

Exploring the Variety of Native Saltwater Algae in Babeldaob and Koror

Taira Kishigawa
Republic of Palau

Mentors

Christopher Kitalong, PhD, *Palau Community College-Cooperative Research and Extension*

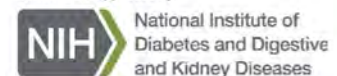
Leilani Rechelluul, *Palau Community College-CRE*

Elchung Hideyos, MS, *Palau Community College-CRE*

Marinca Faimau, BS, *Palau Academic Institute for Research*



Research supported by



United States
Department of
Agriculture

National Institute
of Food and
Agriculture

Introduction

What is algae?

- Algae are a diverse group of aquatic organisms
- They (species of algae) can fall under three different kingdoms
 - Bacteria, protista, and plantae

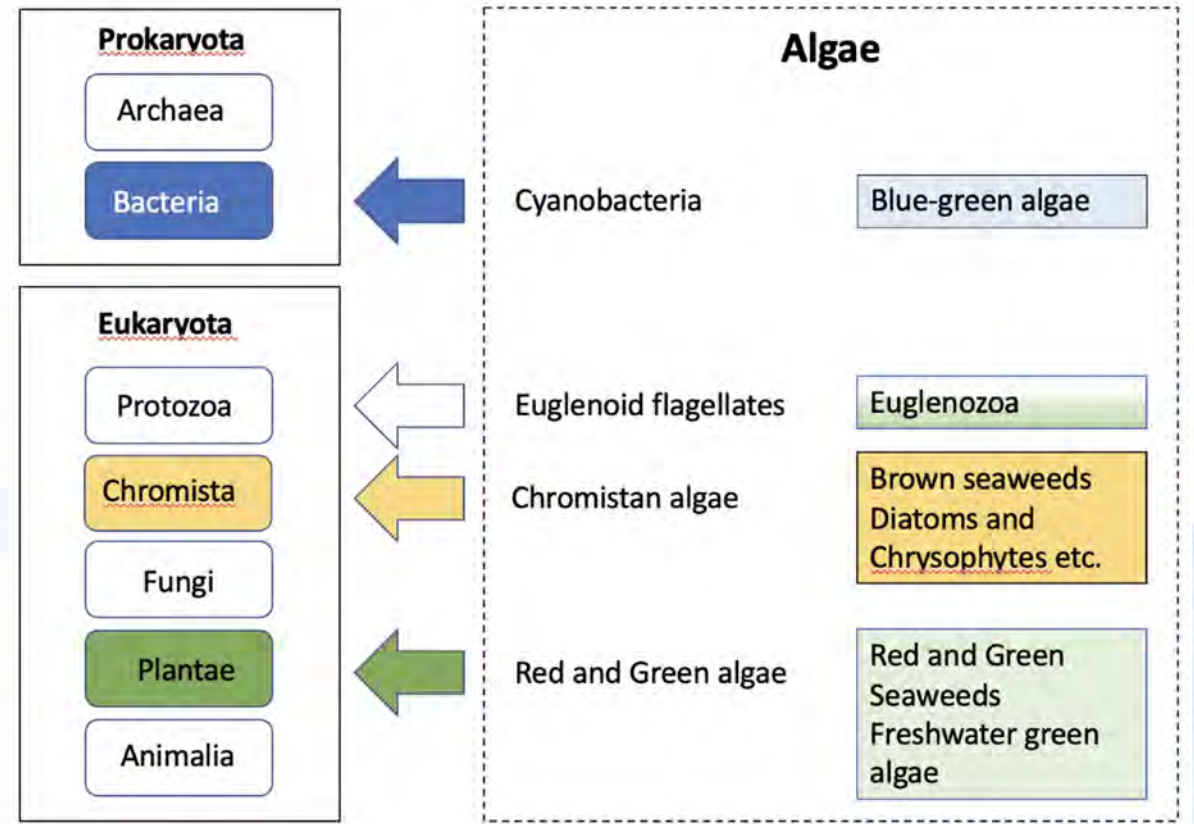
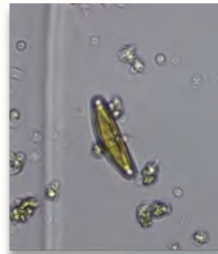


Image from <https://www.seaweed.ie>

Background

- ~260 Marine Phytoplankton species in the Western Pacific
 - Dinoflagellates, diatoms (protists), and cyanobacteria (bacteria) were found in samples collected from Palau's shores.



