
USP research in Fiji and the region

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Raw sources

Terrestrial sources - plants, animals, organism

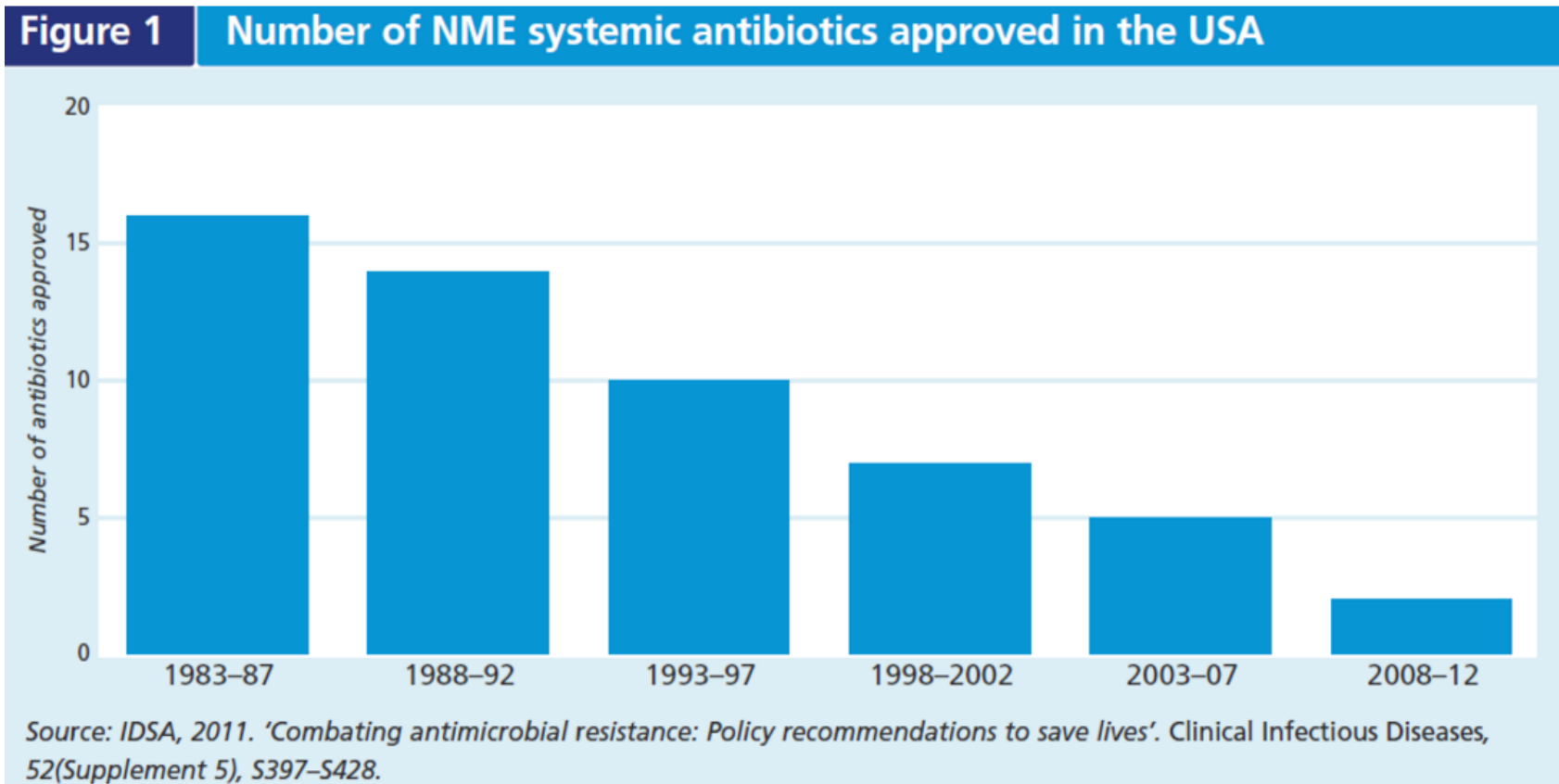
Bacteria

Marine sources – Micro or Macroorganisms or plants

Marine is understudied, less IP issues, less traditional knowledge associated

Bioprocessing: Background

Drug resistance on the rise - spread of superbugs that are *resistant* to all known *drug* treatments.



