

# The 13<sup>th</sup> Annual Asia Pacific Mercury Monitoring Network Partners Meeting

Update on activities in the Pacific Islands (FIJI)

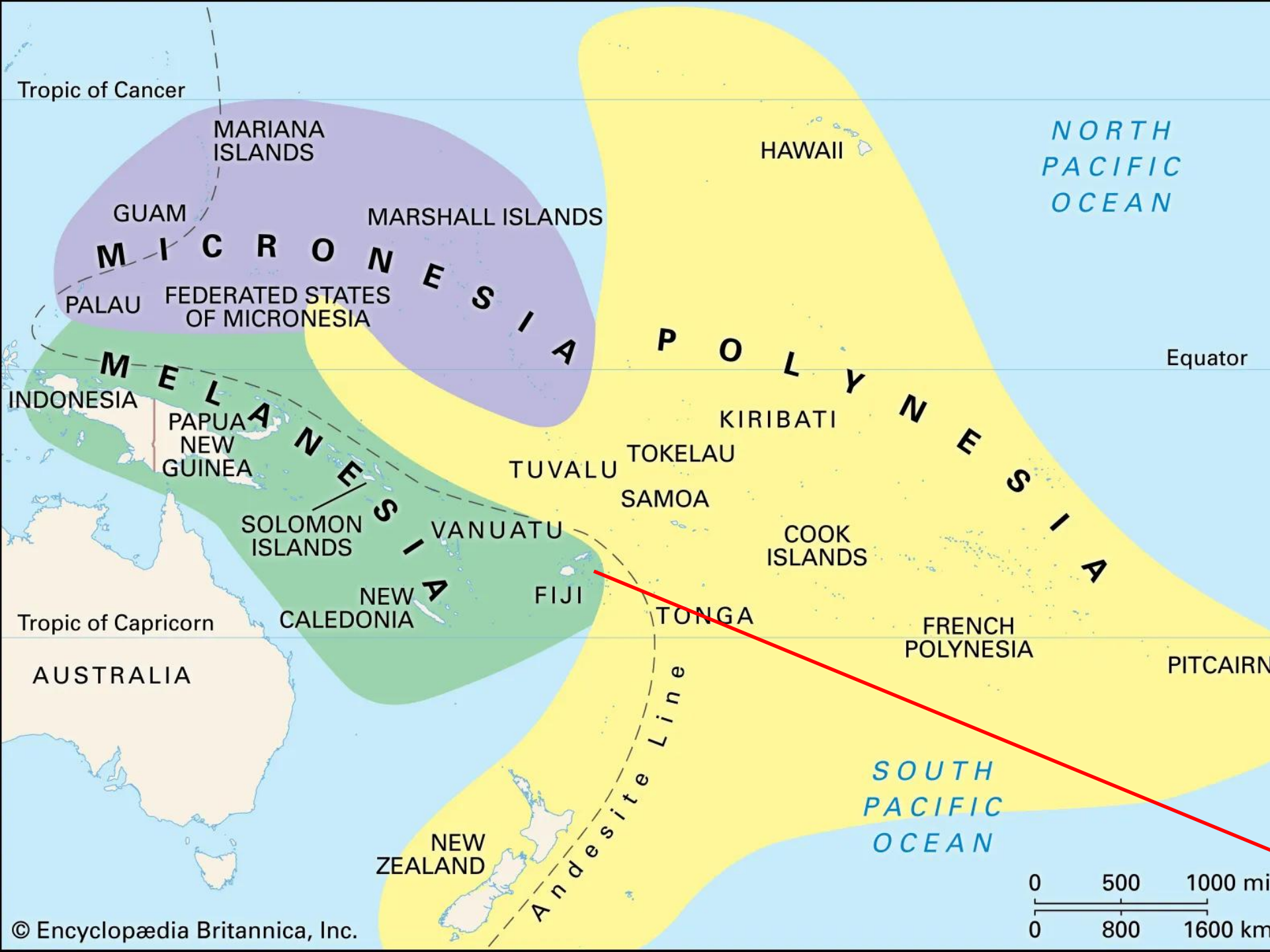
3 - 6 September, 2024

Taipei, Taiwan (ROC)

APMMN 2024

Dr. Vincent Lal, Manager Analytical Services.