Navicula



Chaetoceros atlanticus

Why is Algae important to Palau?

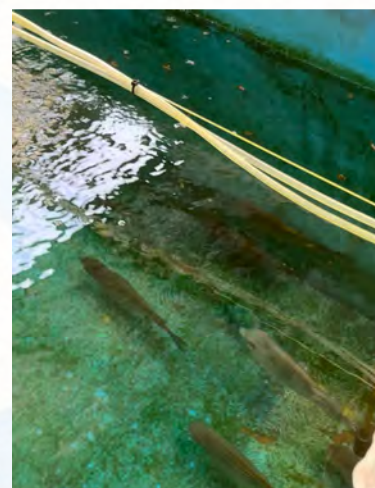
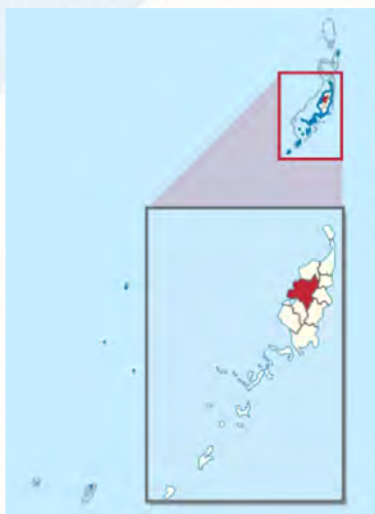
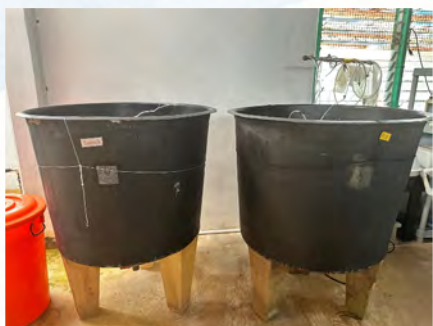
- Algae are an indicator of reef and ocean health
- Provide food stability (i.e. PCC Ngeremlengui Hatchery).
- Uphold ecological growth



Species grown at PCC Hatchery:

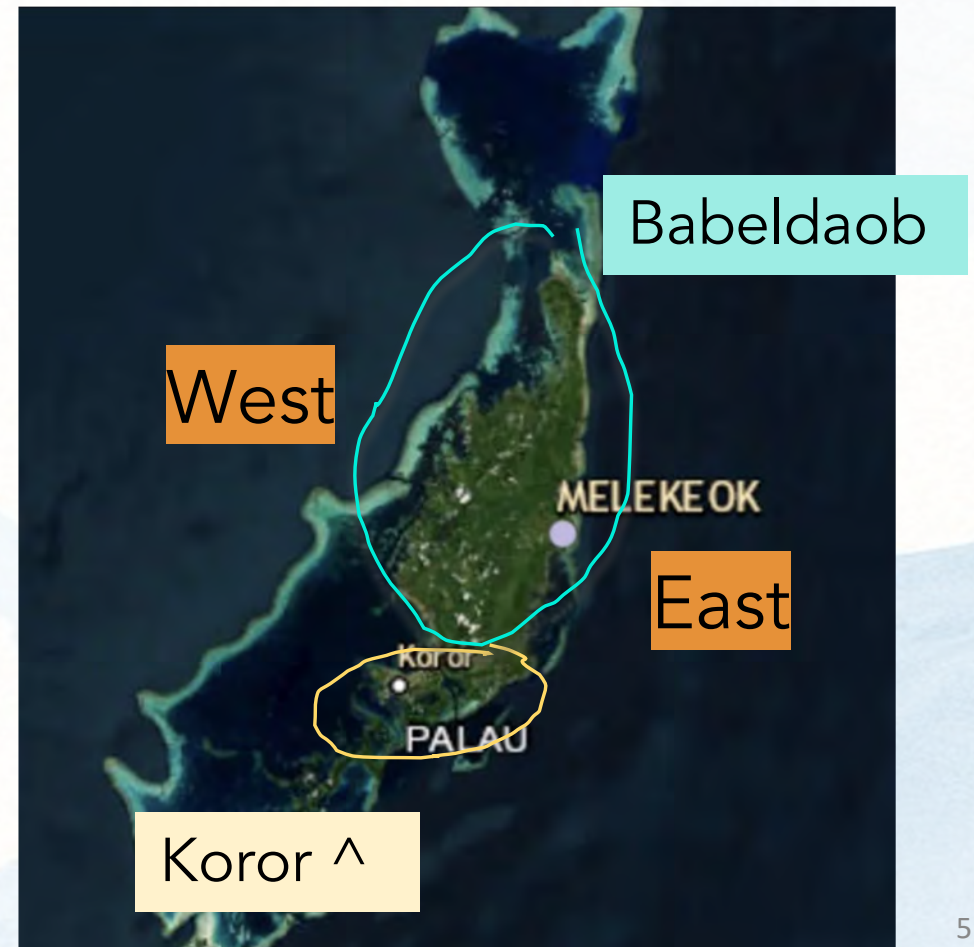
1. *Chaetoceros Mulleri*
2. *Nannochloropsis*
3. *Tysochrysis Lutea*

The Facility



Objective

- Identify species of algae from different areas in Babeldaob and Koror.
- Compare and contrast the presence and diversity of algal species from said areas



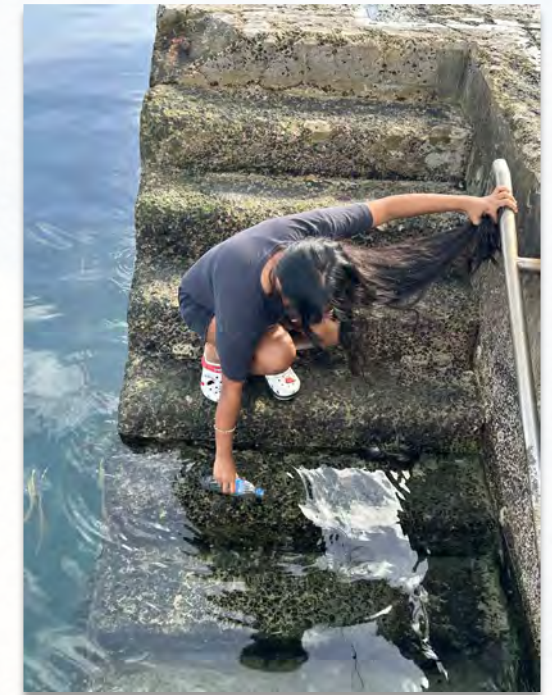
Hypothesis

The variety and abundance of saltwater algae species will differ between the two regions due to variations in environmental conditions, including human activity and coastal differences.