Bioprospecting - Background

- 50% of western medicines are derived from natural sources (e.g. aspirin, quinine, many anti-cancer agents and anti biotic drugs)
- Process takes 15–20 years and costs 10-100 million's
- 1 in 10,000 chance to develop medicine from given organism

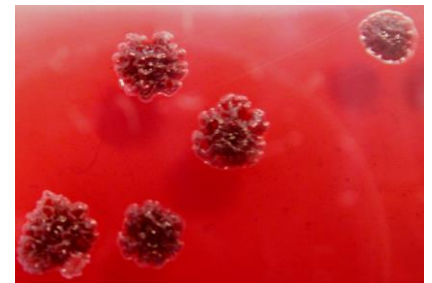
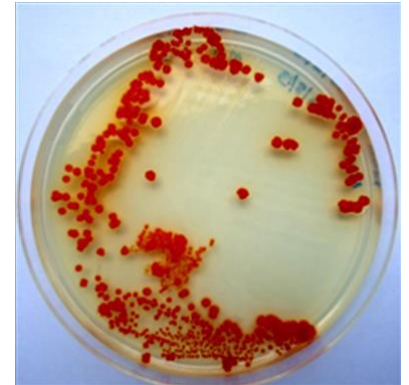
Groups of Invertebrates/Bacteria



Halimeda copiosa st 10.jpg



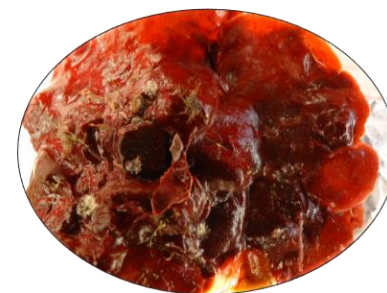
- Sponges (porifera) ~ 50%
- Algae ~ 10%
- Ascidians (chordata) ~ 10%
- Coelenterates (cnidaria) ~ 20%
- Others: bryozoans, crinoids
- Bacteria: Main target currently (culturability)
actinomycetes



Bioprocessing Process - 1

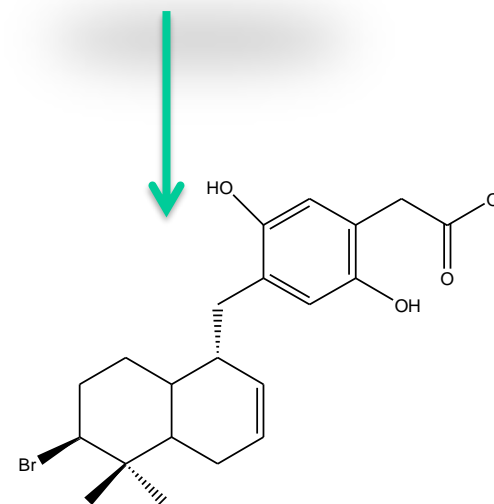
Bioprospecting

1. Information gathering
2. Access - Permitting
3. Collecting and Organism Identification



BIODISCOVERY

4. Extraction
5. Bioactivity Testing
6. Fractionation and Purification
7. Structure elucidation



2 Peyssonicoic acids

Prior Informed Consent



Permission through MoU or MTA



**MINISTRY OF AGRICULTURE, FISHERIES & FORESTS
DEPARTMENT OF FISHERIES**

Tech. Research Corporation
MOU between 1) Georgia ~~Institute of Technology~~, United States of America, 2) the people of Macuata Province and 3) Fisheries Department of the Ministry of Agriculture, Fisheries and Forests.