[vincent.vishant.lal@gmail.com](mailto:vincent.vishant.lal@gmail.com)



# Summary

- Background
- APMMN activities in 2023
- Water samples using CVAAS
- Freshwater fish species
- Tuna species
- Freshwater mussel species
- Future work
- Acknowledgements

# Background

- The Institute of Applied Sciences (IAS) is based at the University of the South Pacific (USP) in Fiji which is co-owned by the 12 member Pacific Island countries
- IAS is working towards establishing a long-term mercury testing analytical capacity for the Pacific Island Region
- Facilitating regional research and commercial testing and monitoring of mercury in food, water and environmental samples
- Takes part in proficiency testing and Interlaboratory comparison activities for mercury (IAEA, fapas and UNEP)
- Accredited to ISO/IEC 17025 since 2004, mercury is an accredited test for food and water samples through IANZ (New Zealand)

# History of collaboration with APMMN in Mercury Research



IDEA Inc Consultants from Japan  
MOEJ (Japan)  
Training (January)

September  
Workshop in  
Manilla  
Philippines

Training  
workshop “wet-  
deposition”  
sampler in  
Taiwan  
June

APMMN  
Meeting in  
Indonesia

Taiwan ROC office  
(Fiji), NCU and USP  
staff commission wet  
deposition sampler  
and Workshop in Fiji  
November

Attend the 12<sup>th</sup>  
APMMN  
Meeting in  
Taipei, Taiwan

Expand  
monitoring  
activities, student  
research,  
purchase Direct  
Mercury Analysis  
system

2018

2018

2019

2019

2019

2023 - 2024



ICMGP 2019  
Kraków (Poland)

Covid throws a  
huge spanner to  
our operations  
2020 – 2022  
only online  
contact

Establish a CoE  
at USP Fiji for  
mercury testing  
and monitoring  
in Pacific Islands

# APMMN related Mercury Project – MOEJ, IDEA (Japan)



IDEA Consultants Researcher Miwako Ueda assists IAS Lab Technician Anaseini Turukawa in measuring hair samples for Mercury Analysis.

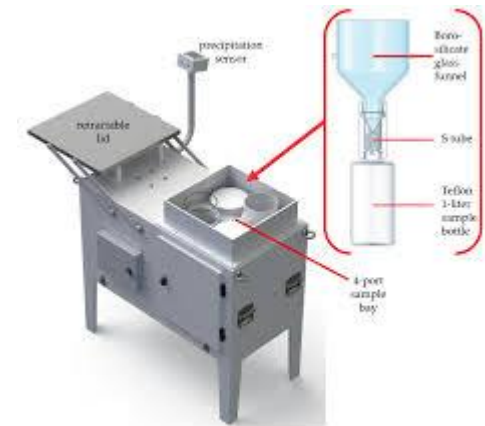


# Mercury Wet deposition Sampler: Taiwan EPA and NCU



# APMMN Activities in 2023

- Collection of rainwater samples from the wet deposition sampler
- Air sampling on third Tuesday using gold amalgamation trap
- MerPAS passive air sampling
- Received new MerPAS samplers to continue in 2024
- Analysis of mercury in particulates (air filters using PM 2.5)



# Water samples using CVAAS



FIMS 400

| Year           | Concentration (ng/L) |
|----------------|----------------------|
| July 2020      | 13                   |
| August 2020    | 9                    |
| September 2020 | 24                   |
| December 2020  | 20                   |
| January 2021   | 32                   |
| February 2021  | 49                   |
| March 2021     | 31                   |
| April 2021     | 9                    |
| August 2021    | 6                    |
| October 2021   | 16                   |

