



Assessment of coastal water parameters and nutrient distribution in the Suva Lagoon

ILICO Seminar

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Jasha Dehm

Who am I?

- Jasha Dehm
- BSc in Marine Studies ☐ USP, Fiji
- MSc in Biological Oceanography ☐ GEOMAR, Germany
- PHD Candidate at the SAGEONS, USP
- ARTS Fellow, IRD Nouméa

Oceanography

USP ☐ Dr. Awnesh Singh
IRD ☐ Dr. Christophe Menkes,
IFREMER ☐ MR. Romain Le Gendre

Coral Ecology

USP -> Dr. Amanda Ford



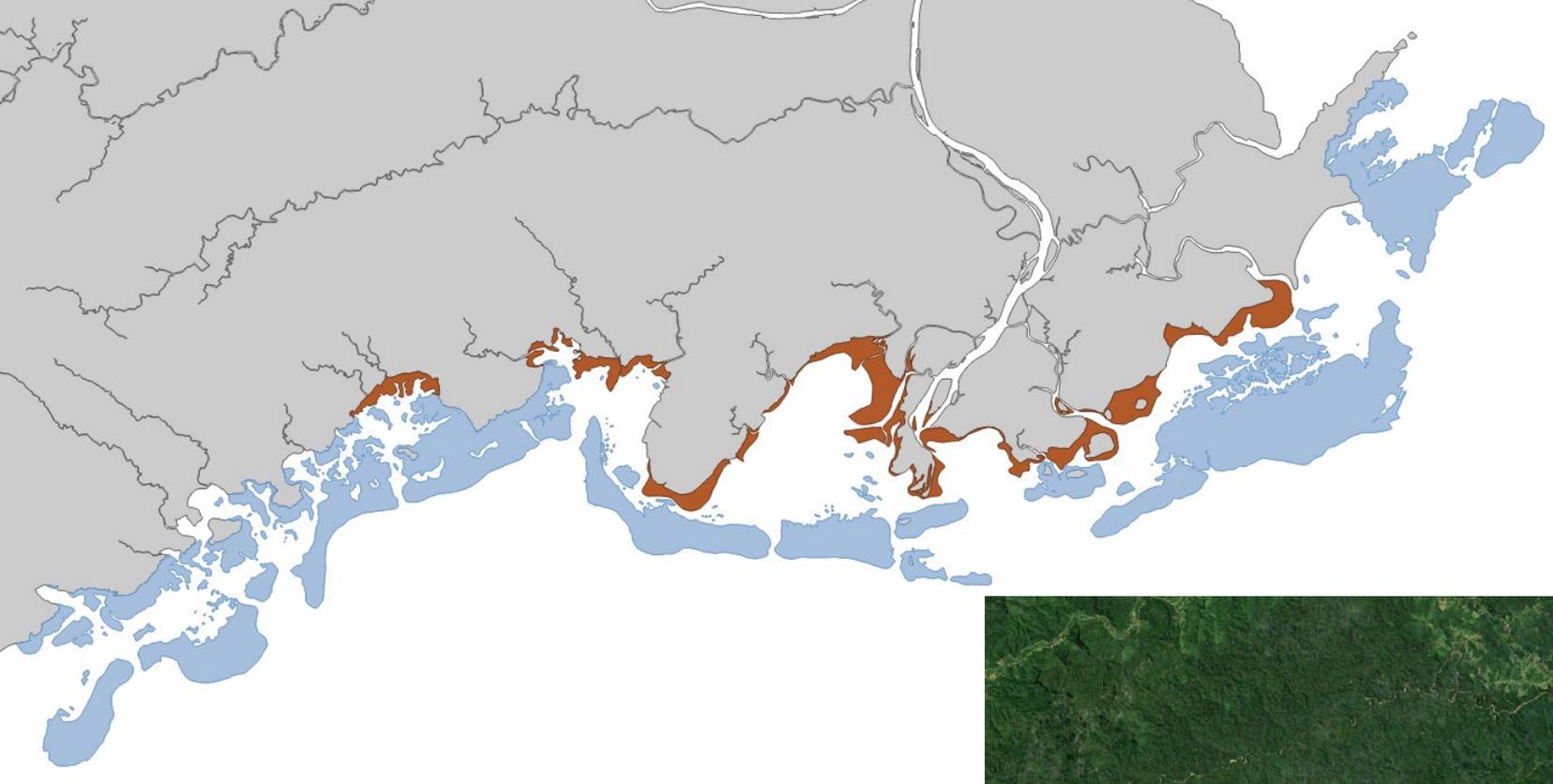
My PHD

- Coral reefs are essential providers of key ecosystem services and functions within PICTs
- Dynamic systems made up of multiple communities
- Community distribution heavily dependent on parameters
- Overexploited or faced with other natural and anthropogenic pressures → change inevitable

→ Drivers for Change in Distribution Patterns of Coral Reef Assemblages within the Greater Suva Urban Marine Environment