This Memorandum of Understanding (MOU) is a binding agreement between 1) Georgia Institute of Technology, United States of America, 2) the people of the ~~Macuata Province~~ *Macuata* Province – as owners of customary fishing right areas and 3) Fisheries Department of the Ministry of Agriculture, Fisheries and Forests – as representative of Fiji Government, pertaining to the taking of living marine organisms within Fiji fisheries waters for the general purpose of research work.

Summary:

The Intellectual Property Right (IPR) of the Ministry of Agriculture, Fisheries and Forests is in place, where its primary purpose is fully covered under the provisions in the Convention of Biological Diversity, which Fiji has ratified. The role of the IPRI is to ensure the protection of indigenous rights and resources from the exploits of outside forces and demands. It is paramount that indigenous and rural communities participation in the development of their natural resources are respected by all parties, and that sustainable resource use are the over-arching goals, and that any benefits derived should be equally entered by the same.

Conditions:

The following conditions shall apply:

1. All developments pertaining to the taking of living marine organisms within customary fishing right areas in the Fiji Islands shall be subjected to consent by the customary resource owners.
2. Any removal of live marine organisms (biological material) or materials derived therefrom as specimens out of the country for the purpose of scientific research work will require formal certification from the Fisheries Department.
3. Relevant copies of reports on these scientific research work will be made available to Fisheries Department and customary fishing right owners as and when required for their information, reference and record.
4. Permission must be obtained from the Permanent Secretary for Agriculture, Fisheries and Forests before the samples covered in this agreement are conveyed to any third party or any commercial use is made of the samples except for taxonomic identification purposes only.
5. Any scientific research work undertaken on these specimens for commercial purposes should have definite benefit sharing in place for the customary fishing right owners, the Fisheries Department and the country, as a whole.
6. A local sample collection center shall be set up in Fiji, with the assistance of Institute of Applied Sciences University of the South Pacific.

Acknowledged and agreed on:

this _____ day of _____, 20__

[Signature]
1) Georgia ~~Institute of Technology~~, United States of America
Georgia Tech Research Corporation

