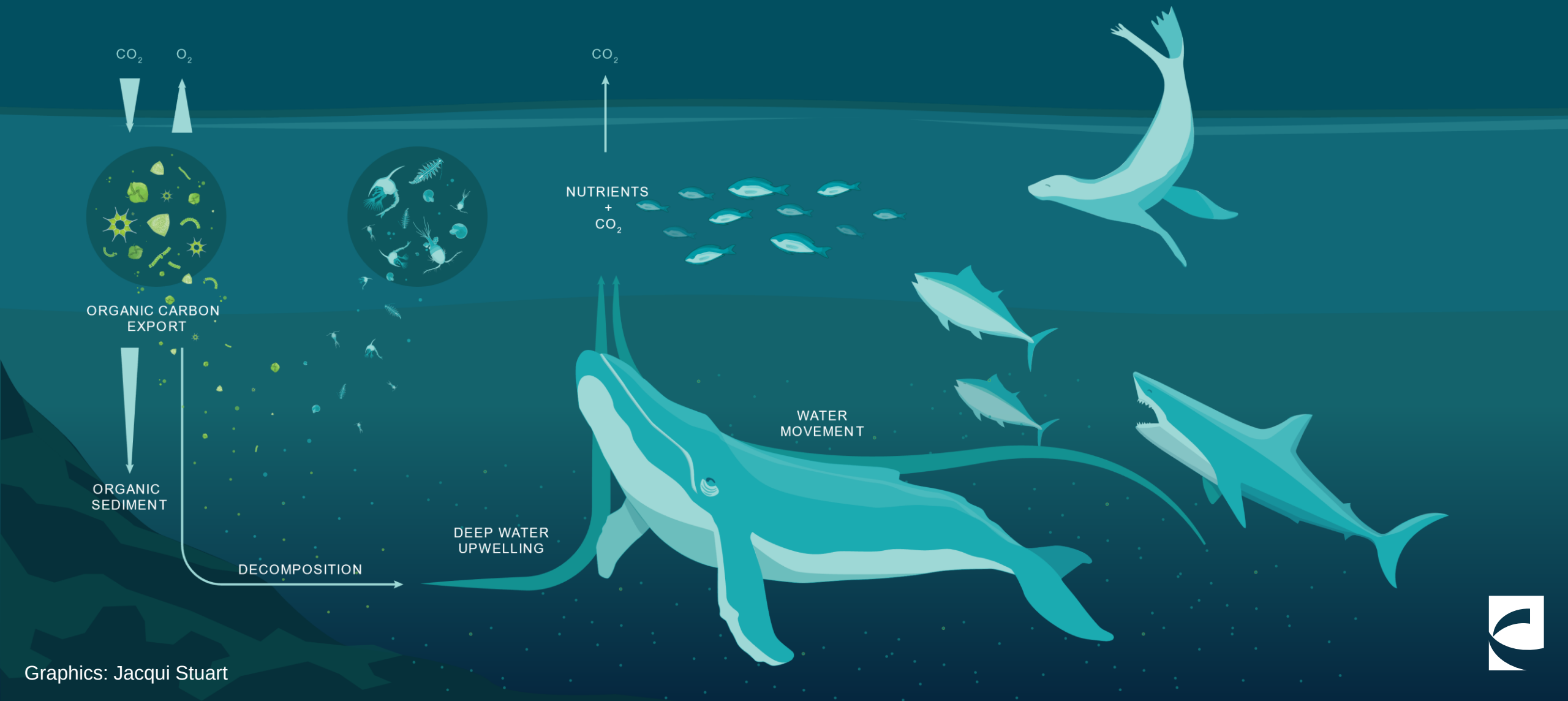
CAWTHRON

- Microalgae are microscopic (<2 µm to 200 µm) photosynthetic plants
- Play a critical role in marine and freshwater ecosystems
- At the bottom of the food chain and essentially feed the ocean



Graphics: Jacqui Stuart

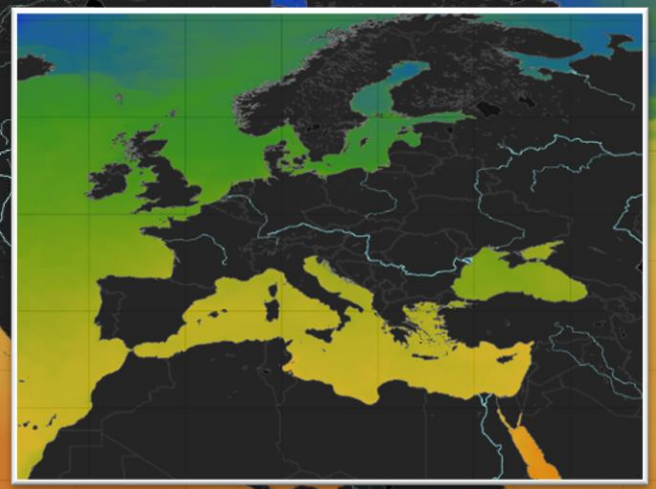
Carbon sequestering & atmospheric oxygen production

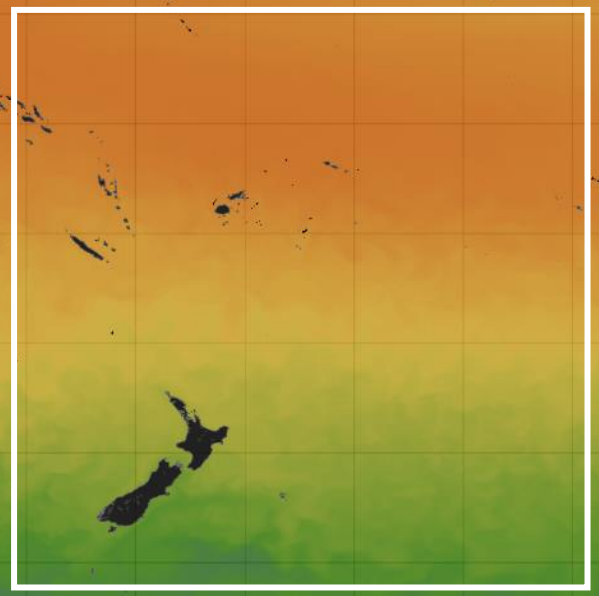


Graphics: Jacqui Stuart

Pacific ocean surface temperature

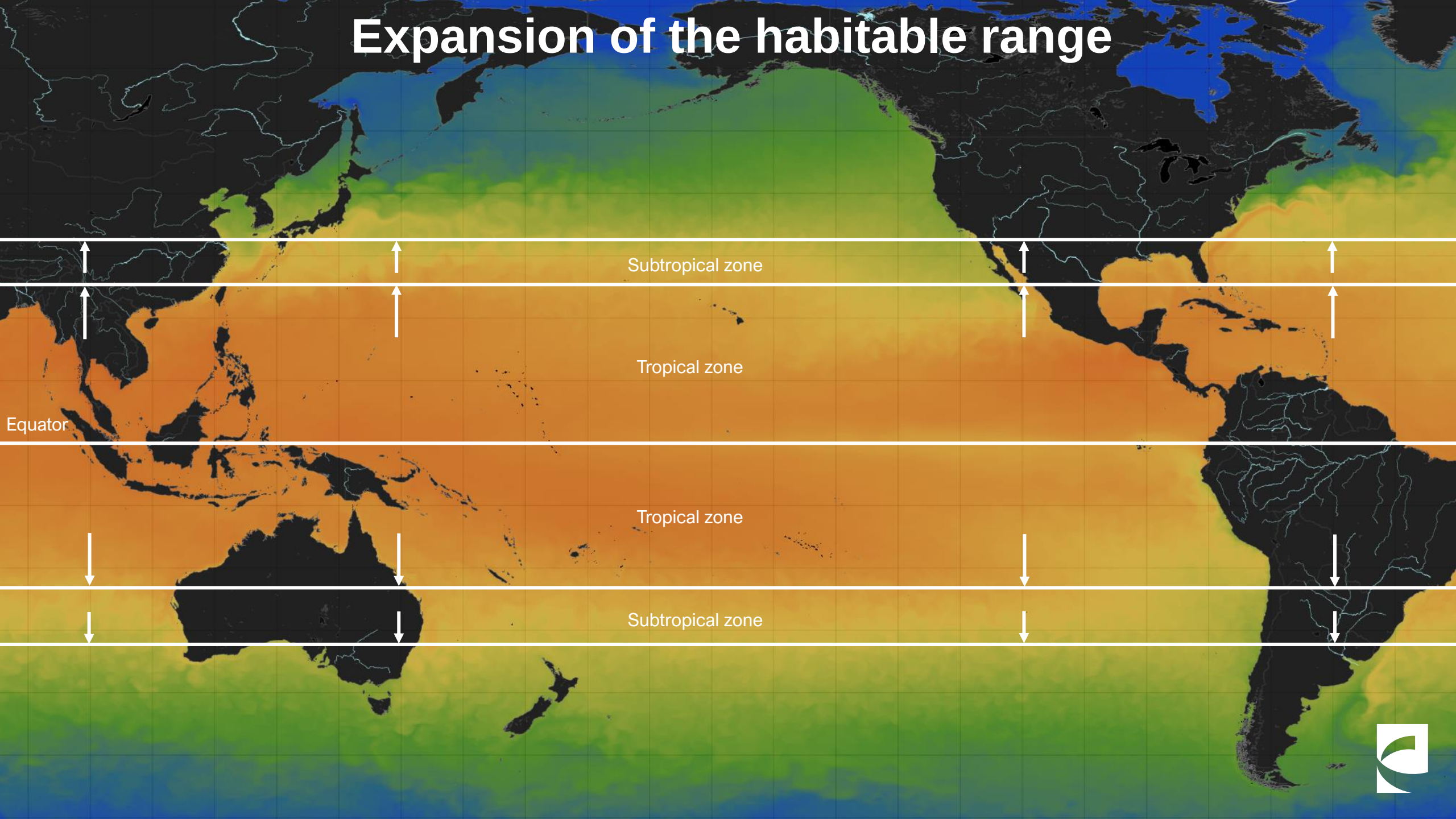
Global **O**cean **R**eanaly**s**es and **S**imulations (**GLORYS**)
1993 – 2020 (Monthly, 0.083° resolution)