Methods/Materials

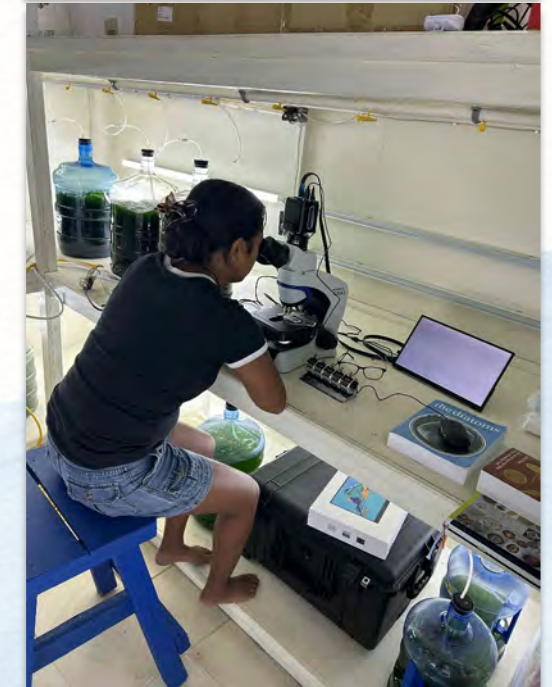
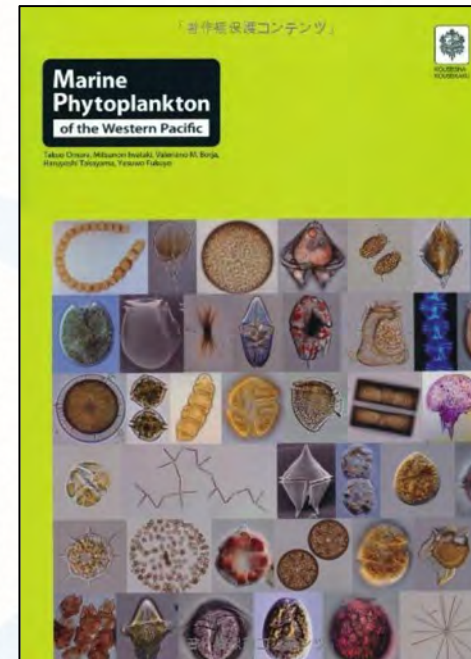
Collecting seawater samples:

- Go to the docks from each location/state
- Collect seawater samples in 500ml containers
- Put the samples in a refrigerator for 2-3 hours



Observation:

- Separate the algae from the samples with filtered seawater and a 50mm mesh filter
- Collect 10ml of isolated algae
- Use 1ml for microscopic analysis
- Identify species by comparing cells to ones in this book ->

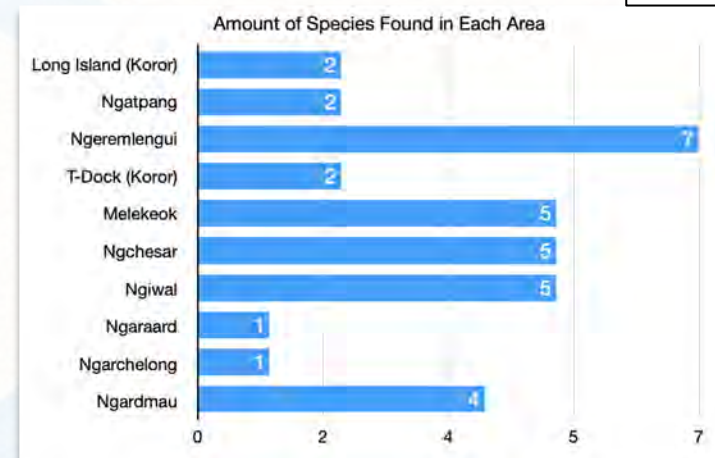


Data & Results

- Nine samples were collected and analyzed.
- There were **19** species found altogether within the samples.
- The findings indicate that **shared** marine phytoplankton species can be found in different areas on the **same side** of the island (west and east sides).

The 19 Analyzed Marine Phytoplankton Species

1. Nano Algae
2. Navicula Algae
3. *Cyanobacterium*
4. *Rhizosolenia setigera*
5. *Pleurosigma normanii*
6. *Prorocentrum emarginatum*
7. *Prorocentrum shikokuense*
8. *Cylindrothea closterium*
9. *Skeletonema* sp. 2
10. *Thalassiosira punctigera*
11. *Chaetoceros atlanticus*
12. *Chaetoceros danicus*
13. *Chaetoceros didymus*
14. *Pseudo-nitzschia* sp.3
15. *Pseudo-nitzschia circumpora*
16. *Pseudo-nitzschia pungens*
17. *Ceratium trichoceros*
18. *Helicotheca tamesis*
19. *Ornithocerus skogsbergii*