Understanding and visualizing how

1. 3D coastal hydrodynamics within the greater Suva Urban Area
2. Hydrodynamic and physiochemical properties influence coral community assemblages, growth and distribution
- 3. Nutrients/Water Quality influence coral community assemblages, growth and distribution**
4. Scenarios for change based on future climate projections



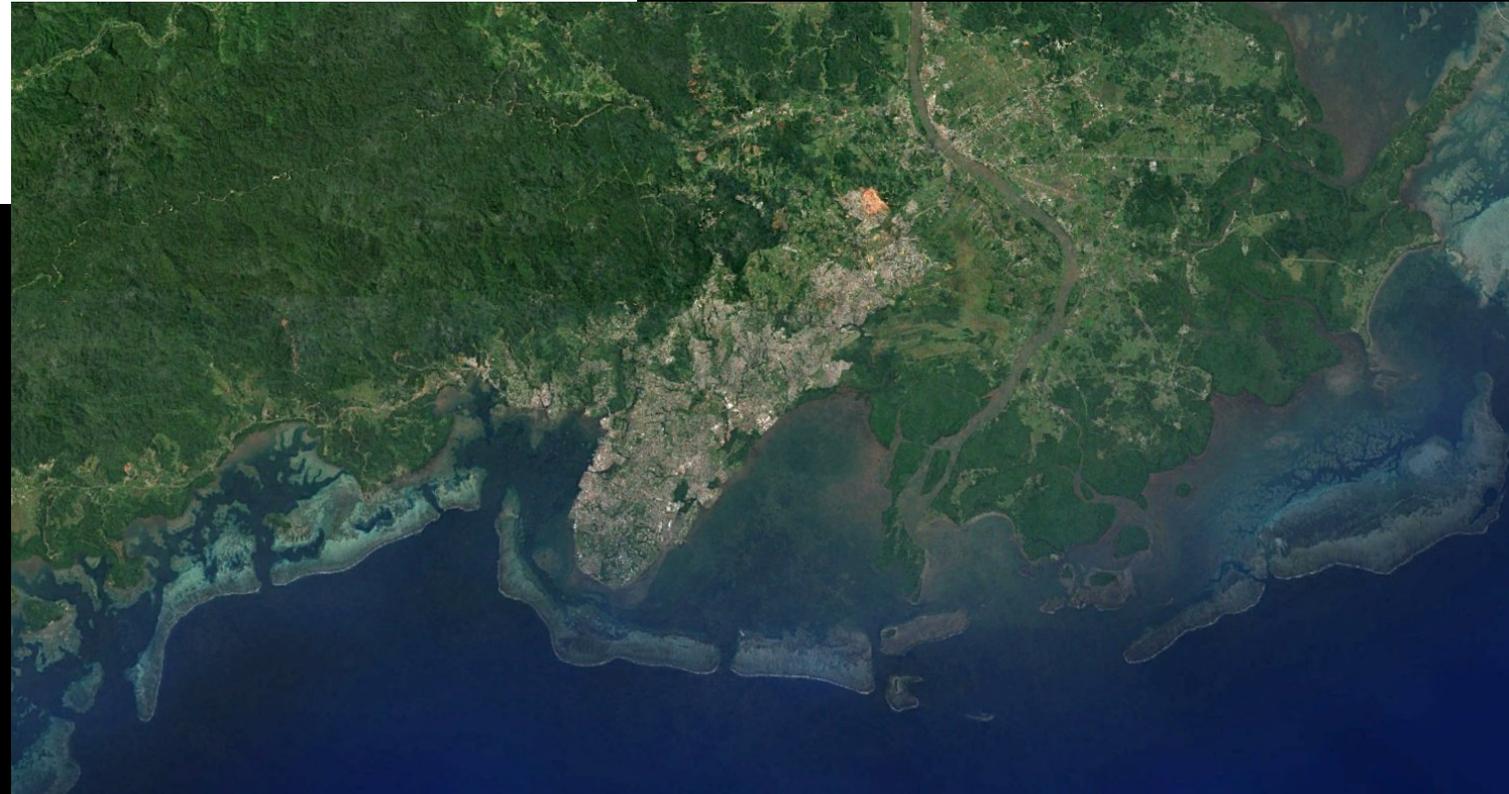
Study Site

Primary = Greater Suva Urban
Marine Environment

~25 km each way from Suva
Peninsula

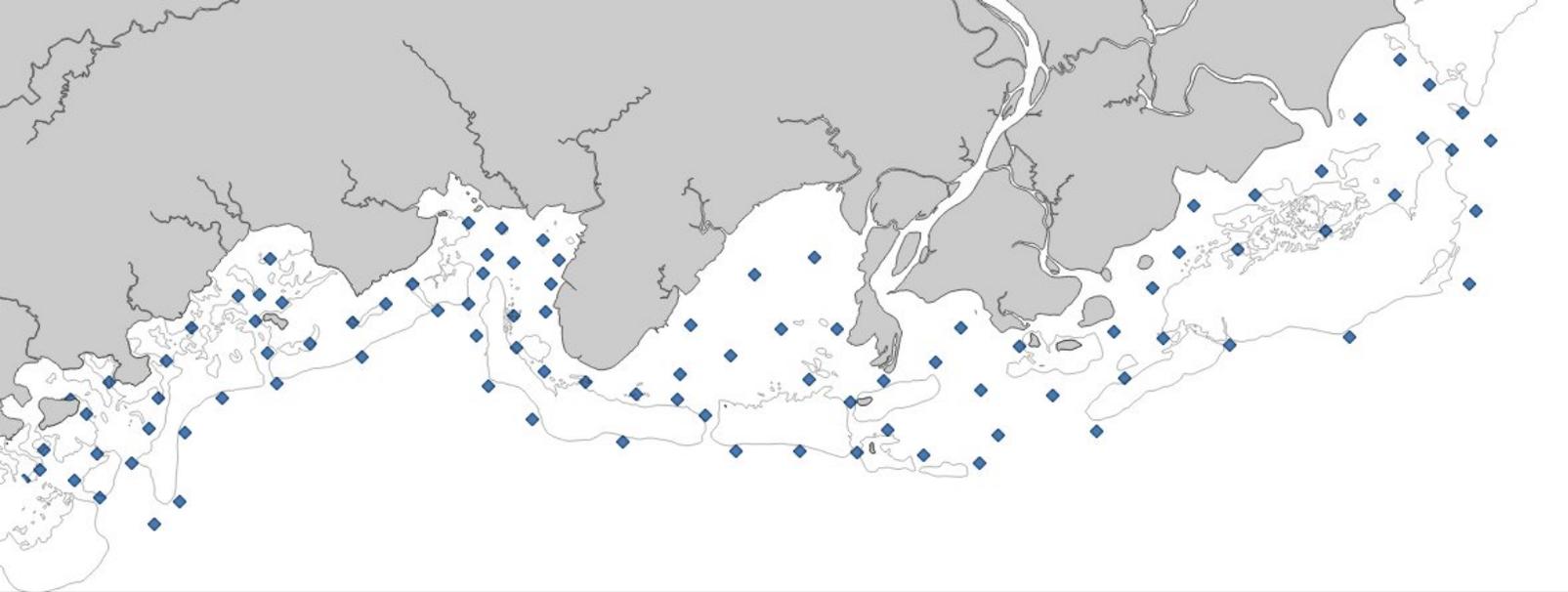
Notable features

1. ~ 1/3 of Fiji's population
2. ~150 square Km of Reef system
3. Rewa River
4. South Easterlies



Organic Pollution implications on coral assemblages

1. What is the distribution of total hard coral cover within the shallow Suva Urban Reef System
2. What does Nutrient distribution tell us about Organic Pollution within the Greater Suva Area.
3. How are coral GENUS distributed relative to Organic Pollution Index
4. How are juvenile corals distributed relative to Organic Pollution Index