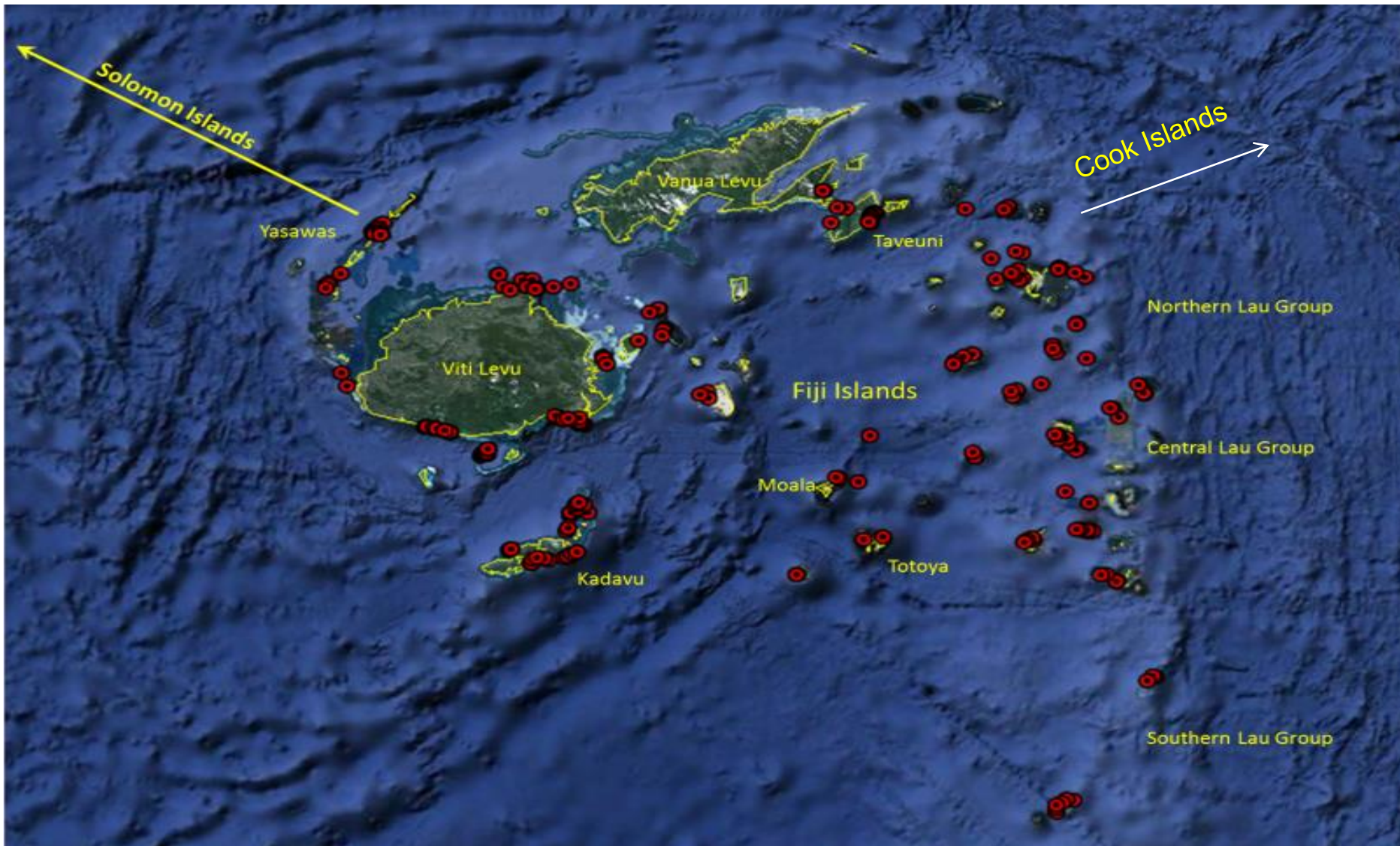
[Signature]
3) Chief Executive Officer for
Agriculture Fisheries and Forests

Qotilipi: _____

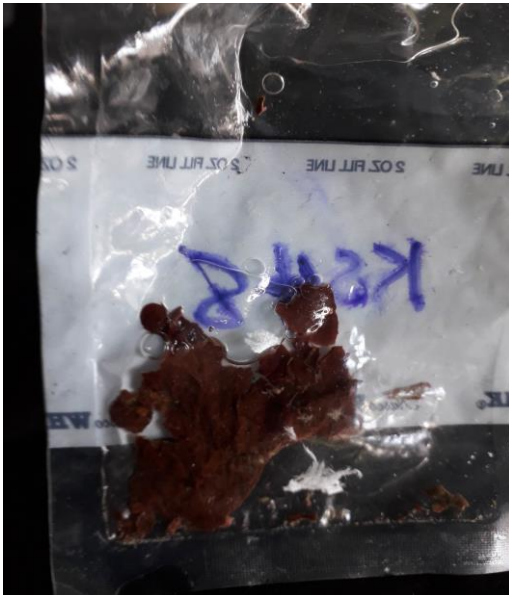
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Collection Sites in Fiji

GIT/USP/SIO collaboration



Collection

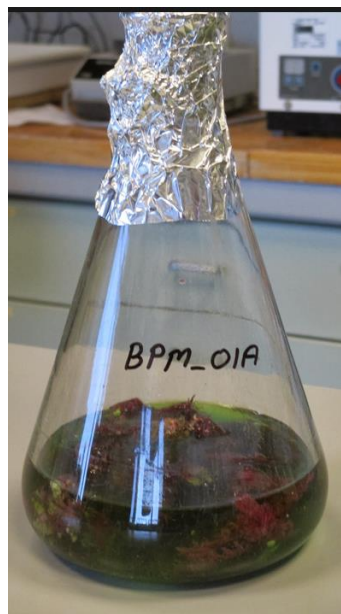


Identification,
labelling and
processing

Processing



Extraction and Purification



Sample
(Solvent extraction)