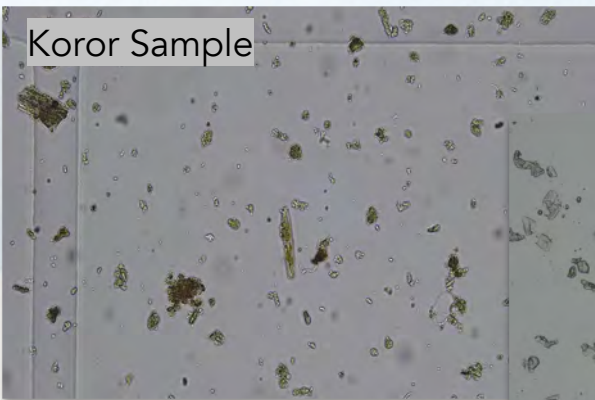


The graph does not combine shared species for each area's tally.

Data & Results

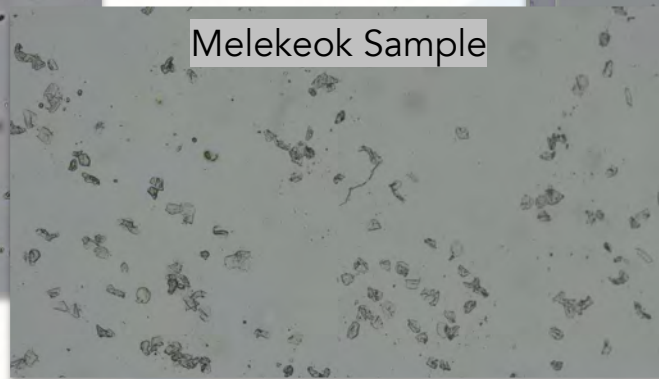
Amount of Species Found in Each Area

State	Number of species	Date Collected	Date of Analysis	Amount Collected
Long Island (Koror)	2	4/29/25	7/15/25	500ml
Ngatpang	2	4/29/25	7/16/25	500ml
Ngeremlengui	7	7/15/25	7/16/25	500ml
T-Dock (Koror)	2	7/18/25	7/18/25	500ml
Melekeok	5	7/23/25	7/31/25	500ml
Ngchesar	5	7/23/25	7/23/25	500ml
Ngiwal	5	7/23/25	7/24/25	500ml
Ngaraard	1	7/24/25	7/31/25	500ml
Ngarchelong	1	7/24/25	7/31/25	500ml
Ngardmau	4	7/24/25	7/31/25	500ml