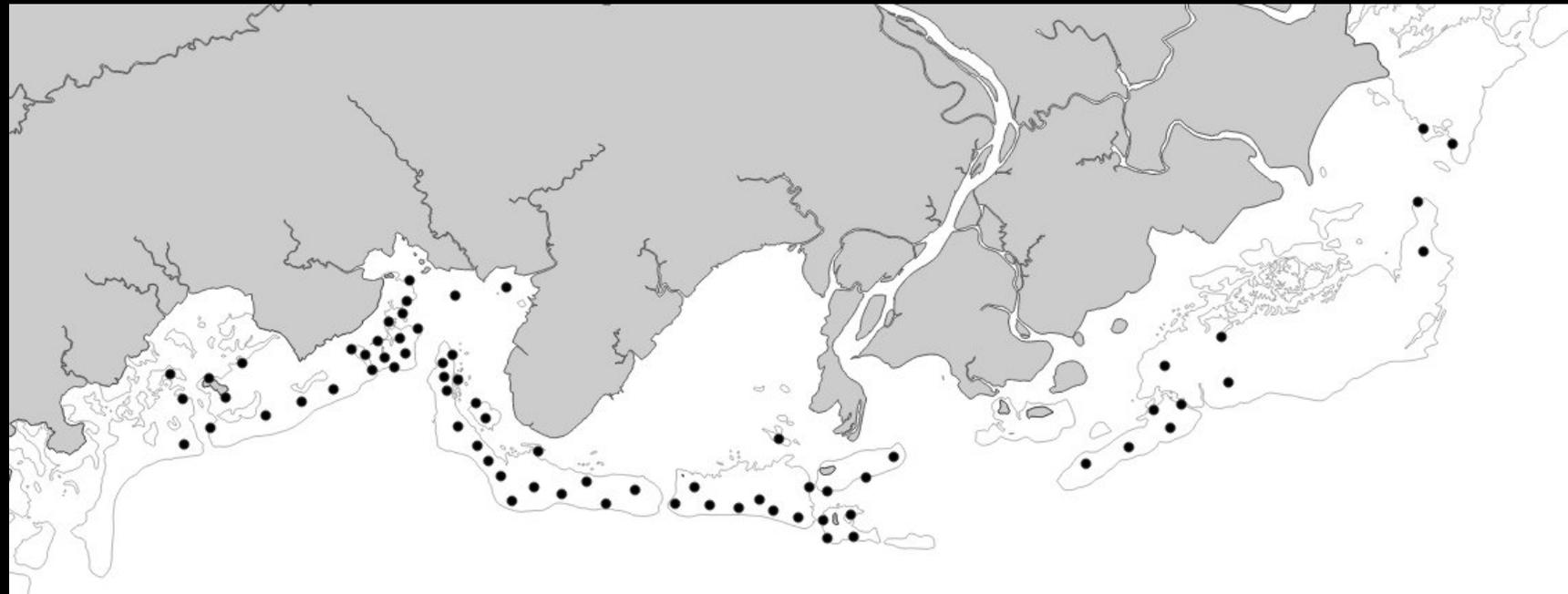


Sampling

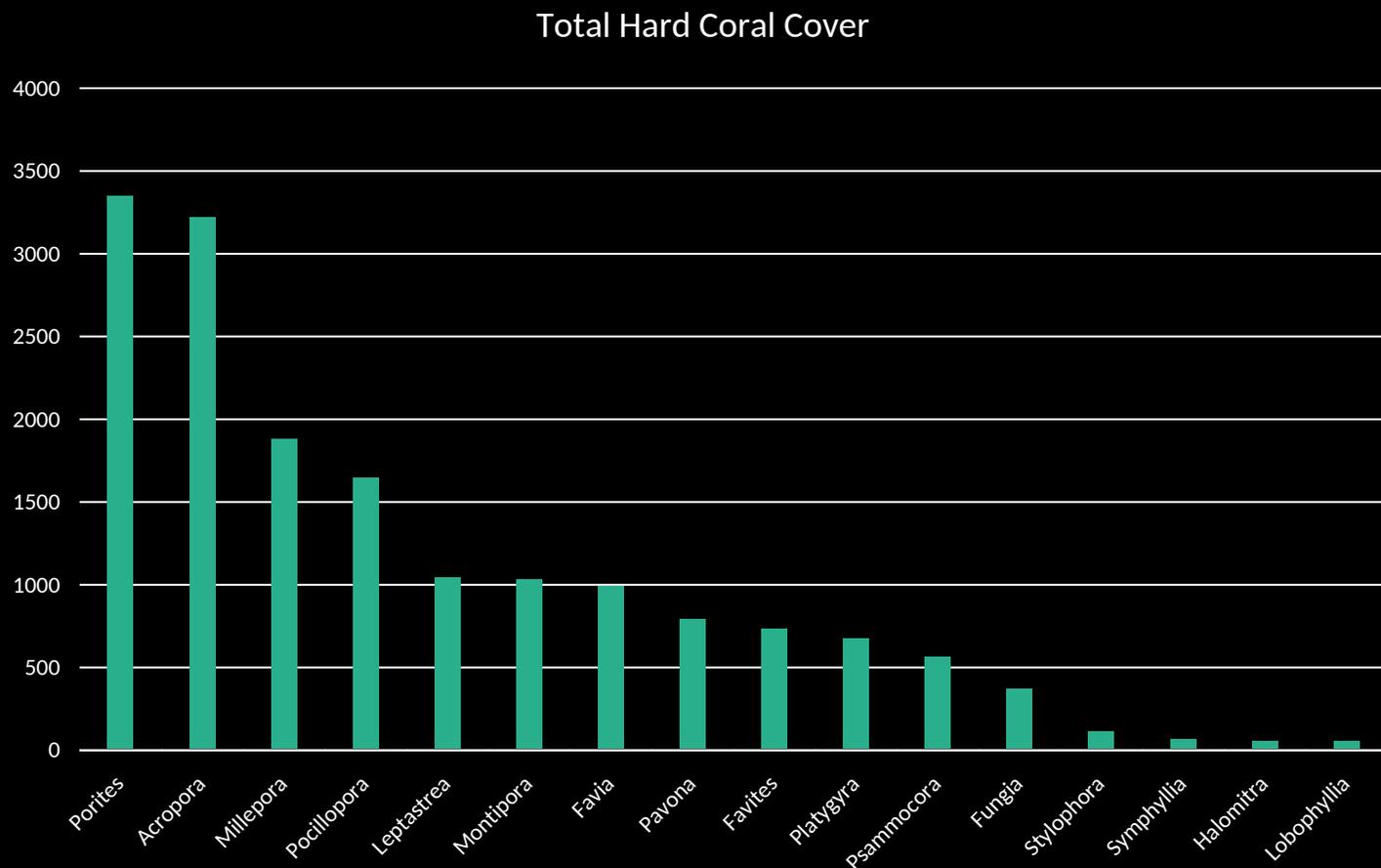
1. Nitrates, Nitrites, Ammonia, Phosphate
2. Chemical Oxygen Demand
3. Temperature, Salinity, Dissolved Oxygen, Turbidity, TSS
4. 6 sampling events