# Freshwater fish species

|    | sample name             | Conc (mg/kg) | Recovery |
|----|-------------------------|--------------|----------|
| 1  | L. equulus              | 0.09         |          |
| 2  | T.leptarus              | 0.30         |          |
| 3  | Caranx papnensis        | 0.05         |          |
| 4  | C.chanos                | 0.02         |          |
| 5  | Moolgarde scheli        | 0.02         |          |
| 6  | Sardinella fijiens      | 0.07         |          |
| 7  | K. munda                | 0.06         |          |
| 8  | Mesopristes kneri       | 0.10         |          |
| 9  | Mesopristes kneri SPIKE | 0.35         | 126      |
| 10 | Masit cephalus SPIKE    | 0.23         | 102      |
| 11 | Masit cephalus          | 0.02         |          |
| 12 | Sample blank            |              |          |

Levels are below CODEX regulatory value of 0.5mg/Kg



# Tuna species



- USP Lab receives tuna samples from exporters, importers and distributors
- These include fresh and or frozen tuna slices and canned tuna samples
- On average around 1500 samples of tuna per year; ~10% request Hg test
- Samples are accepted based on “Sample registration requirements”
- Samples prepared using acid digestion\* (muscle tissue) and analysed by Hydride Generation/Cold Vapour Atomic Absorption Spectrometry (CVAAS)

\*nitric-sulphuric-hydrochloric acid

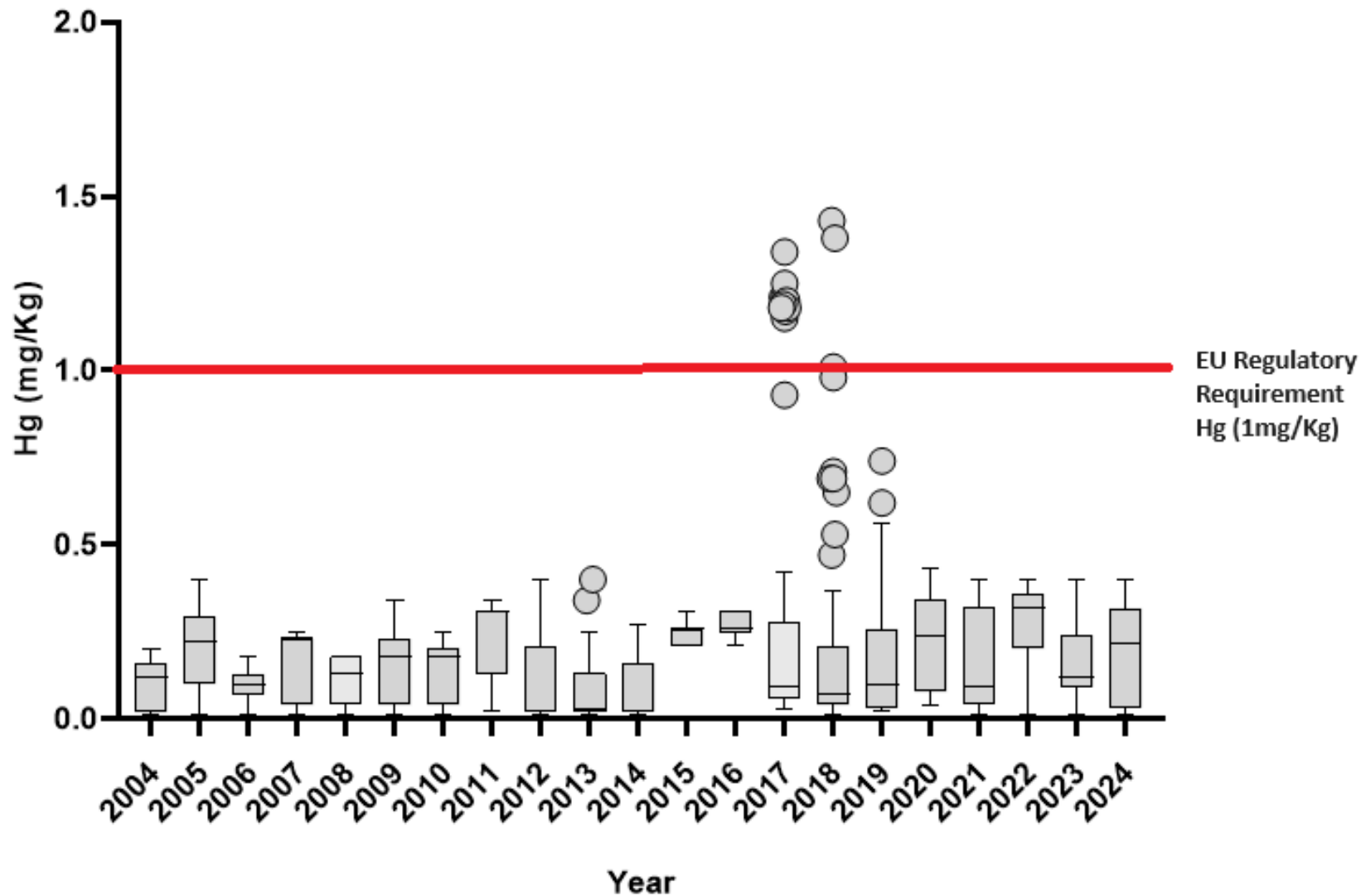
# Which tuna species are regularly tested?