500g to 1Kg

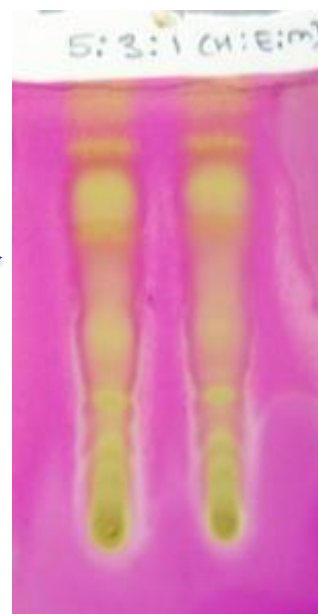
MeOH (3x)

DCM (3x)

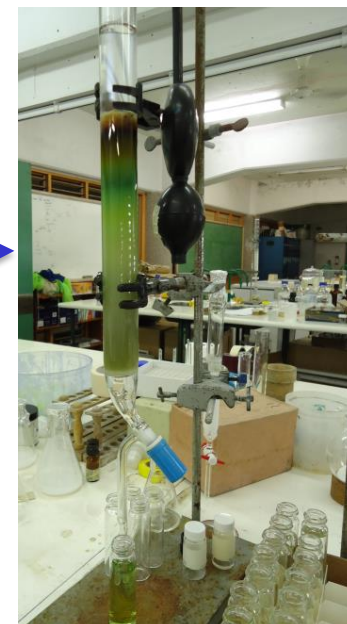


Evaporation
(Total Polar
Extract)

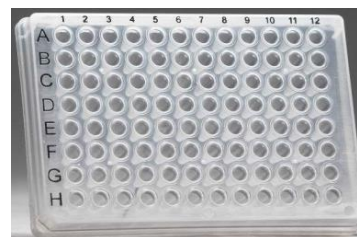
~ 3-15 g



TLC



**Flash
Purification**



In-vitro bioassay

Drug Discovery Process - 2

7. Organism Identification and Recollection
8. Product Development: Structure – Activity Relationships
9. Toxicology Tests
10. Clinical Trials
11. Commercial production
12. Product to market
13. Pray

COMMERCIALISATION
PHASE

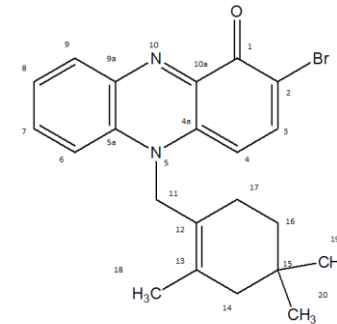




HPLC Purification

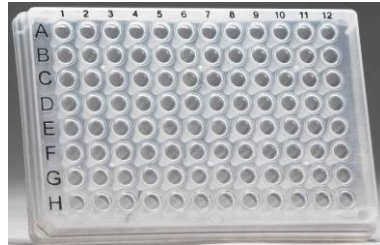
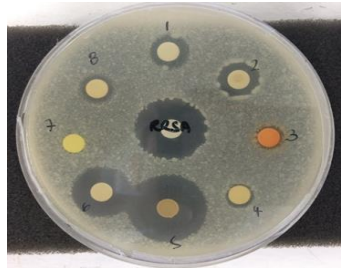


Spectroscopic analysis

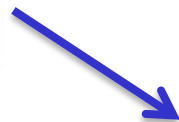


Marinophenazimycin A

Chemical structure



In-vitro bioassay



→ **Drug**

10-20 years to get to a usable drug (0.0001% probability)