Surveys

1. Photo transects
2. CoralNet
3. CPCe
4. Survey over 2 months



Initial results – Coral Distribution

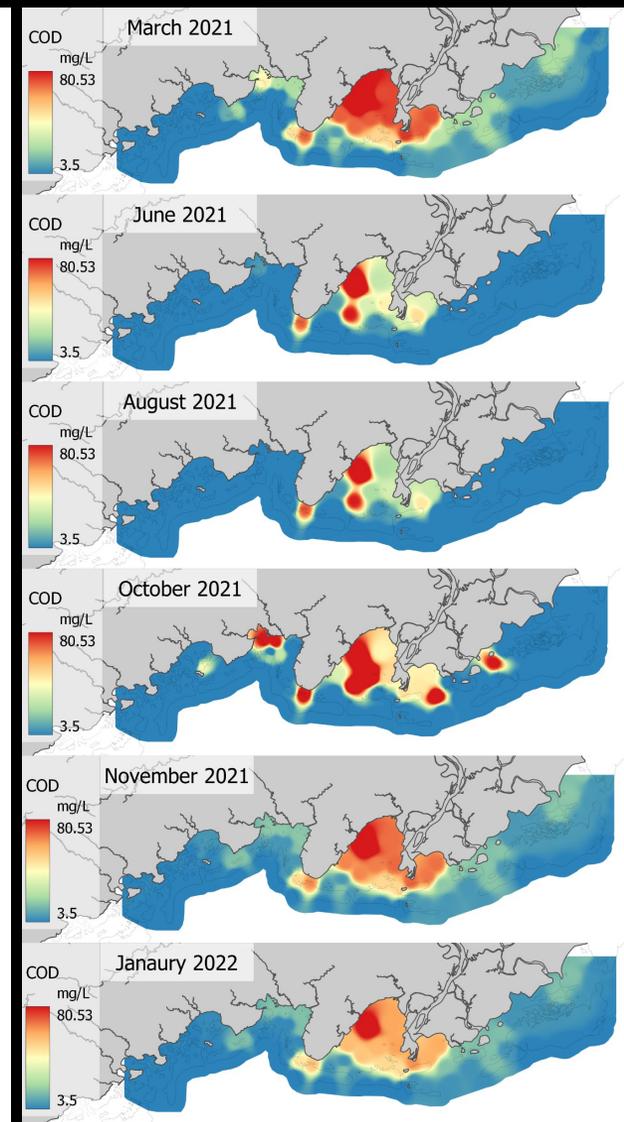