- Tuna samples mainly received include:
  1. Albacore Tuna (*Thunnus alalunga*)
  2. Yellowfin Tuna (*Thunnus albacares*)
  3. Skipjack Tuna (*Katsuwanas pelamis*)
  4. Bigeye tuna (*Thunnus obesus*)
  5. Marlin (exact species is not mentioned)
  6. Canned tuna (some do not specify the tuna species)

# Tuna

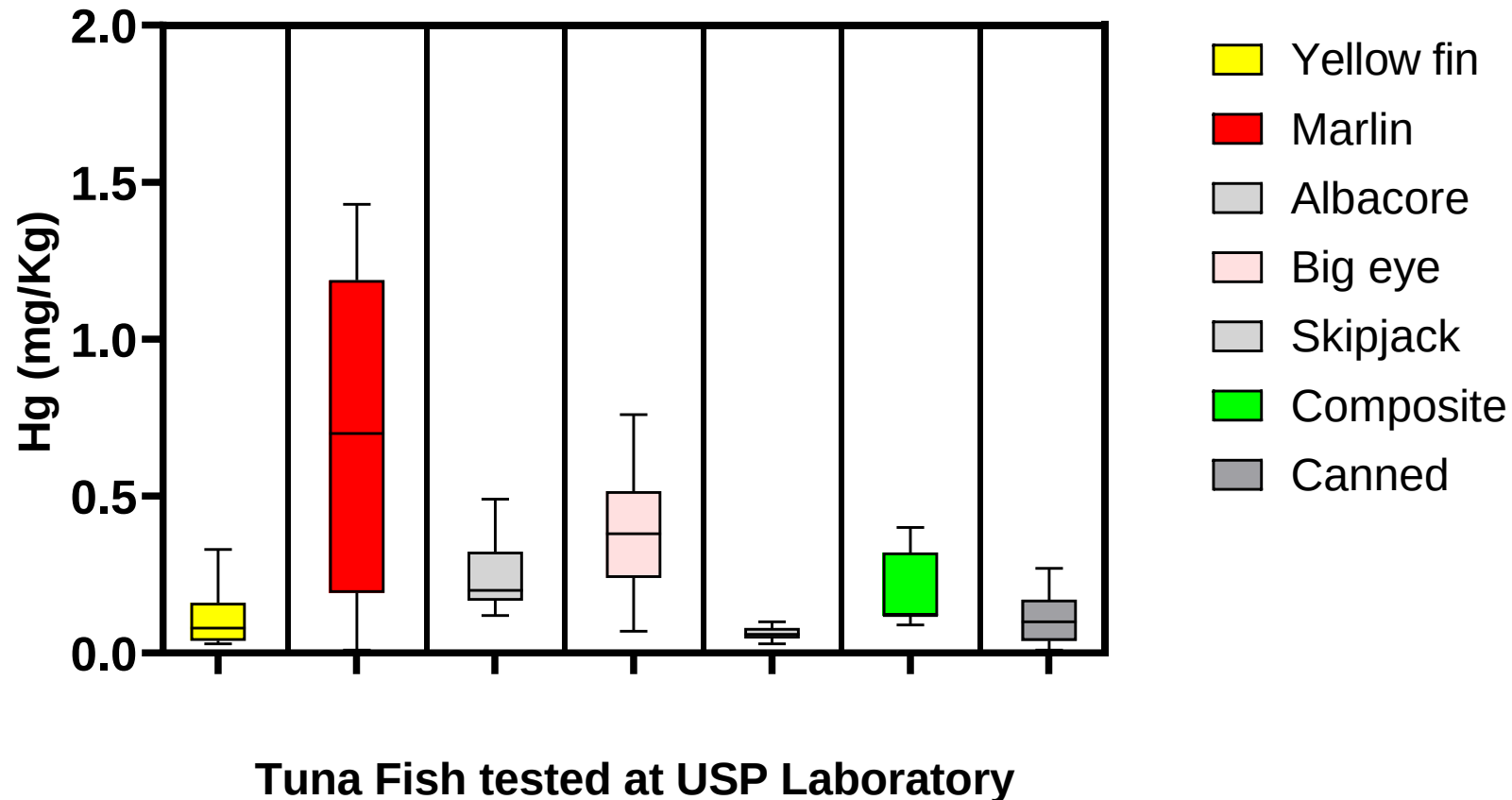
- Quality control and Quality assurance (QAQC) using laboratory blank, Tuna CRM #464 and spike recovery
- Total Hg measured in the range of 5.07-5.38 mg/kg (Certified value =  $5.24 \pm 0.10$  mg/kg based on 0.2g dry weight of the SRM)
- Spike recoveries within 90-110%
- The detection limit for Hg 0.02 mg/kg based on the analysis of 2 g of the fish sample