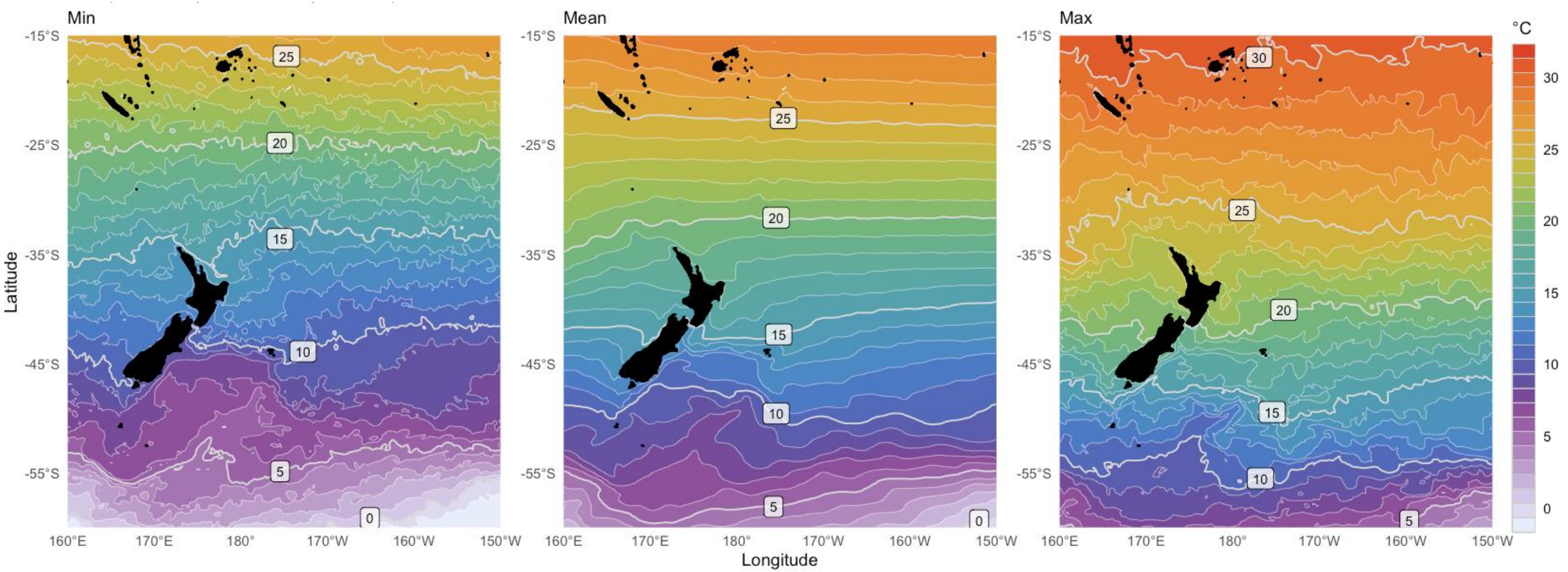


www.mercator-ocean.eu

Expansion of the habitable range

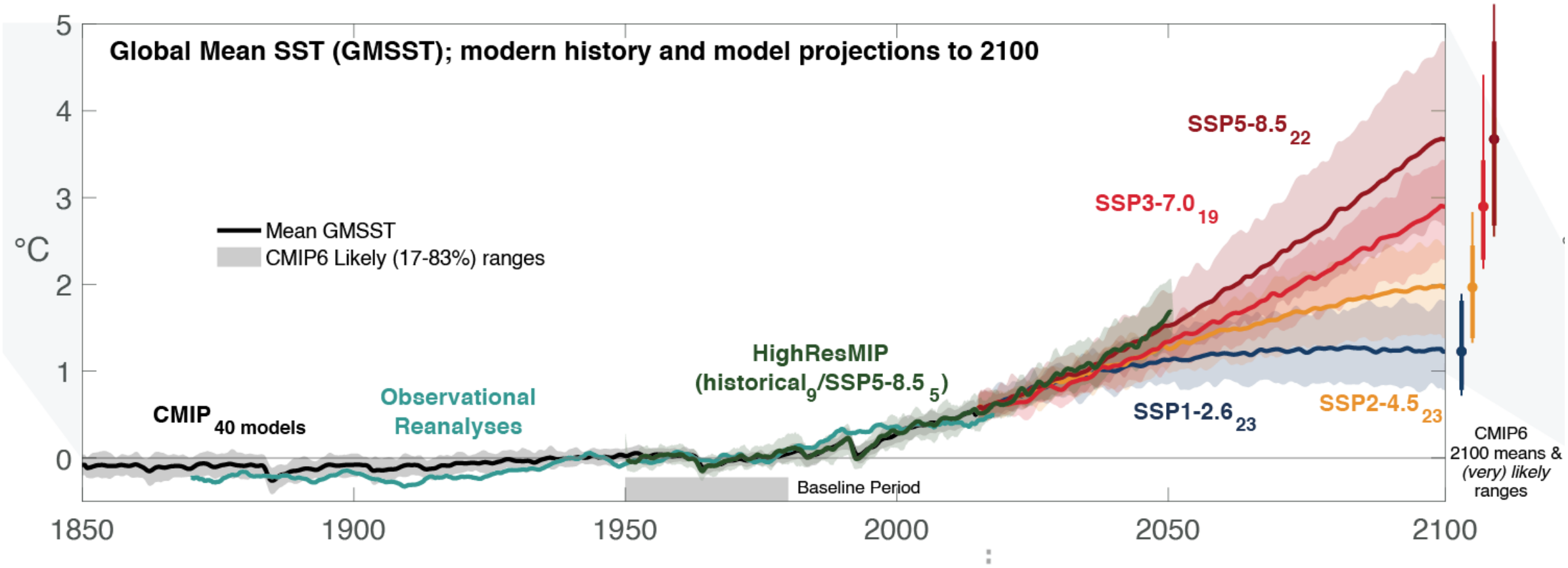


Temperature (1993 – 2020): 0m Depth

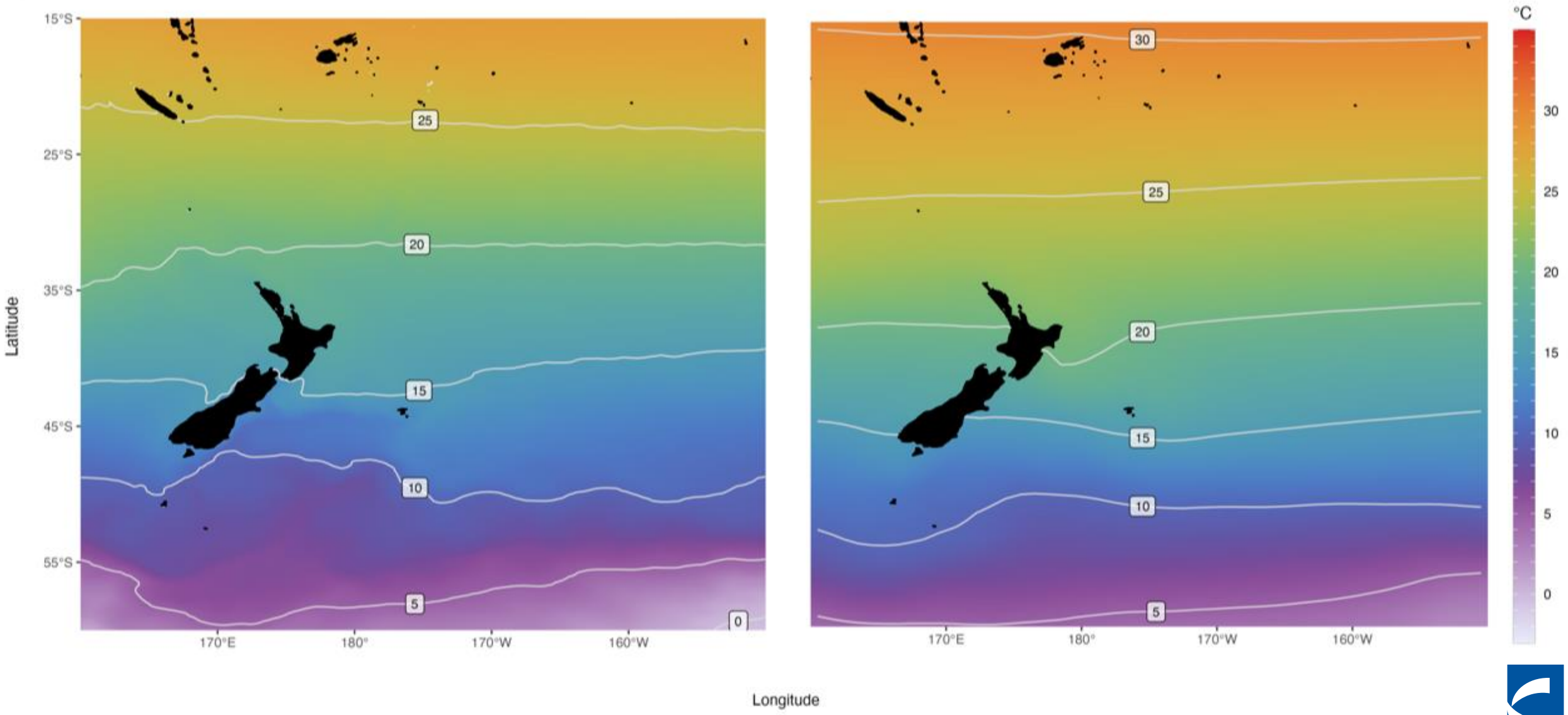


Data modelling: Dr Dana Briscoe

Global sea surface temperature change (IPCC 2019)