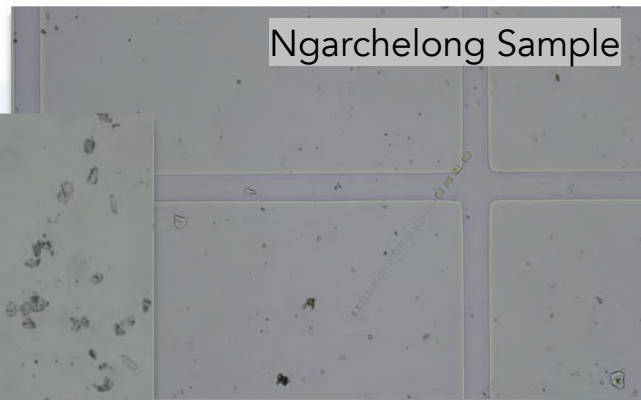
Koror Sample

Sample with algae chunks



Melekeok Sample

Sample with sediment



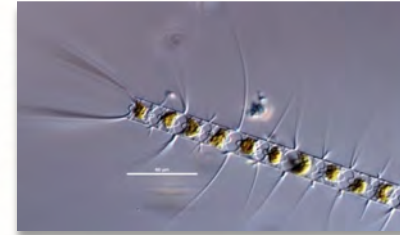
Ngarchelong Sample

Sample with little to no sediment or algae

State of Residence	Population			
	2005	2012	2015	2020
Total	19,907	17,501	17,661	17,614
Aimeliik	270	281	334	363
Airai	2,723	2,537	2,455	2,529
Angaur	320	130	119	114
Hatohebei	44	10	25	39
Kayangel	188	76	54	41
Koror	12,676	11,665	11,754	11,400
Melekeok	391	299	277	318
Ngaraard	581	453	413	396
Ngardmau	166	195	185	238
Ngeremlengui	317	309	350	349
Ngatpang	464	257	282	289
Ngchesar	254	287	291	319
Ngerchelong	488	281	316	384
Ngiwal	223	226	282	312
Peleliu	702	489	484	470
Sonsorol	100	6	40	53

Data & Results

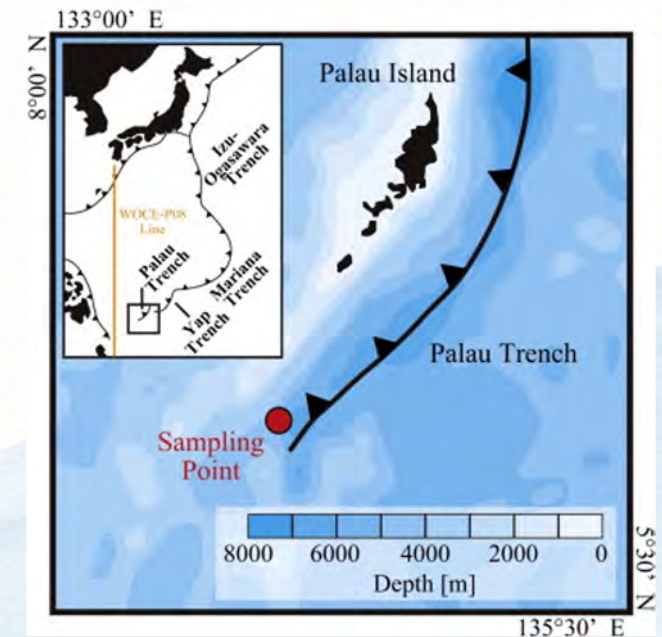
- Koror's two areas, T-Dock and Long Island (3.9 kilometers apart), housed two unique species of phytoplankton in their respective areas.
 - *Chaetocerus didymus* and *Skeletonema* sp.2
- On the east side of Babeldaob, two states (Ngchesar and Ngiwal) shared four species of algae:
 - *Rhizosolenia setigera*, *Pleurosigma normanii*, navicular algae, and nano algae).
- Seven species of algae were only found in eastern states (Ngchesar, Ngiwal, and Melekeok).
 - *Rhizosolenia setigera*, *Prorocentrum shikokuense*, *Pseudo-nitzschia pungens*, *Chaetoceros danicus*, *Ceratium trichoceros*, *Helicotheca tamesis*, and *Ornithocerus skogsbergii*



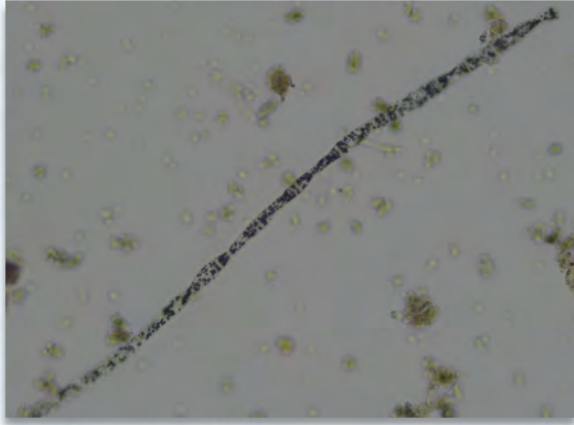
Chaetocerus didymus
from the Phyto'pedia