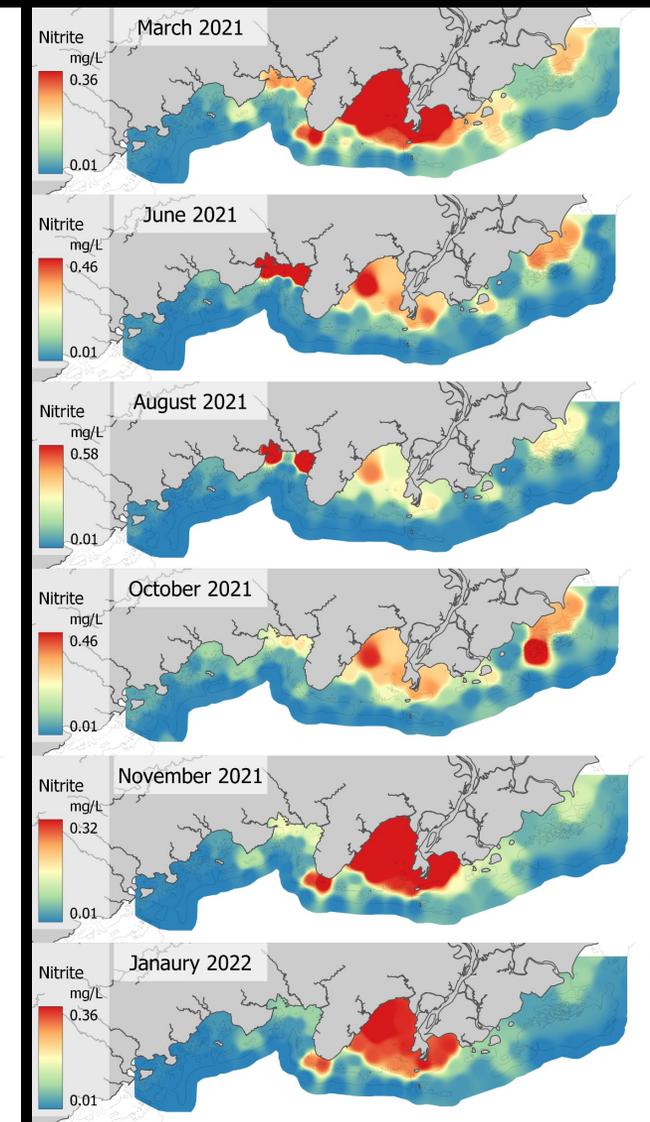
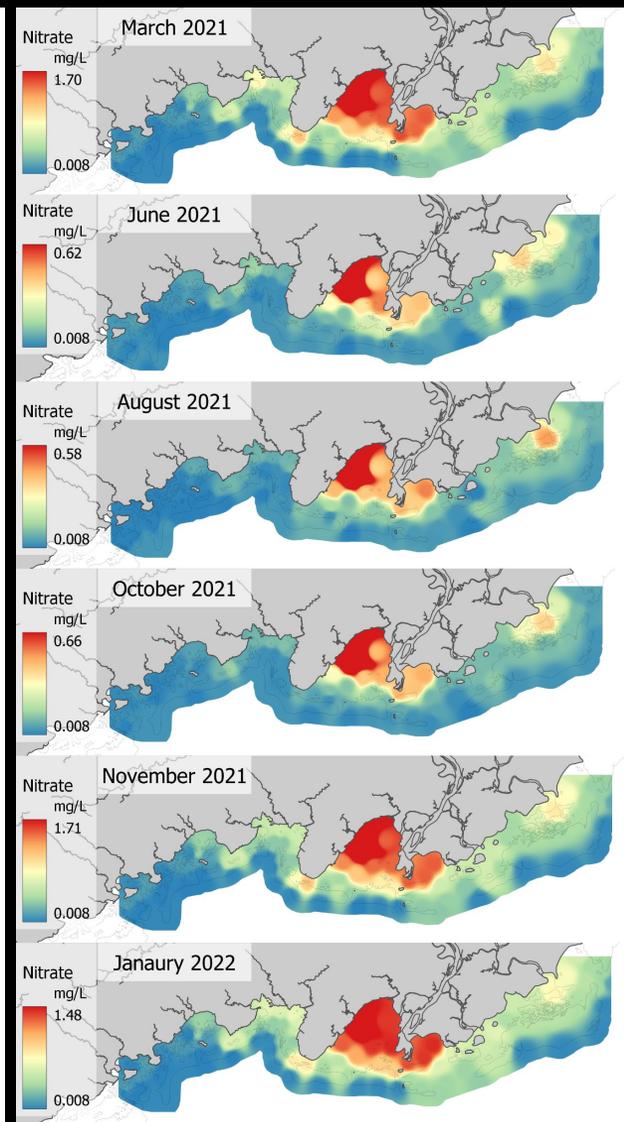
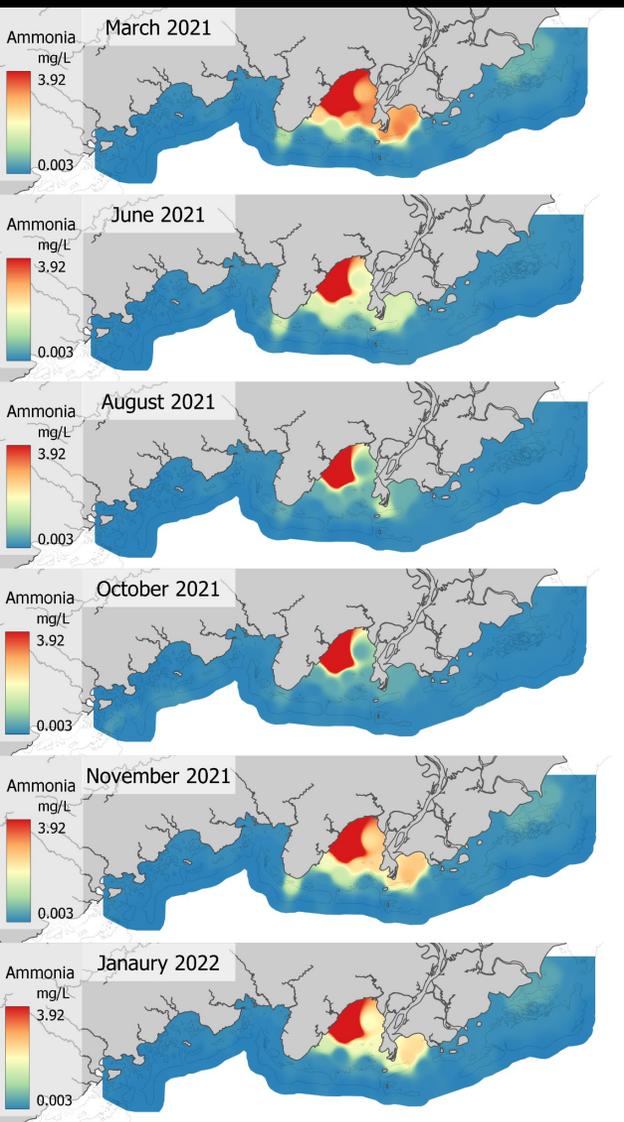