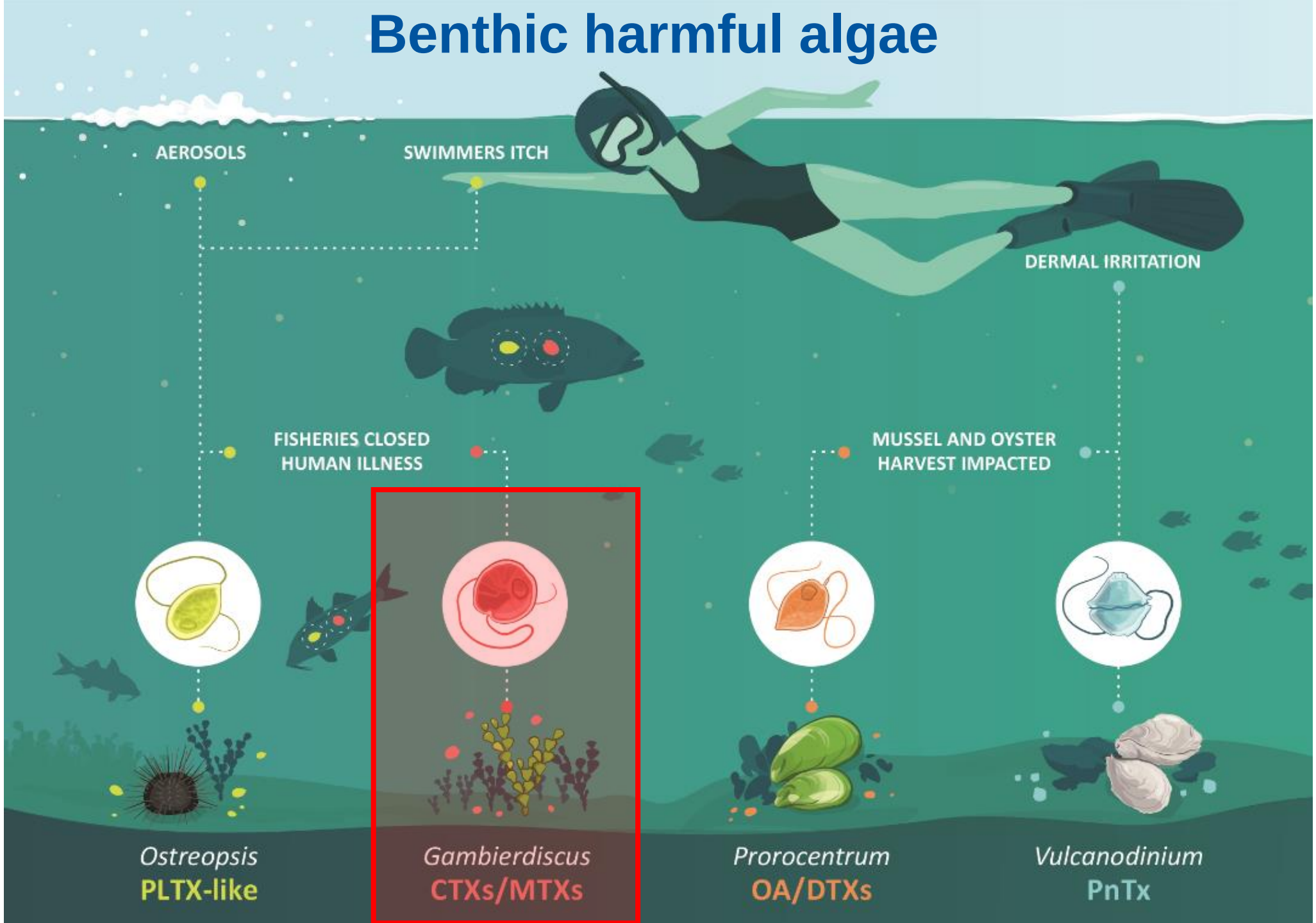


Predicted Temperature based on RCP 8.5: 0m Depth



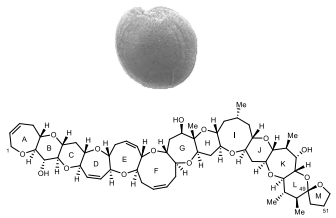
Data modelling: Dr Dana Briscoe

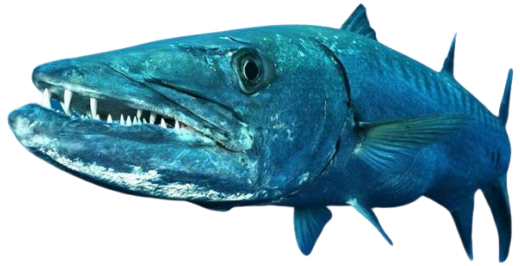
Benthic harmful algae

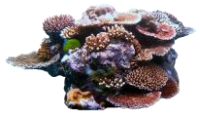


Graphics: Jacqui Stuart

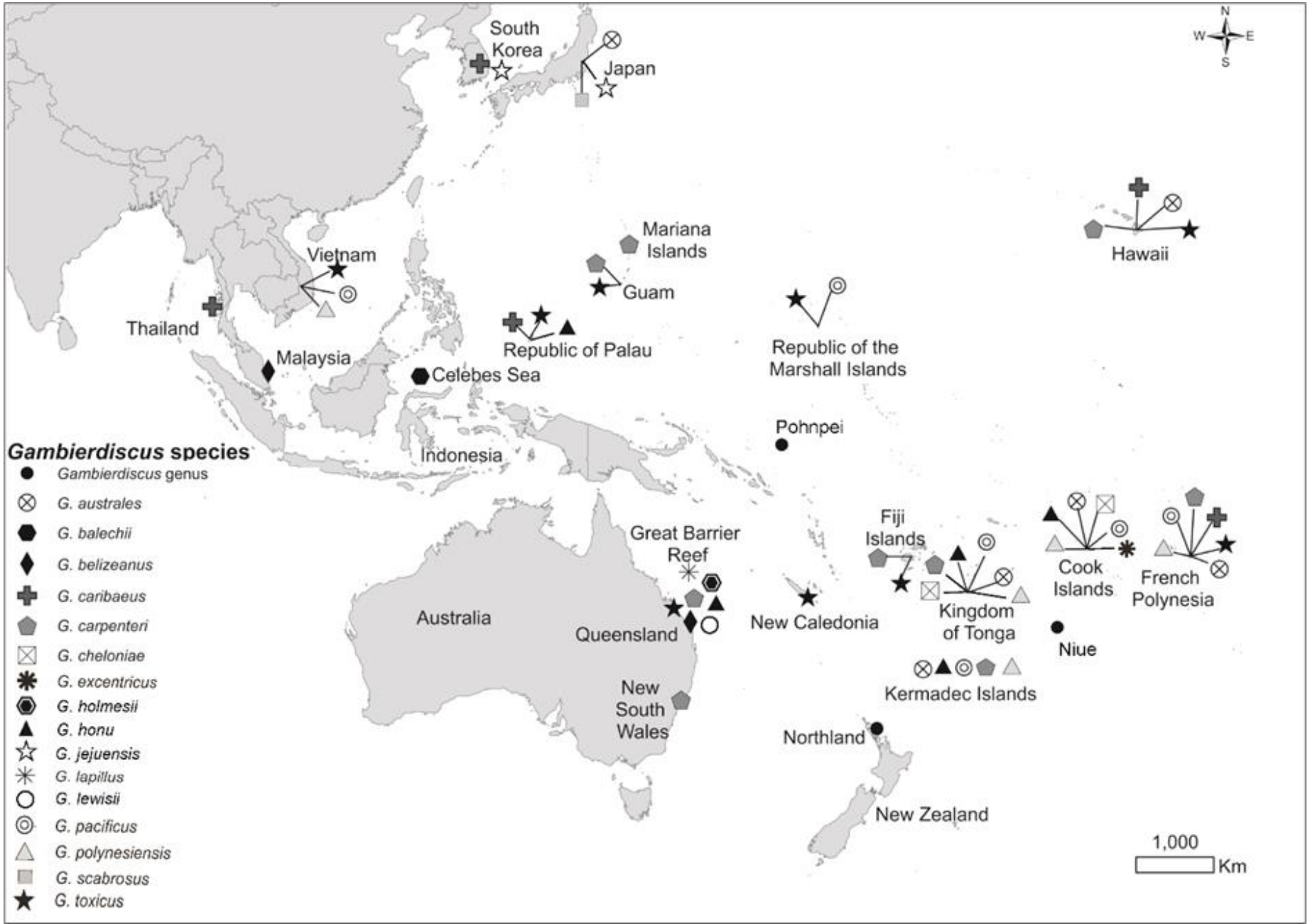
Ciguatera poisoning





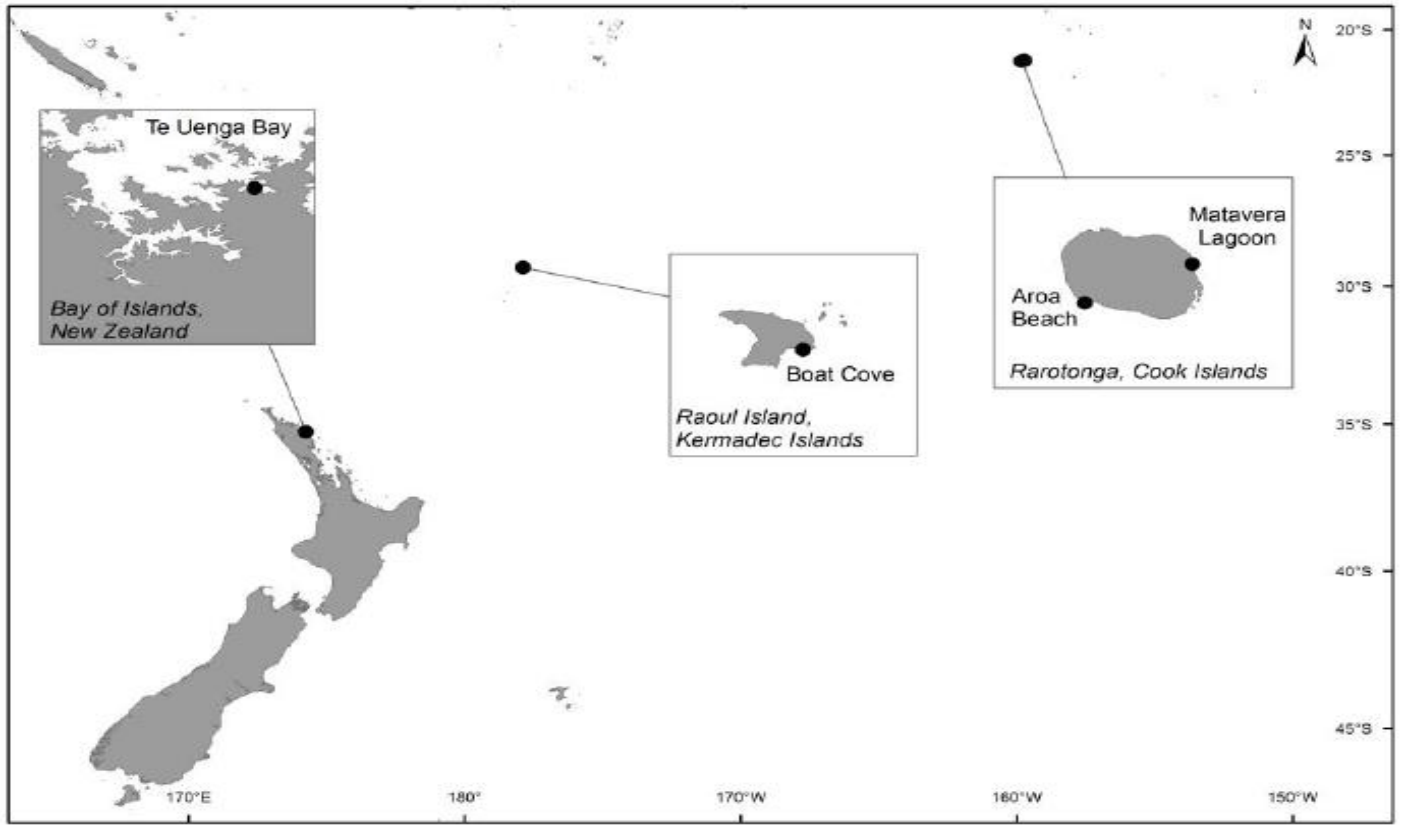


Gambierdiscus distribution in the South Pacific

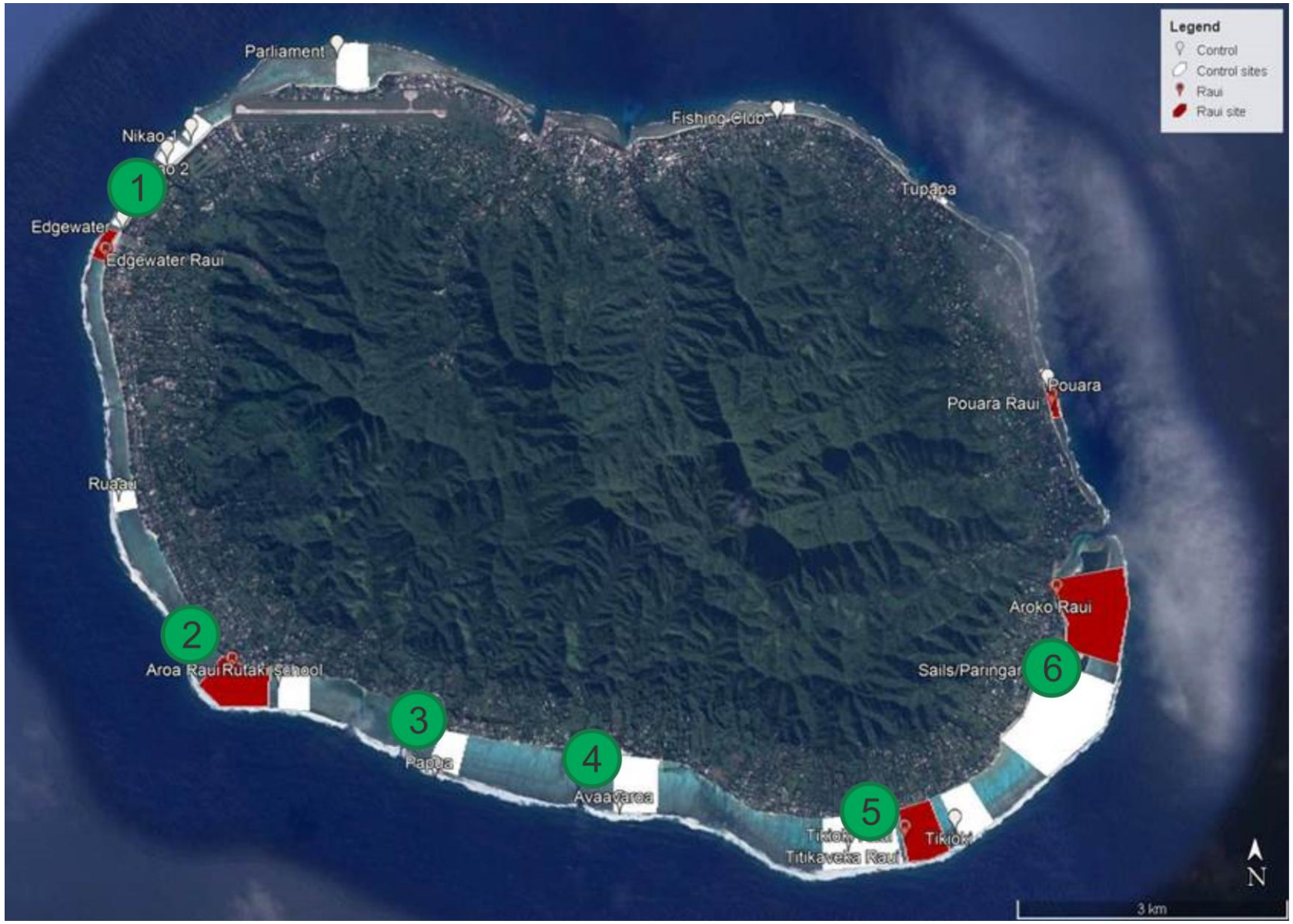


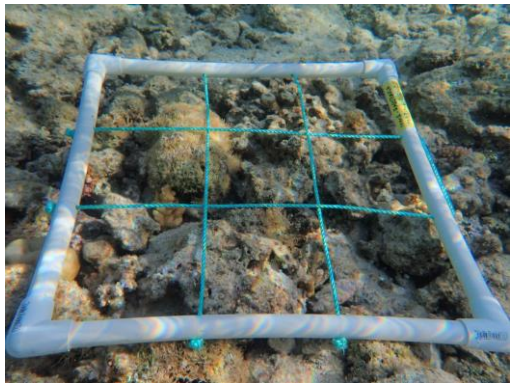
Rhodes *et al*., 2020

Research expeditions