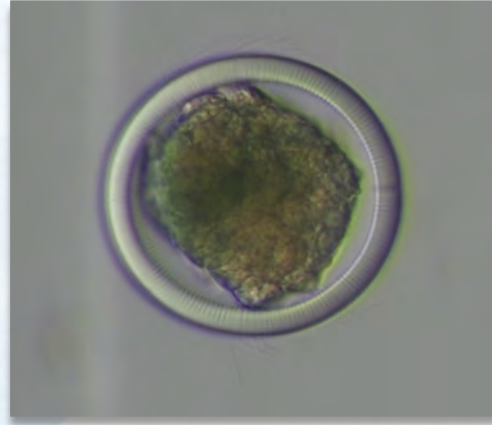
Skeletonema
sp.2



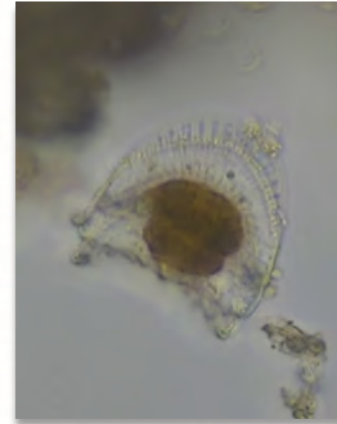
Microscopic Captures



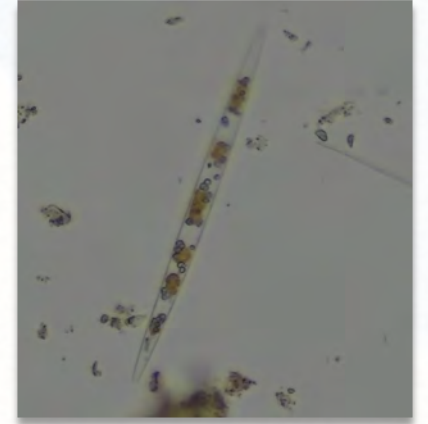
Helicotheca tamesis
(Melekeok Sample)



Thalassiosira punctigera
(Ngeremlengui Sample)



Ornithocerus
skogsbergii
(Melekeok Sample)



Pseudo-nitzschia sp. 3
(Ngardmau Sample)



Pleurosigma normanii
(Ngchesar Sample)

Conclusion

- These results show that algae grow differently in the two regions (Koror and Babeldaob) due to different environments and coastal conditions
 - Koror's water samples had higher amounts of algae but fewer species of phytoplankton
 - Water samples from Babeldaob (i.e. Melekeok) had fewer algae chunks/blooms and more diversity
- By studying areas that have a more diverse set of marine phytoplankton, more local live feeds can be produced for sustainable aquaculture
 - Ex: *Chaeteceros didymus*, *Chaeteceros danicus*, and *Chaeteceros atlanticus*

Future Directions

- Continue collecting water samples from additional islands in Palau for micro-analysis
- Isolate algae cells for further investigation
- Collect and store species for future live-feed cultivation



References

- Yan, W., Chen, Z., Zhang, L., Wang, F., Zhang, G., & Sun, J. (2023). Nanophytoplankton and microphytoplankton in the western tropical Pacific Ocean: Their community structure, cell size, and carbon biomass. *Frontiers in Marine Science*, 10, 1147271.
<https://doi.org/10.3389/fmars.2023.1147271>
- Omura, Takuo & Iwataki, Mitsunori & Valeriano, Borja & Haruyoshi, T. & Fukuyo, Yasuwo. (2013). Marine Phytoplankton of the Western Pacific. Nippon Suisan Gakkaishi (Japanese Edition). 79. 486-488.
https://www.researchgate.net/publication/318787641_Marine_Phytoplankton_of_the_Western_Pacific

Acknowledgement

Christopher Kitalong, PhD, *Palau Community College-Cooperative Research and Extension*

Leilani Rechelluul, *Palau Community College-CRE*

Elchung Hideyos, MS, *Palau Community College-CRE*

Marinca Faimau, BS, *Palau Academic Institute for Research*

The STEP-UP High School program is supported by the
National Institute of Diabetes and Digestive and Kidney
Diseases of the National Institutes of Health, Grant
Number: 5R25DK078386-18.