Sampling

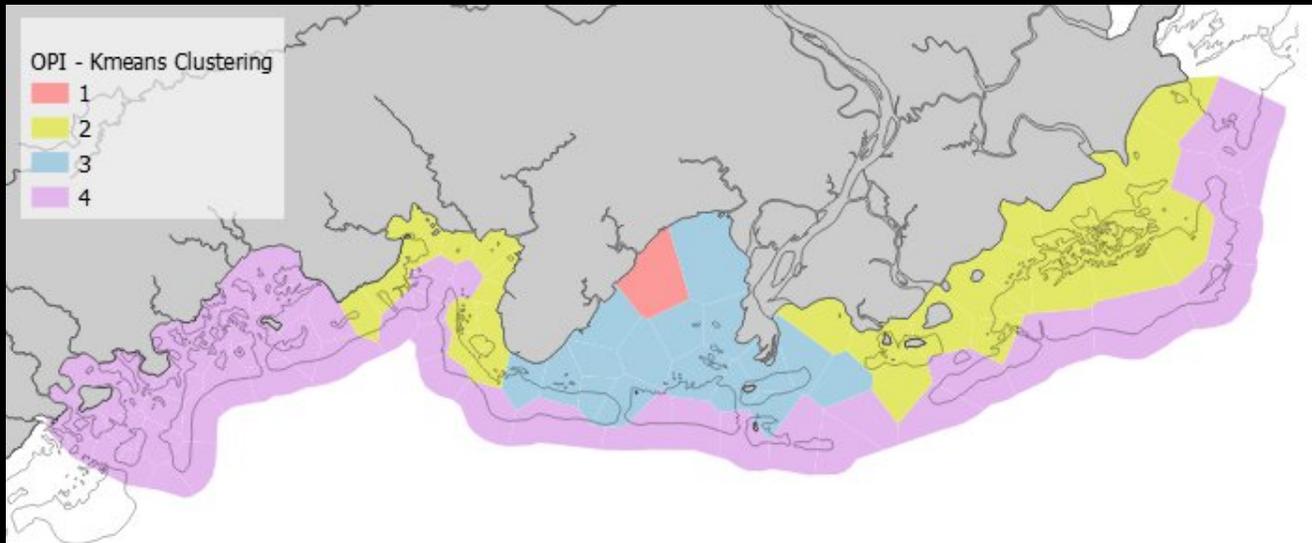
- 101 sampling sites
- 16344 photos
- 54 % (8825) photos at least one coral colony

- 16597 colonies counted
- 18 species

Initial results - Nutrients



Water Quality – Organic Pollution Index

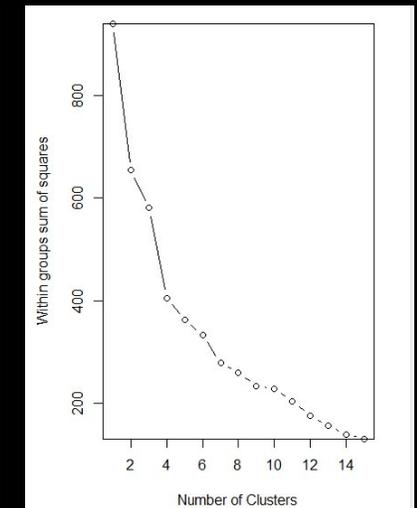
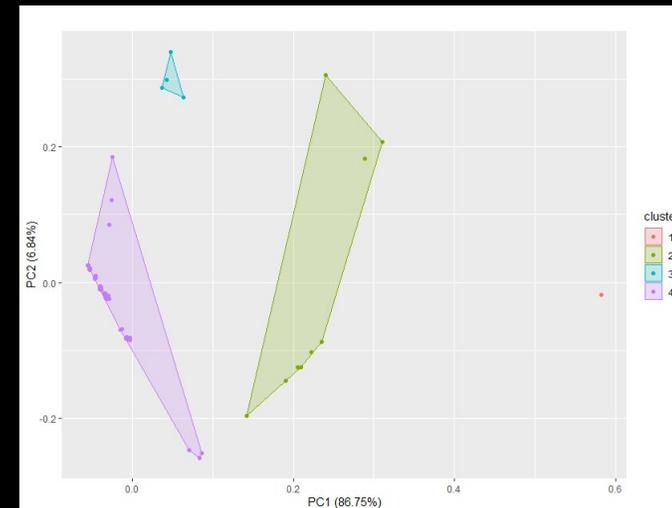


- An index for Organic Pollution
- $OPI = \frac{DIN}{DIN_S} + \frac{DIP}{DIP_S} + \frac{COD}{COD_S} + \frac{DO}{DO_S}$ (EPA standards)
- Kmeans Clustering – 4 suitable clusters

- Cluster 1 – Kinoya, OPI = > 100
- Cluster 3 – Laucala Bay, OPI = 10 - 100
- Cluster 2 – Suva Harbour, Nasilai Reef, OPI = 1-10
- Cluster 4 – Fore-reef, reef flat, Western GSUA, OPI = < 1