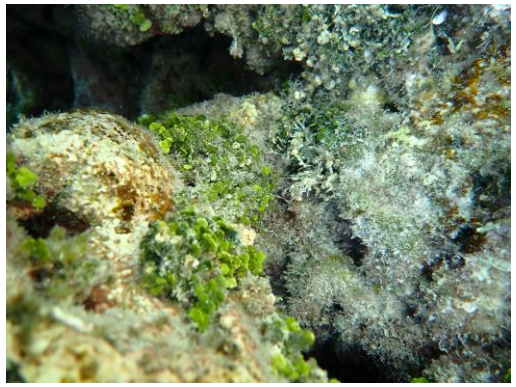


Rarotonga, Cook Islands





Benthic surveys

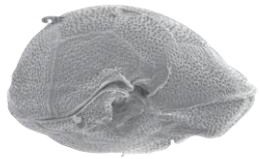


Substrate sampling

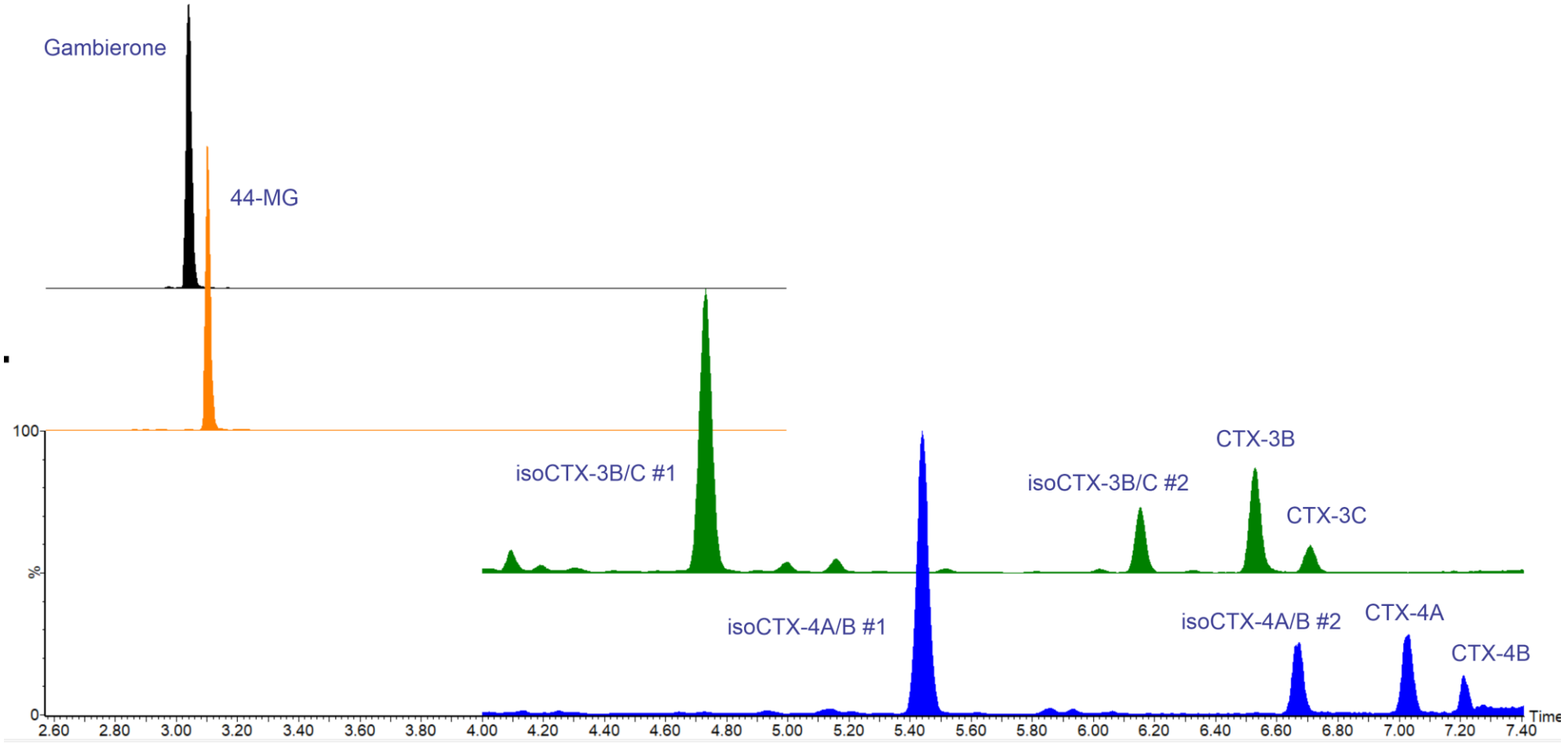
In-situ field devices

Marine specimens

Gambierdiscus polynesiensis

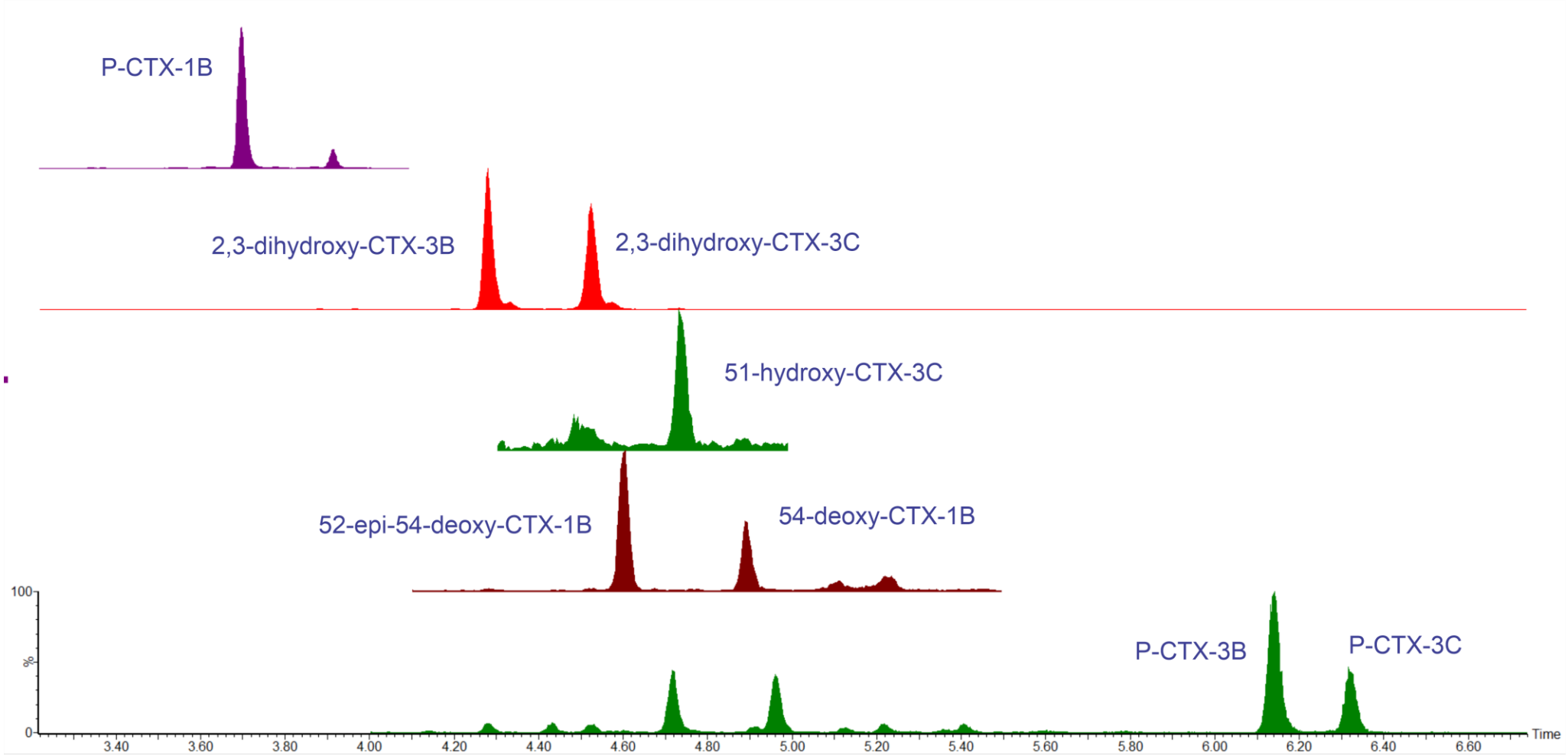


G. Polynesiensis CAWD212
(Rhodes *et al*., 2014)

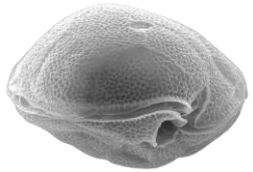


LC-MS/MS method

Murray *et al*., 2018



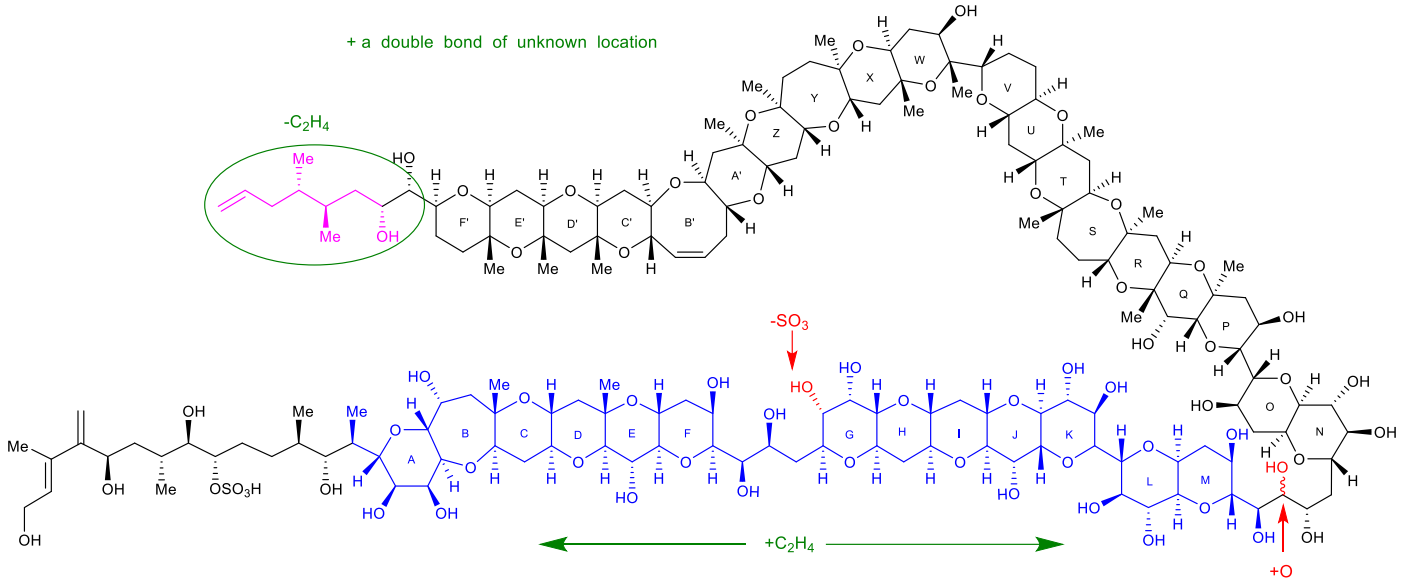
Novel species and metabolites

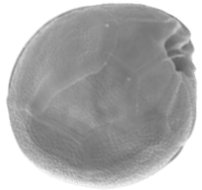


G. cheloniae CAWD232

(Smith *et al*., 2016)