Fijian Red alga



Callophycus serratus

32 Novel compounds in *C. serratus*
between 2006-2010

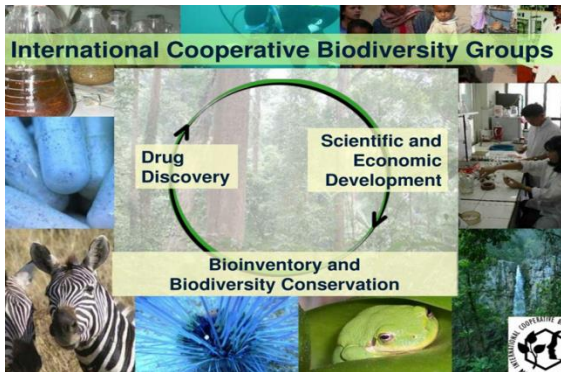
Antimalarial

Antimicrobial

👍 Anticancer

👍 Antitubercular

Contribution to National and capacities



- Technology Transfer
- Collection and Screening
- Compound Identification from sponge invertebrates
- Mentor researchers
- Contribute into development of marine conservation tool kits that assist FLMMA and USP-IAS



- Technology Transfer
- Collection and Screening
- Compound Identification from Actinomycetes
- Mentor researchers on marine microbiology research

- The ICBG work has been operating in Fiji since 2004
- The Fiji GEF project on Nagoya protocol and the Fiji ICBG project have established a solid base natural products research and assisted with Fiji's ABS policy framework

Diversification of research at IAS PNPRC within
marine space

GEF Fiji Nagoya Protocol
Implementation project
(2016-2018)



Ocean Acidification and
Blue Carbon research
(2019-2020)

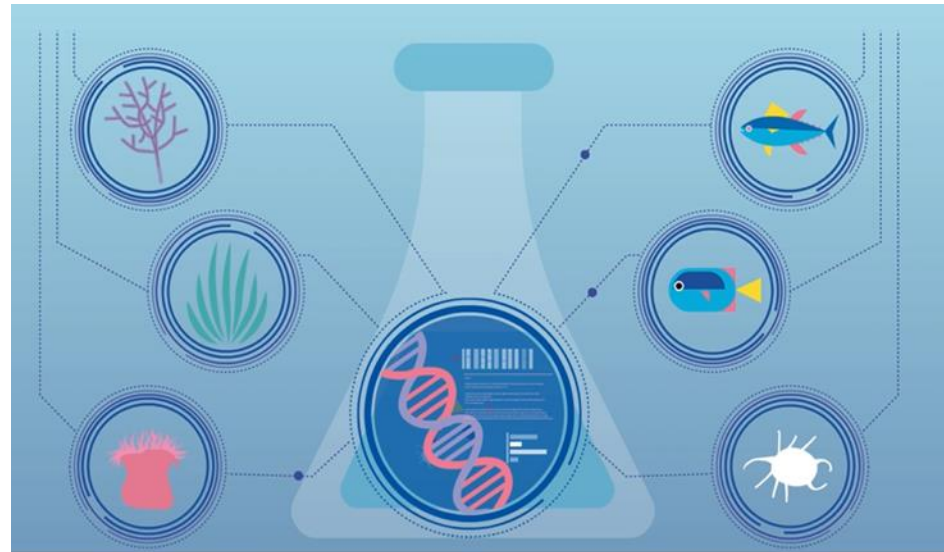


Marine Invasive species PacMAN (2021-2023)

<https://pacman.obis.org/>

1. Develop a marine “high risk” non-native invasive species monitoring plan
2. Build a easy to use (desk top) early warning decision support tool

[PacMAN Video](#)



Acknowledgements

Past members

Professor William Aalbersberg

Dr. Katy Soapi

Mr. Klaus Feussner

Dr. Jioji Tabudravu

Dr. Brad Carte

Dr. Ramesh Subramani

Dr. Girish Larkham

And the many not mentioned here



Current

Dr. Gilianne Brodie

Ms. Miriama Vuiyasawa

Saketa Rabuatoka (Part-time)

Partners

Prof Mark Hay's

Assoc. Professor Paul Jensen

Dr. Julia Kubanek

Prof Marcel Jaspers