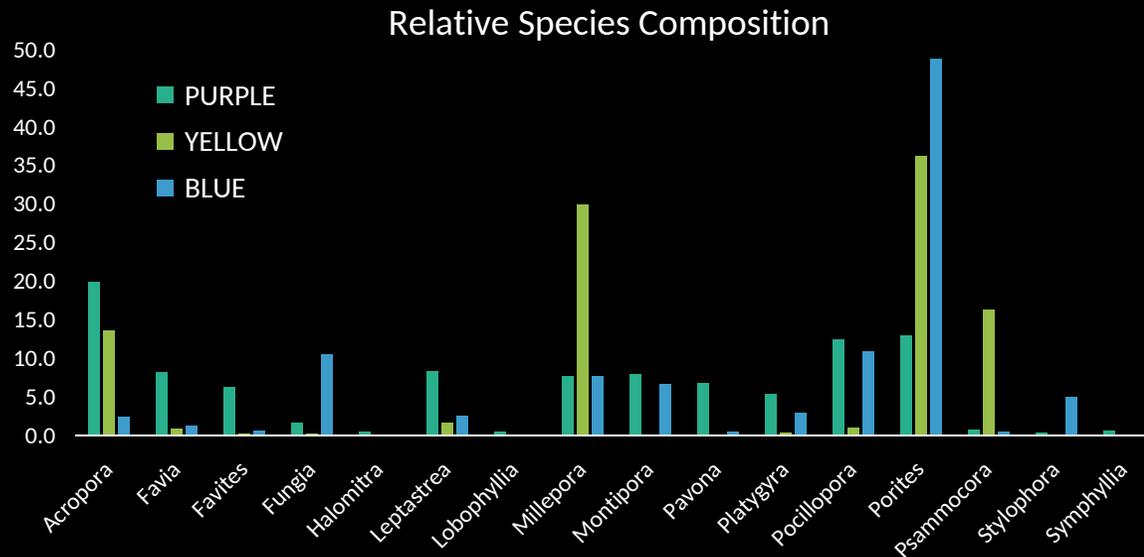
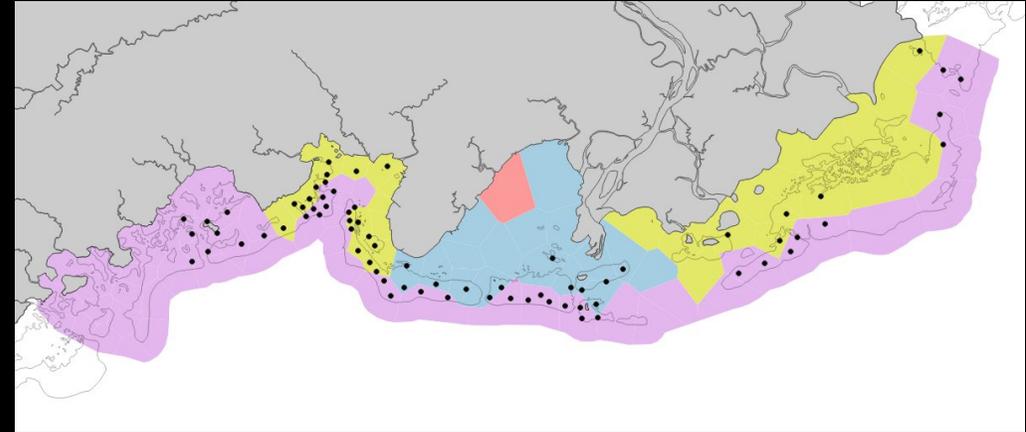


Not Polluted Low Pollution Polluted Extremely Polluted



Water Quality and Coral Distribution

Cluster	OPI	Number of sites	Number of Colonies counted
Purple	Low pollution	63	11557
Yellow	Polluted	22	2156
Blue	High Pollution	13	2884



- Convert HC cover to relative coral cover.
- Species Richness
 - Purple - 18
 - Yellow - 14
 - Blue - 10
- Distribution Pattern
 - No significant difference with regards to relative total coral cover
 - Difference between relative composition/distribution
 - Acropora - Visibly more abundant in less polluted areas
 - Millepora and porites - dominant in more polluted areas.

Moving Forward



- Complete coral reef survey analysis
- Dissimilarity statistics (e.g. Bray Curtis)



- Complete Hydrodynamic simulation



Use model derived data to determine distribution patterns relative to long term hydrodynamics



Derive projections for future assemblage distributions

Vinaka.

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- ## Some Other research

- Hewavitharane, Chinthaka, et al. "Occurrence of Microplastics within a Freshwater Aquaculture System in the Pacific Islands, Viti Levu, Fiji Islands." *CHEM* 95512.
- Dehm, Jasha, et al. "Screening of pharmaceuticals in coastal waters of the southern coast of Viti Levu in Fiji, South Pacific." *Chemosphere* 276 (2021): 130161.
- Dehm, Jasha, et al. "First record of a pygmy sperm whale (*Kogia breviceps*, Blainville, 1838) stranding along the coast of Viti Levu, Fiji." *Australian Mammalogy* 44.1 (2021): 158-160.
- Dehm, Jasha, et al. "Microplastics in subsurface coastal waters along the southern coast of Viti Levu in Fiji, South Pacific." *Marine Pollution Bulletin* 156 (2020): 111239.
- Santon, Matteo, et al. "Redirection of ambient light improves predator detection in a diurnal fish." *Proceedings of the Royal Society B* 287.1919 (2020): 20192292.