Maitotoxin-6

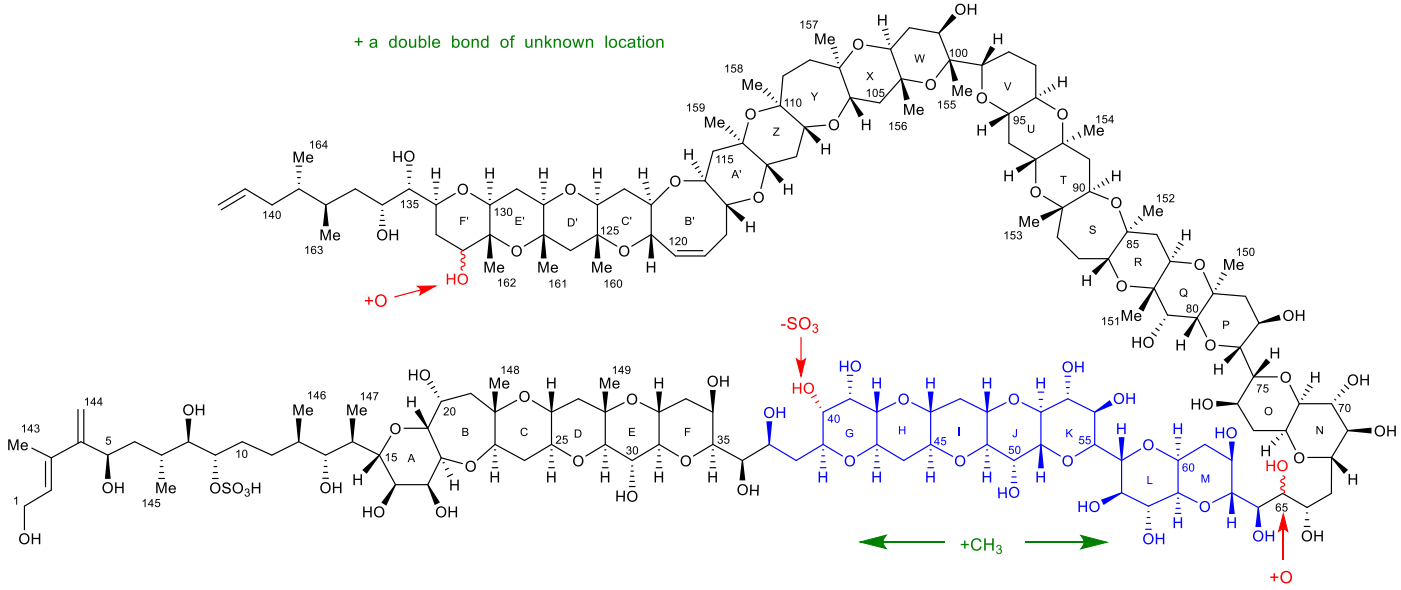




G. honu CAWD242

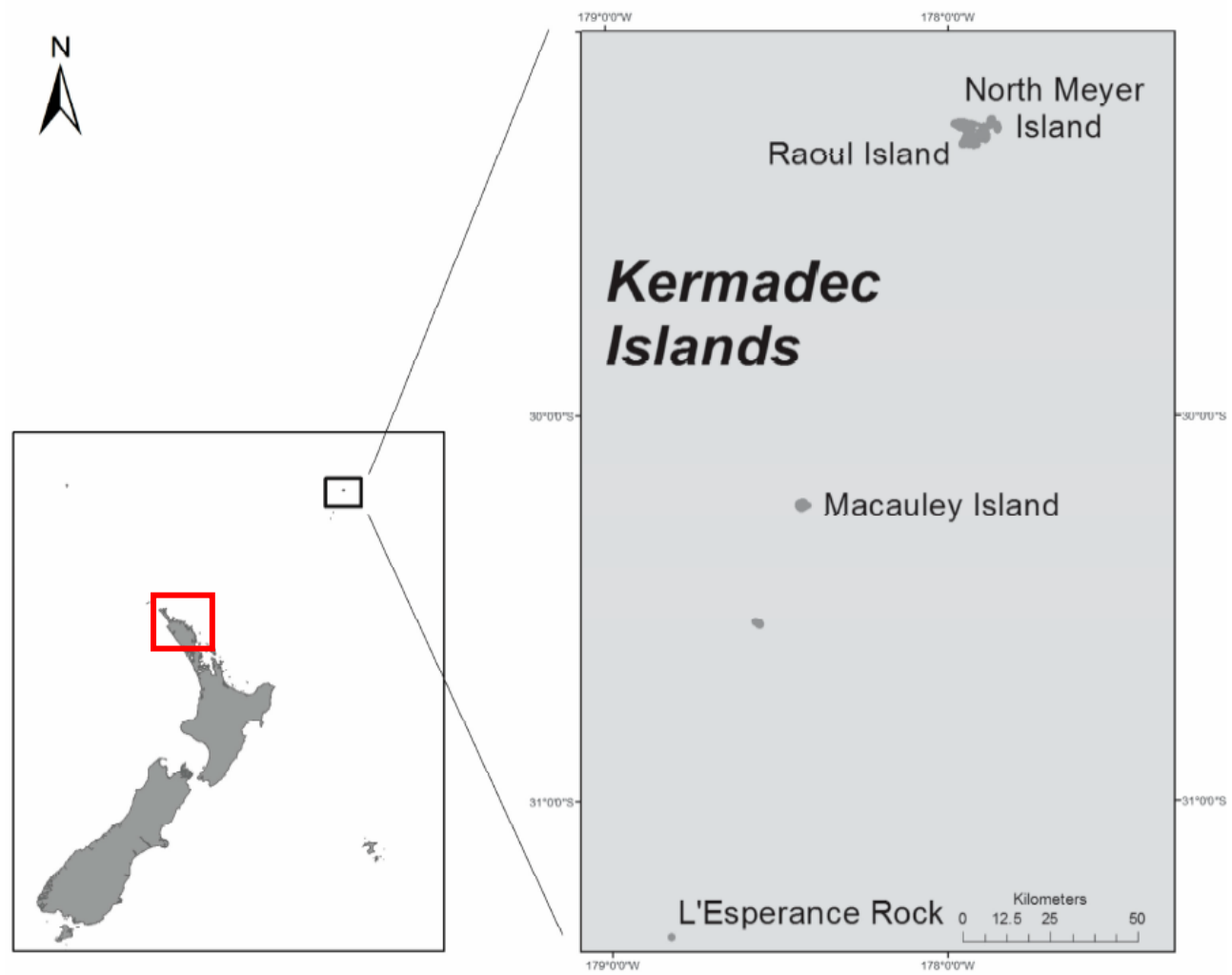
(Rhodes *et al*., 2017)

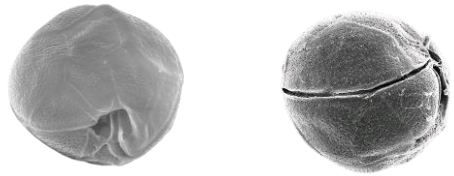
Maitotoxin-7



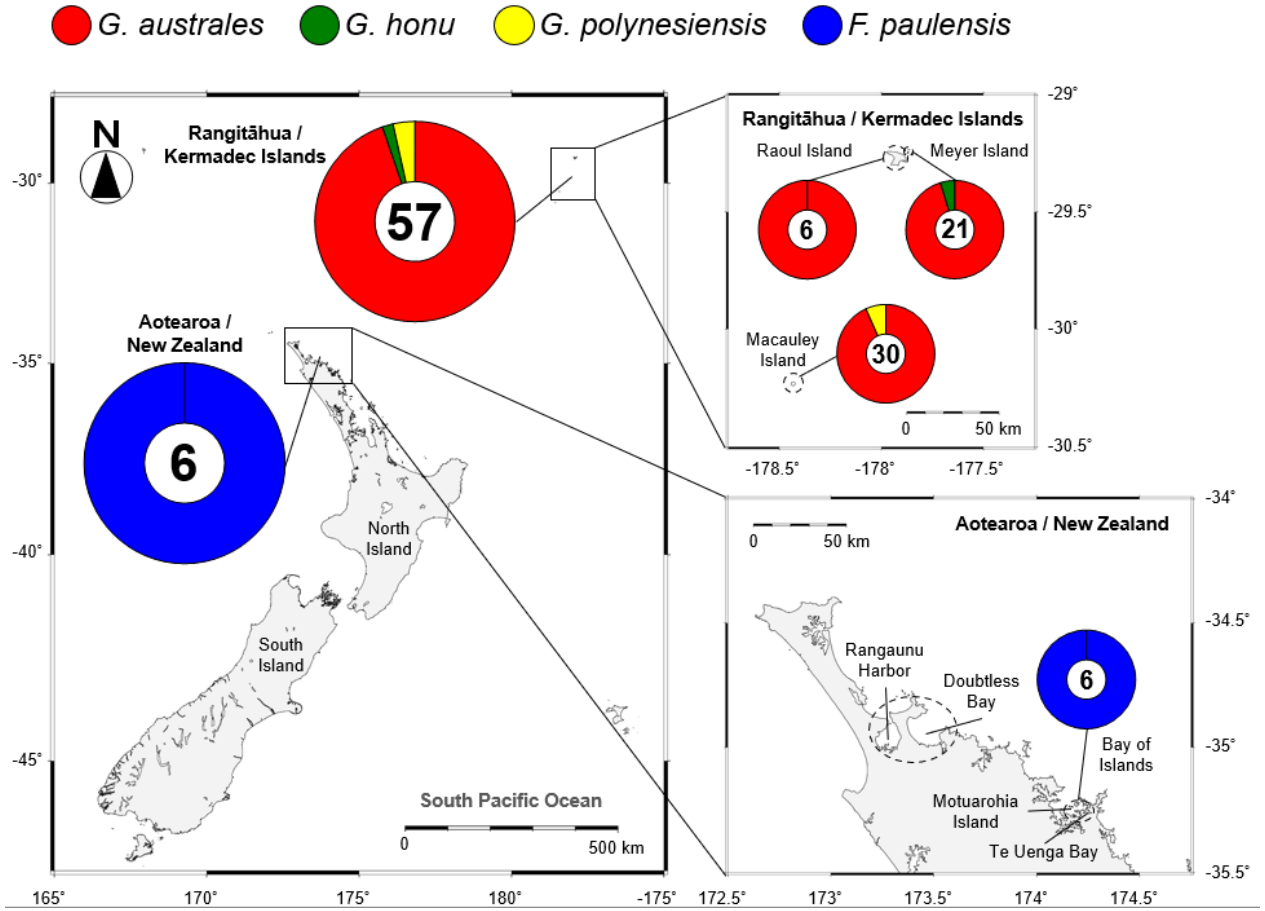
Maitotoxins (Murray *et al*., 2022)

Kermadec Islands and Northland



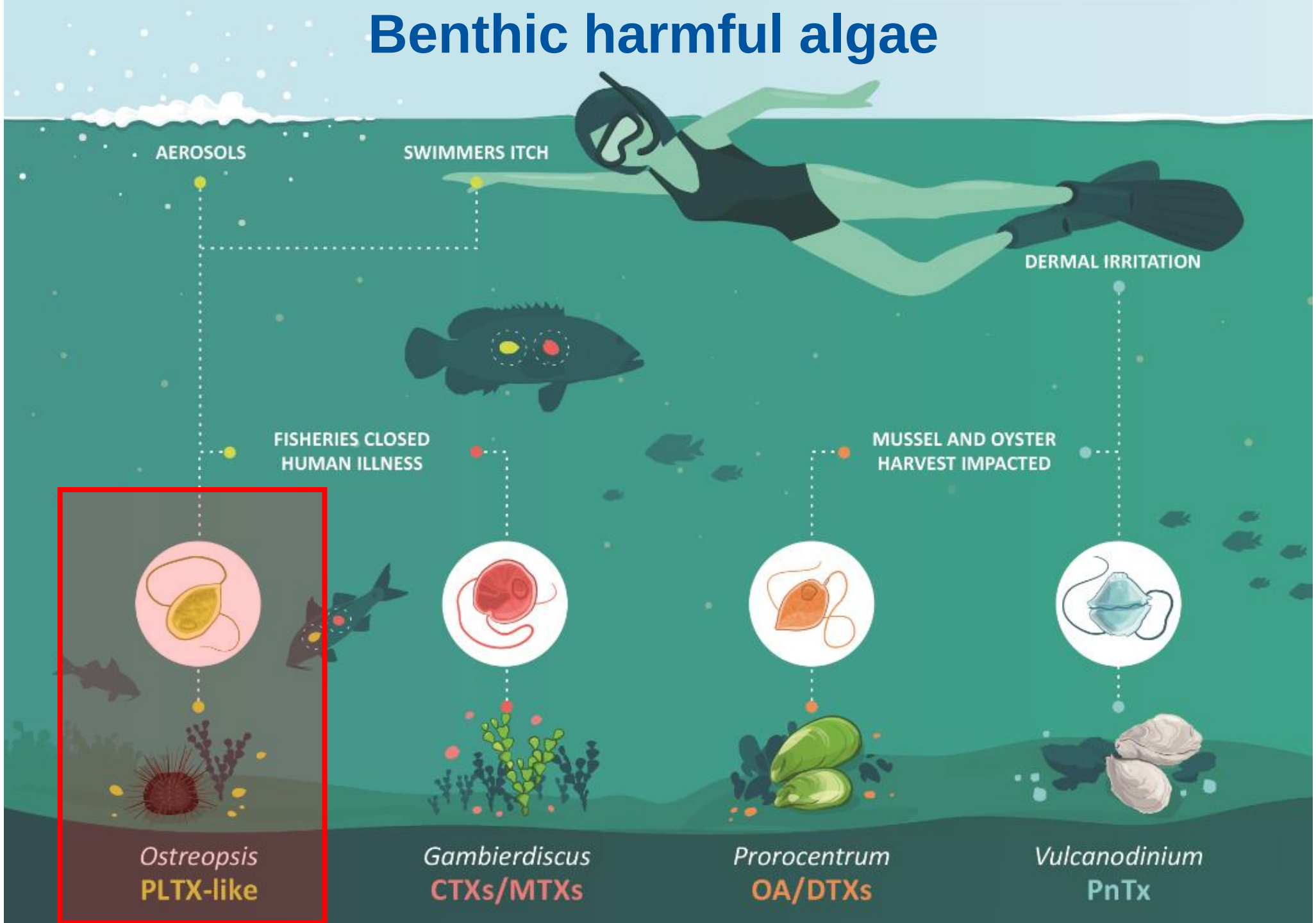


Gambierdiscus and *Fukuyoa*



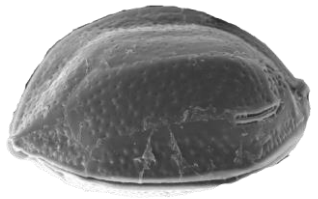
Rhodes *et al.*, 2020

Benthic harmful algae

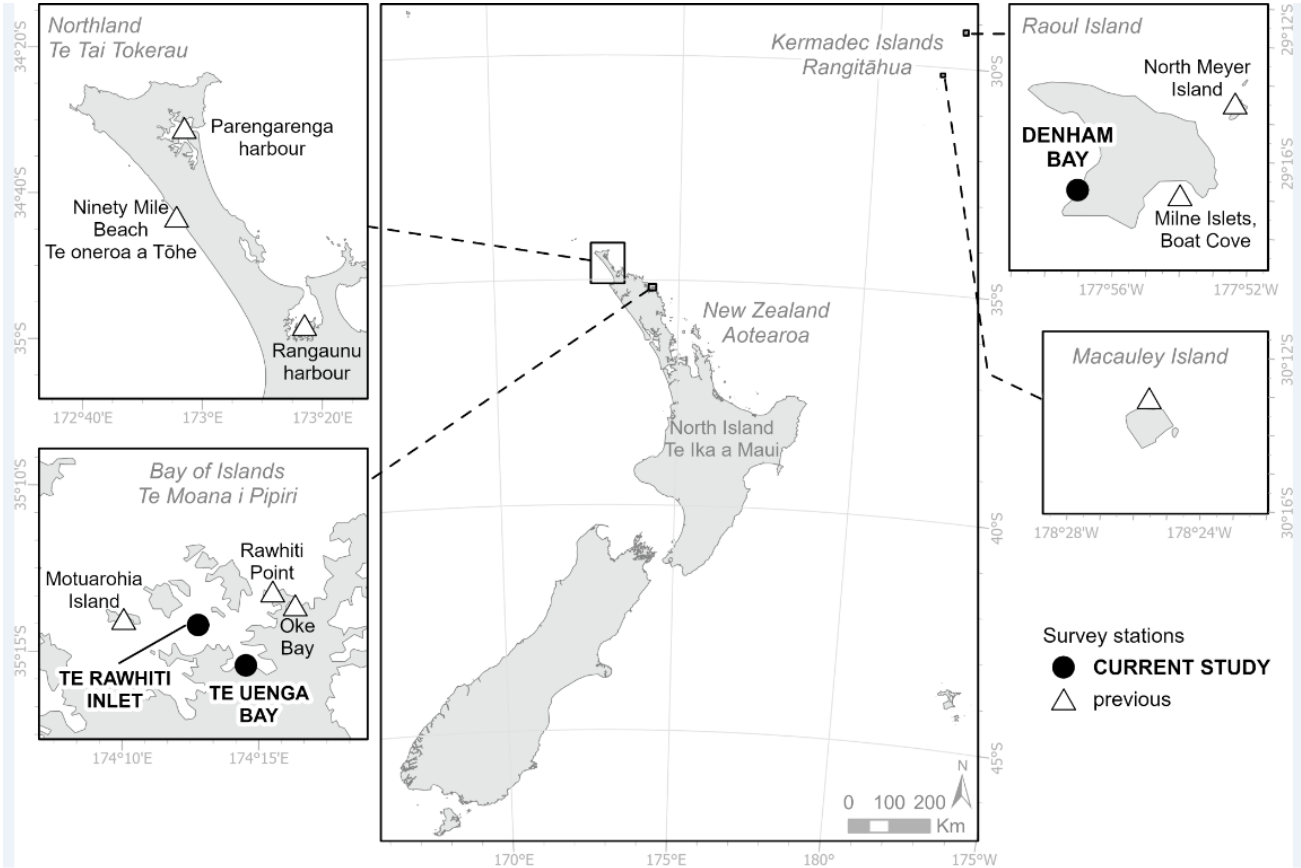


Graphics: Jacqui Stuart

Northland, New Zealand

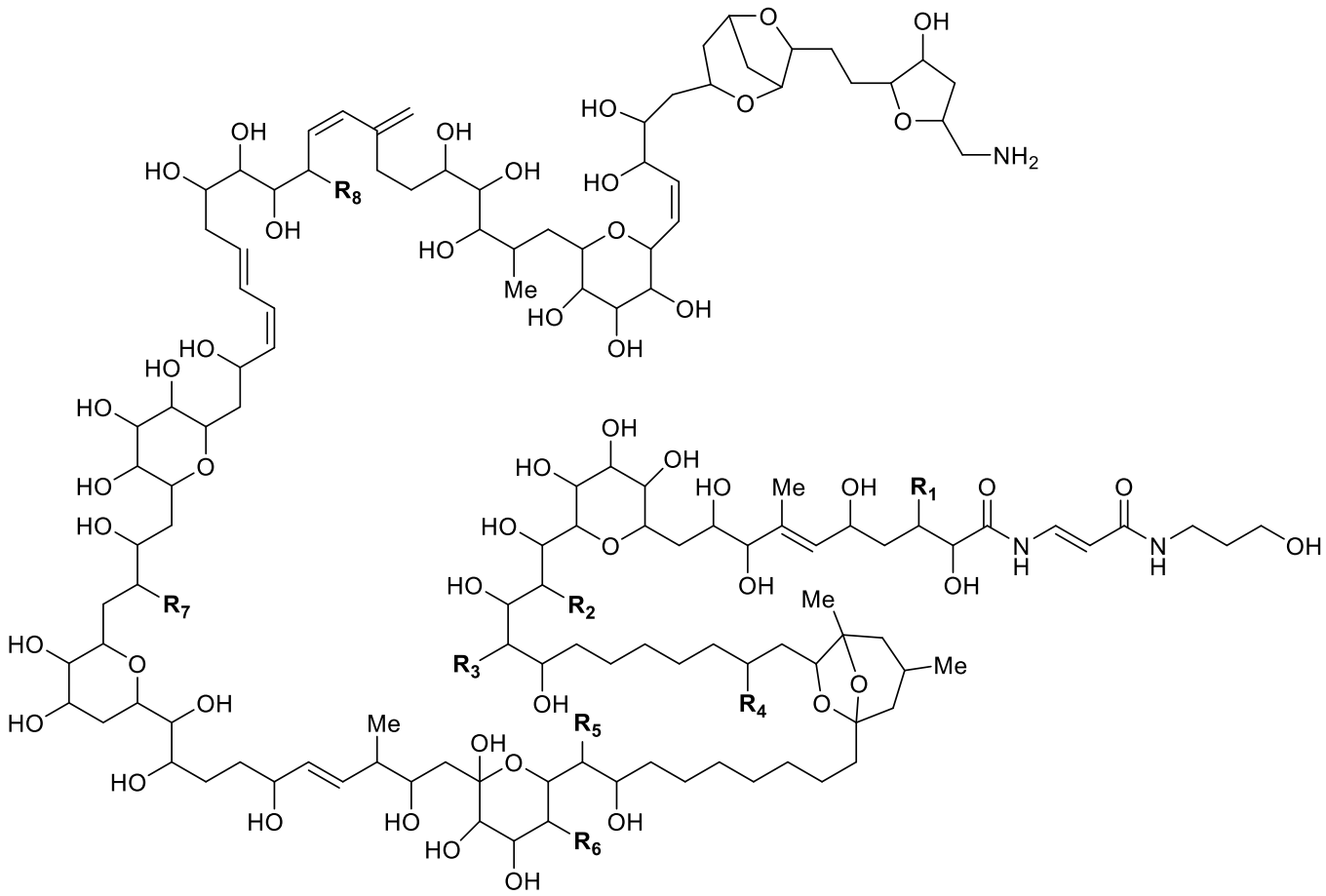


Ostreopsis

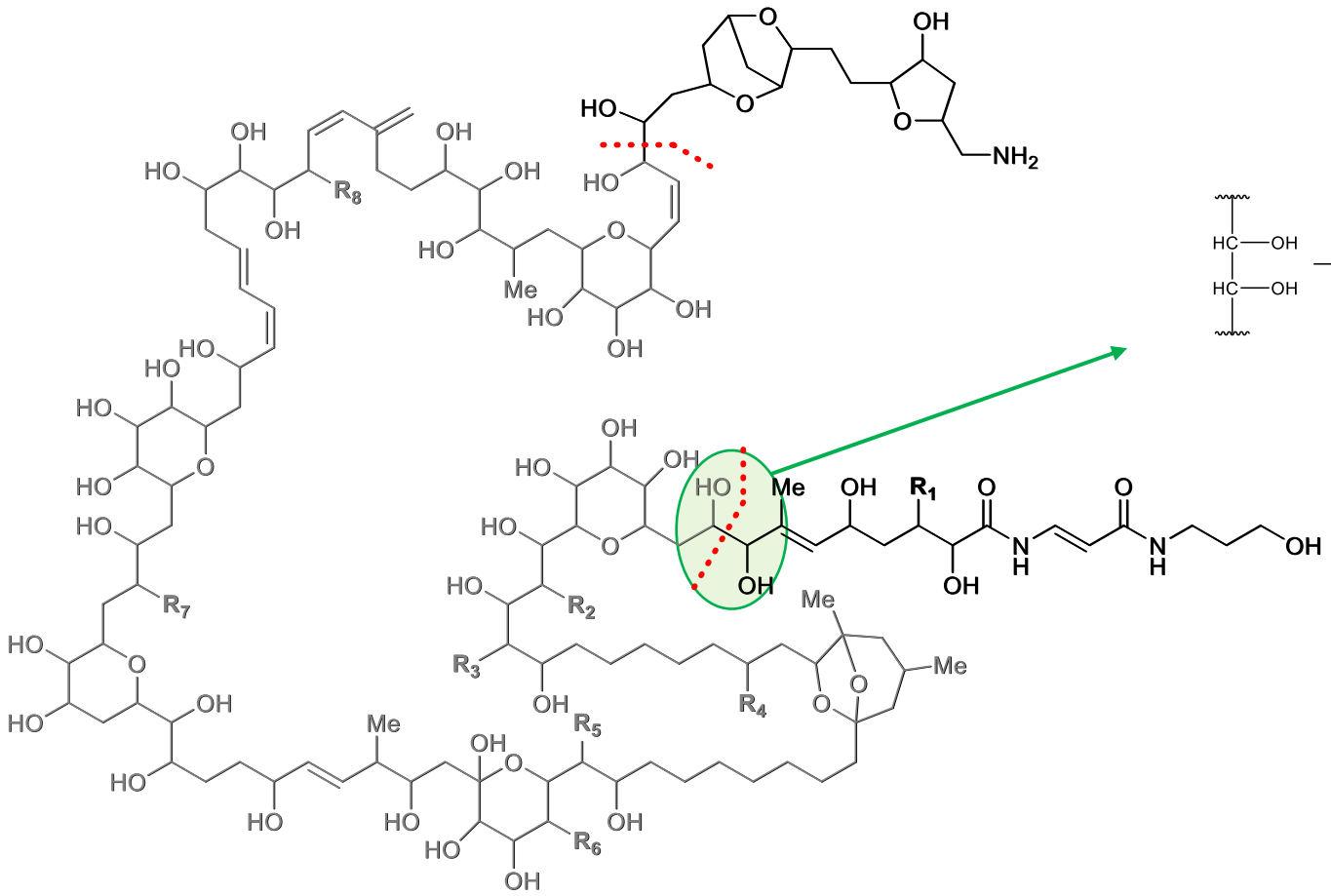


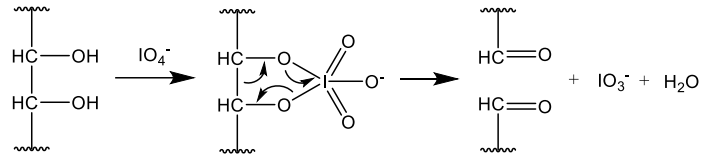
Rhodes *et al*., 2023

Analytical method – oxidative cleavage

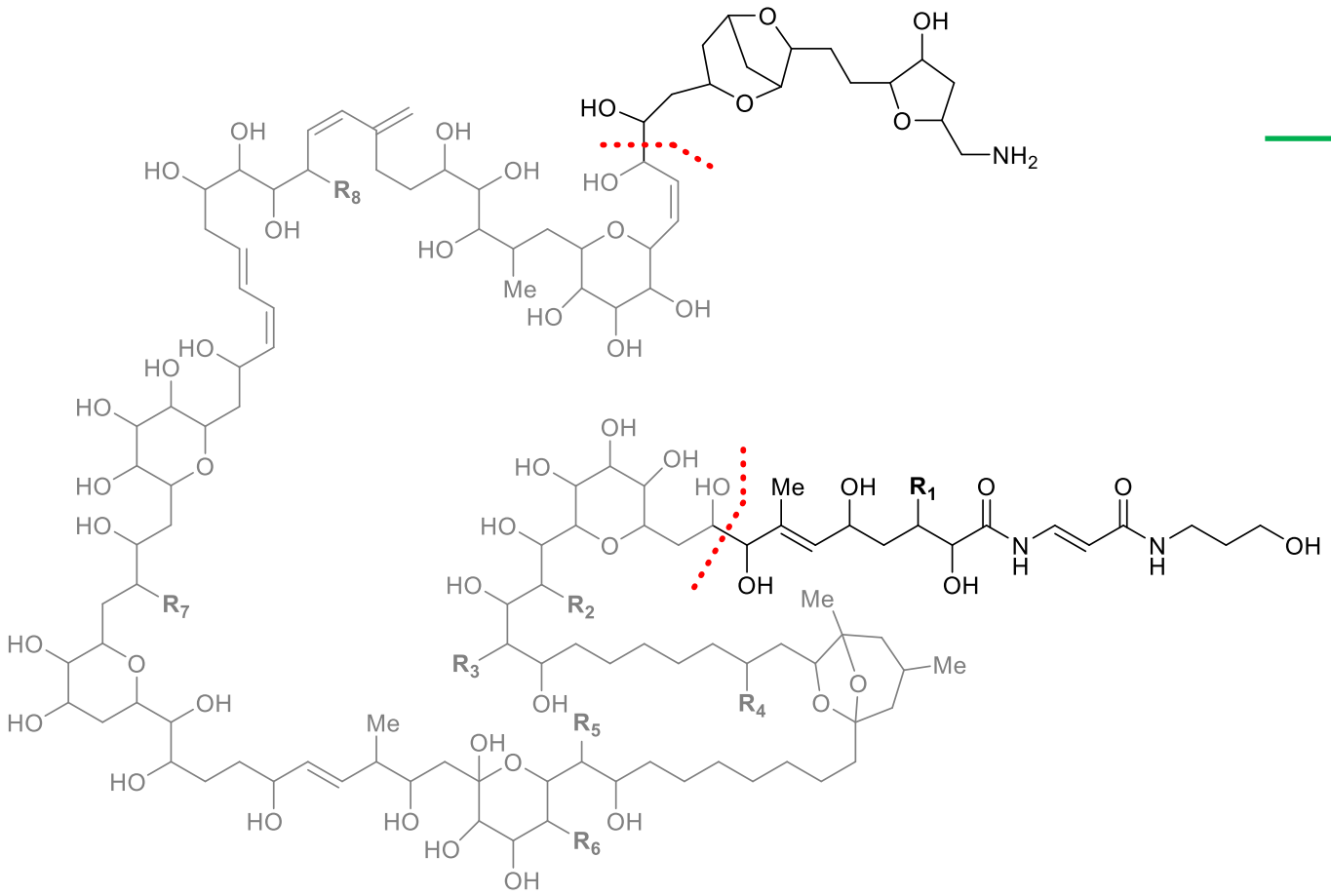


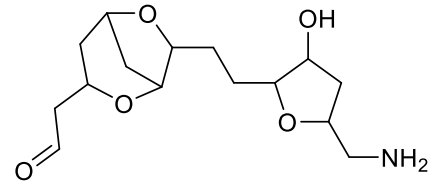
Analytical method – oxidative cleavage



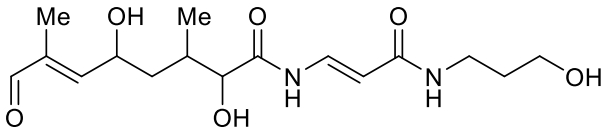


Analytical method – oxidative cleavage

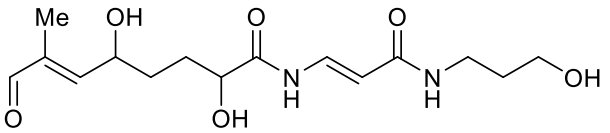




Common - PLTXs, OVTXs, OSTs



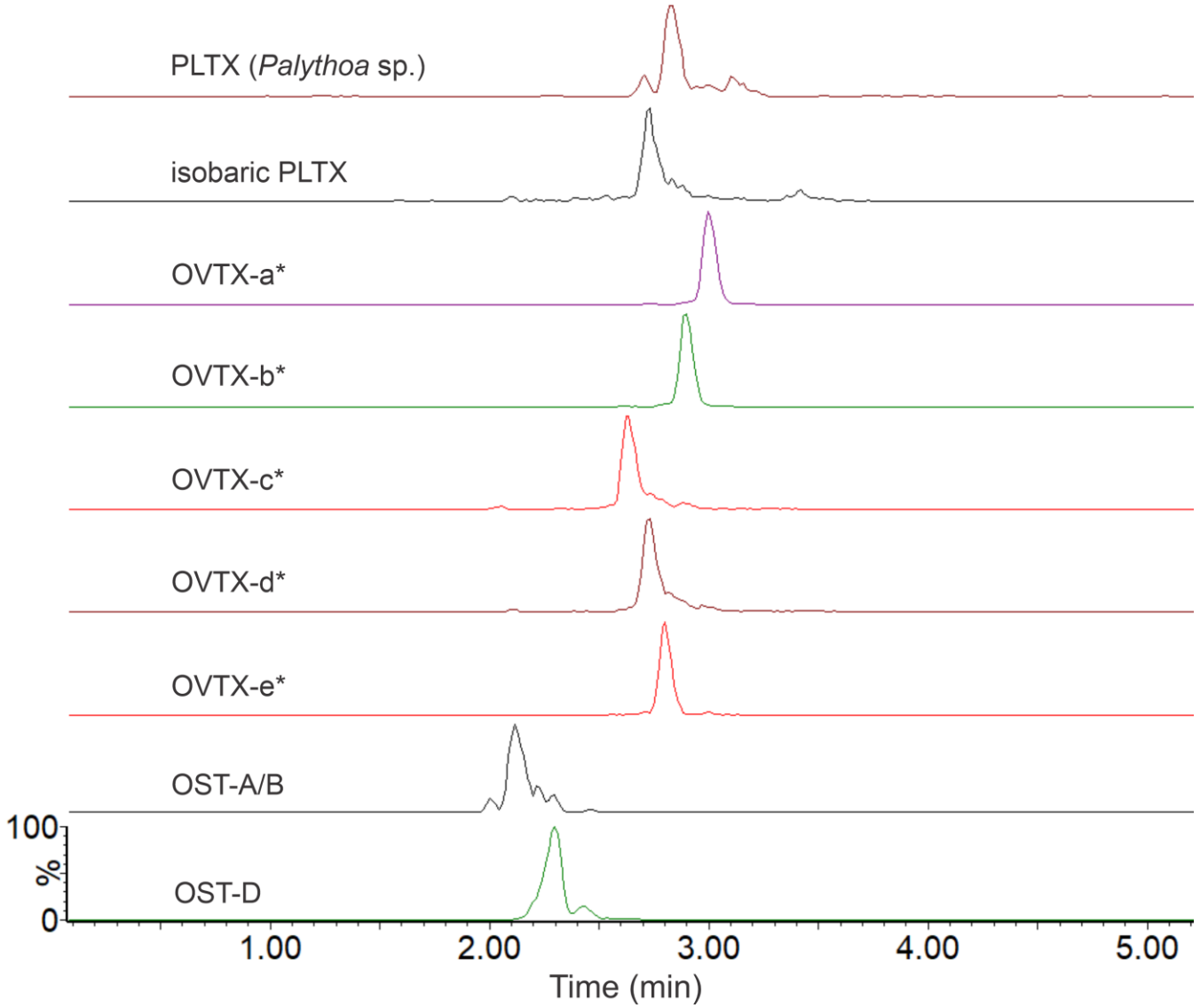
PLTXs, OVTXs



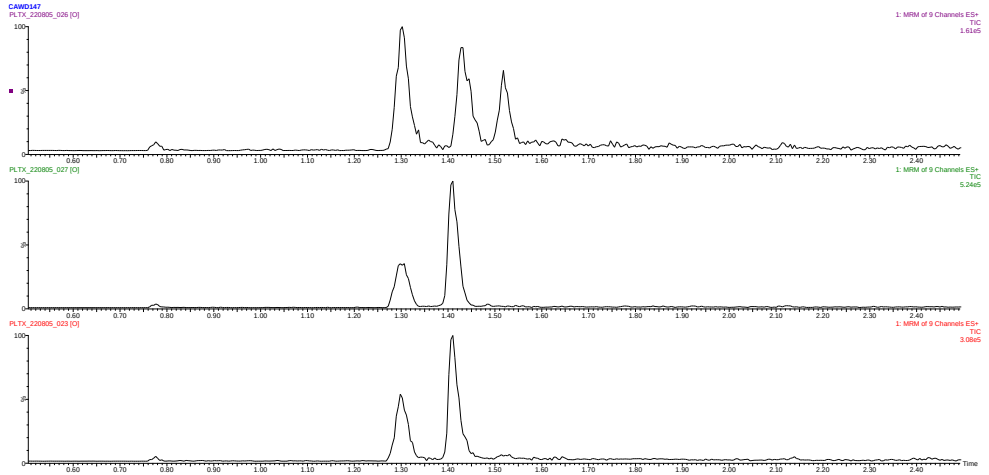
OSTs

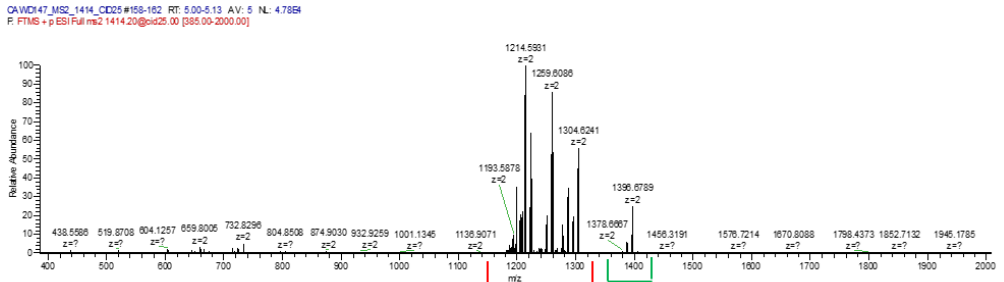
Analytical method - Intact

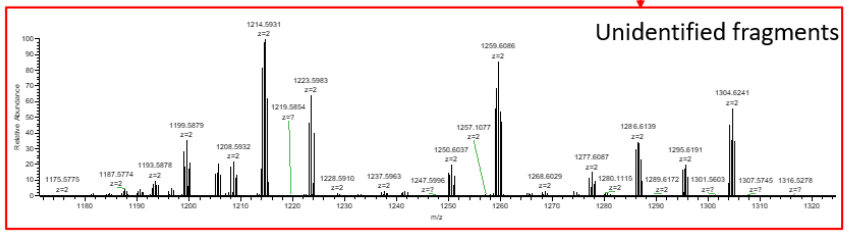
- Developed a method to look for the published PLTX, OVTX and OST analogues using reference material and positive isolates from Japan and Italy

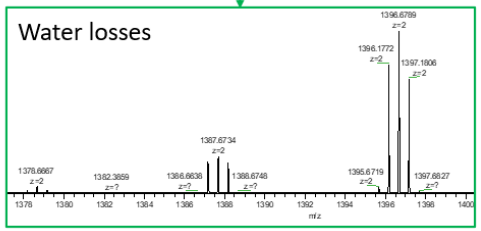


Compound discovery NZ *Ostreopsis* species





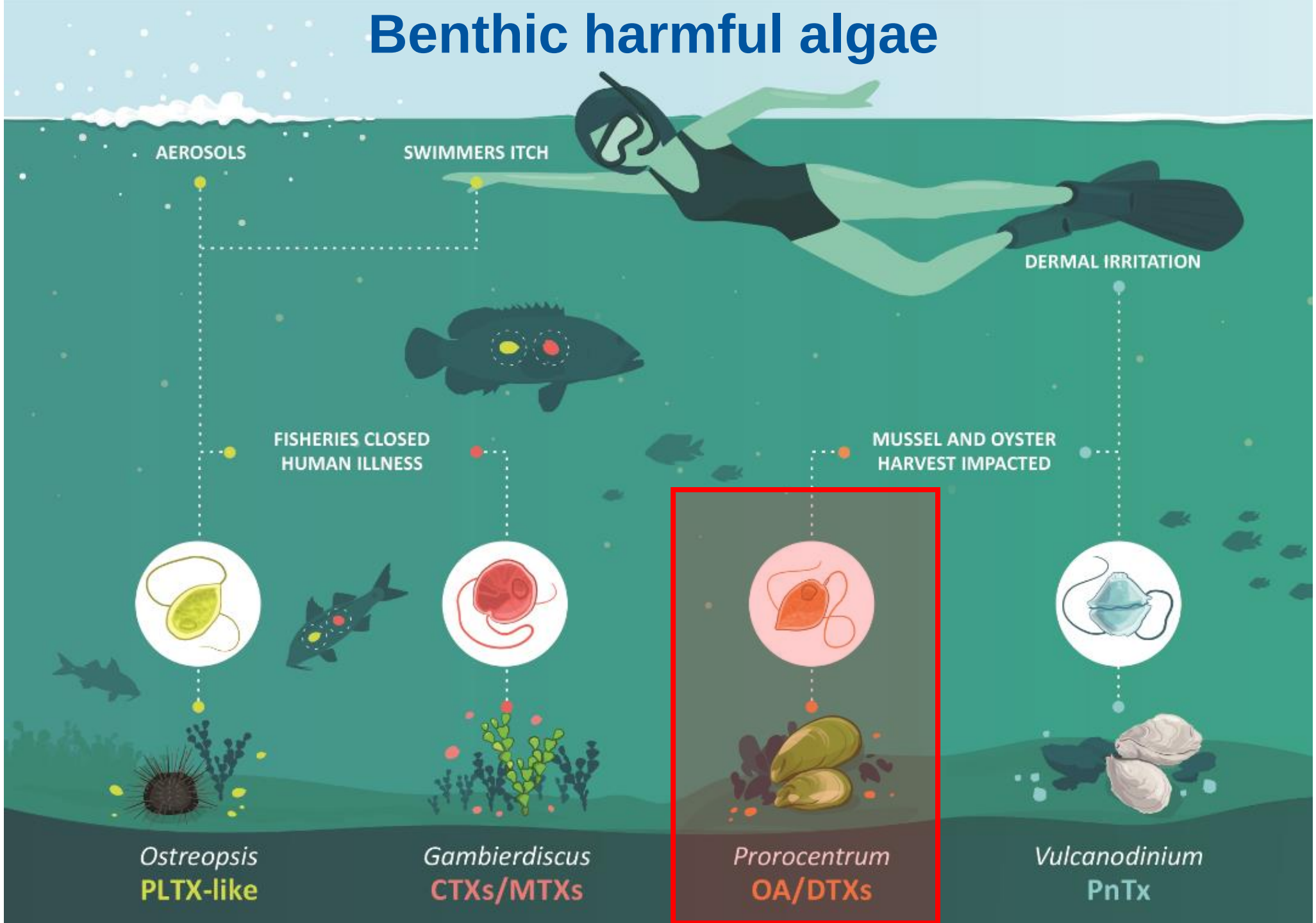




Multi-laboratory comparison

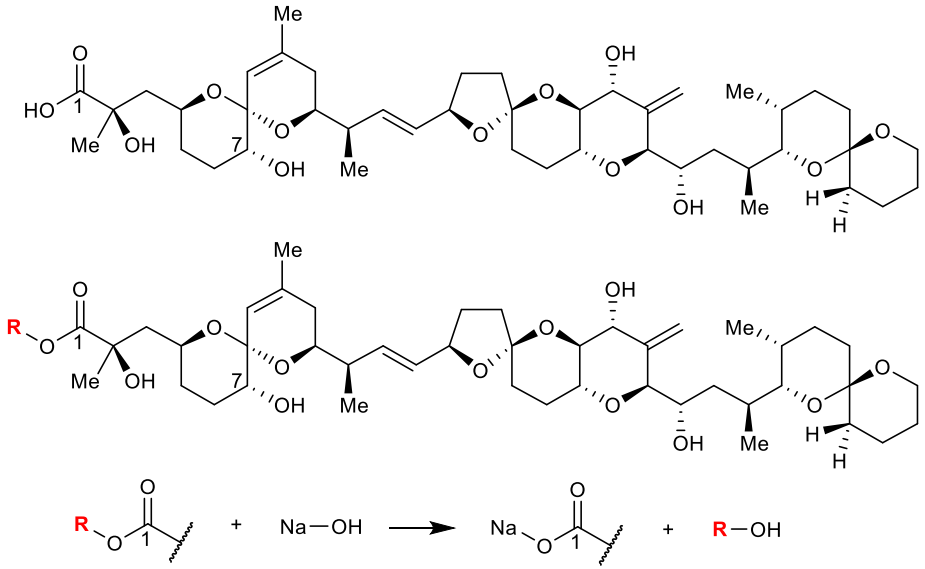
- MLV in collaboration with Cefas (UK), UoNapoli (IT) and UoAlabama (USA)
- SLV for [O] and intact at Cawthron - assess method performance: linearity, sensitivity, accuracy and precision
- Fortified mussels, oysters, fish flesh, algal extracts with PLTX, OVTX-a, OST-D
- This is currently underway and two publications are being prepared

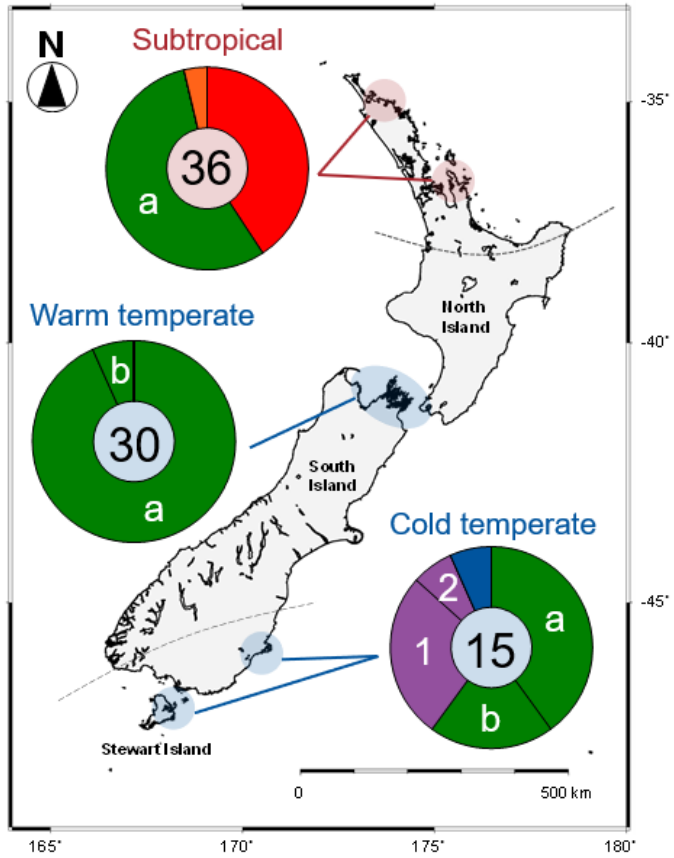
Benthic harmful algae



Graphics: Jacqui Stuart

Prorocentrum species in New Zealand





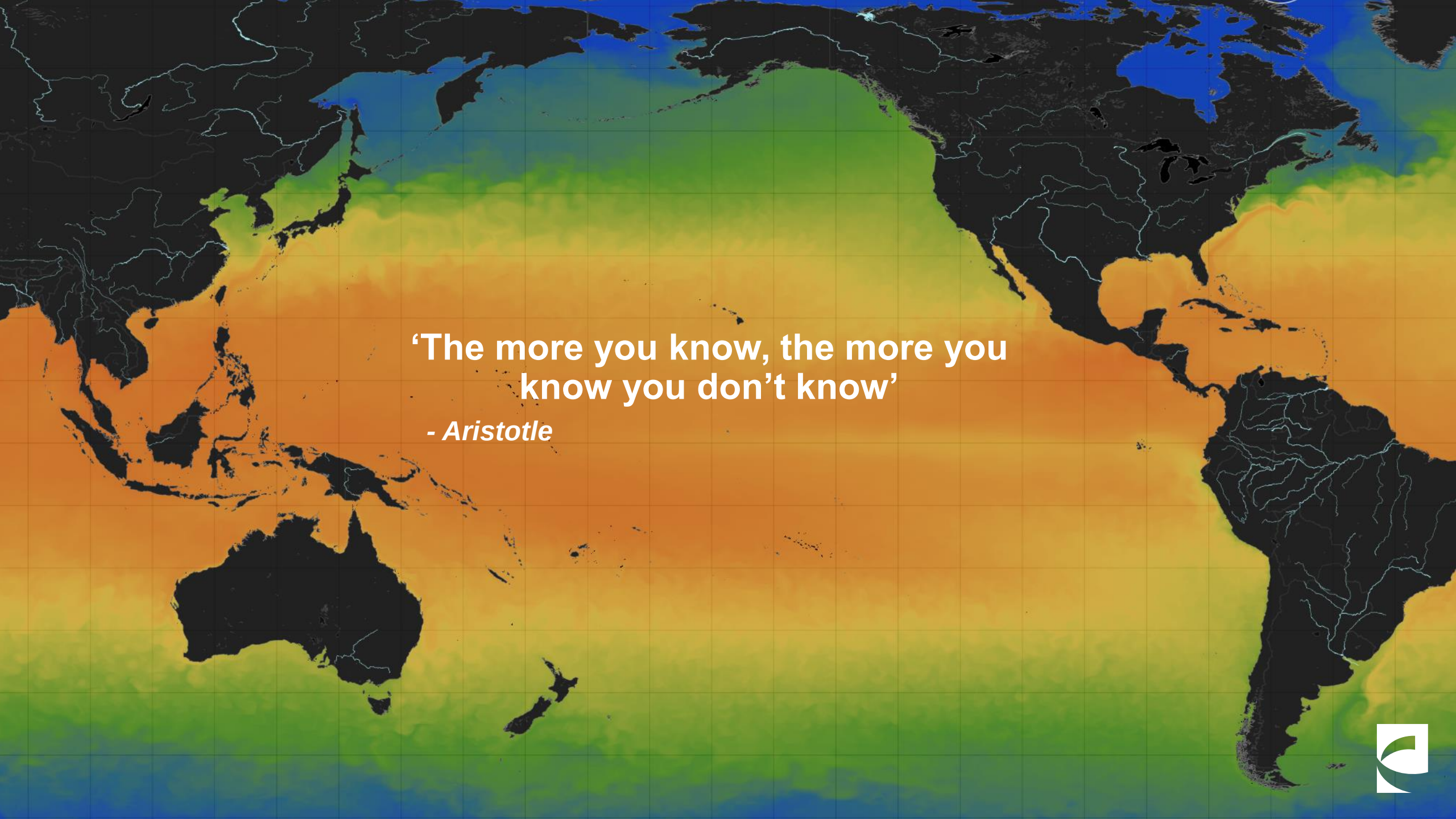
DST producer

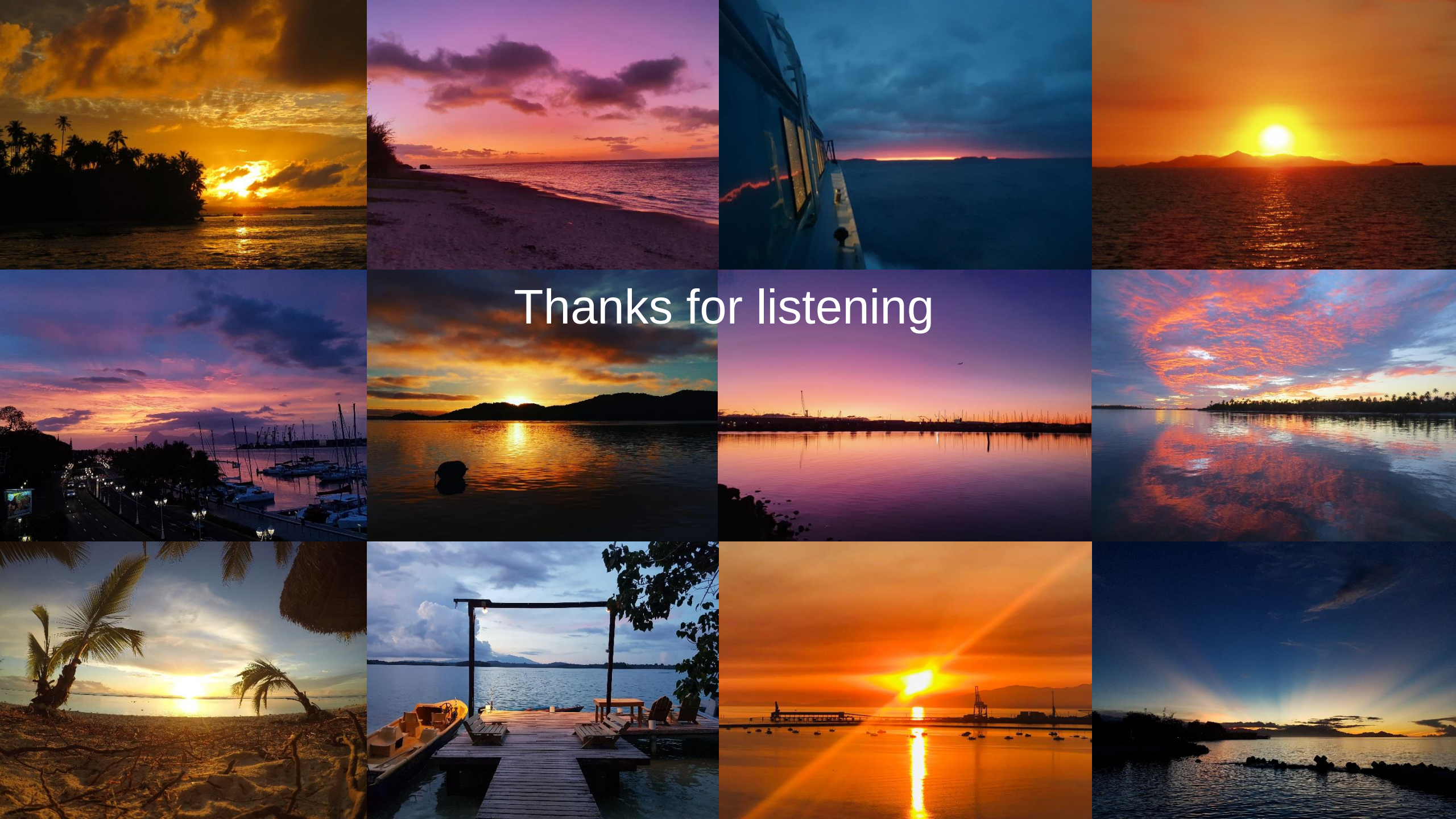
- *P. lima* subclade 1e
- a *P. lima* subclade 4a
- b *P. lima* subclade 4b
- 1 *P.* aff. *foraminosum* clade 1
- 2 *P.* aff. *foraminosum* clade 2

Non-DST producer

- *P. malayense*
- *P. tsawwassenense*

Nishimura *et al.*, in draft


‘The more you know, the more you know you don’t know’
- Aristotle


Thanks for listening