Mercury levels in Tuna from the Western Pacific Ocean



- Most tuna samples tested below the maximum EU and FAO/WHO (Codex) Requirement of 1 mg/Kg
- Post-Covid decline in large tuna species being tested in the laboratory
- No significant changes in Hg concentration over 20 years in tuna from the SWP Region

## Comparison of mercury levels in fresh and canned tuna



- Highest Hg concentration found in large predatory fish i.e. Marlin
- More composite fish samples (fresh and frozen tuna) are being tested post Covid
- Canned tuna had comparatively lower concentrations of Hg, mostly tuna species not indicated or is composite of different species



# Freshwater mussel species

| Sample No | Sample Id | Sample mass | conc (ug/L) | Sample volume (L) | Conc (mg/kg) | Average conc(mg/kg) | Recovery |
|-----------|-----------|-------------|-------------|-------------------|--------------|---------------------|----------|
| S1        | SF1-SPIKE | 0.2012      | 4.643       | 0.1               | 2.31         | 0.15                | 109      |
| S1        | SF2       | 0.2027      | 0.325       | 0.1               | 0.16         |                     |          |
| S1        | SF3       | 0.2028      | 0.266       | 0.1               | 0.13         |                     |          |
| S2        | SF4       | 0.2022      | 0.329       | 0.1               | 0.16         | 0.15                |          |
| S2        | SF5       | 0.2006      | 0.286       | 0.1               | 0.14         |                     |          |
| S2        | SF6-SPIKE | 0.2003      | 4.671       | 0.1               | 2.33         |                     | 109      |
| S3        | SF7       | 0.2004      | 0.355       | 0.1               | 0.18         | 0.25                |          |
| S3        | SF8       | 0.2009      | 0.631       | 0.1               | 0.31         |                     |          |
| S4        | SF9       | 0.2013      | 0.385       | 0.1               | 0.19         | 0.19                |          |
| S4        | SF10      | 0.2036      | 0.404       | 0.1               | 0.20         |                     |          |
| S5        | SF11      | 0.214       | 0.42        | 0.1               | 0.20         | 0.20                |          |
| S5        | SF12      | 0.2042      | 0.43        | 0.1               | 0.21         |                     |          |

The concentrations are below the MRL value of 0.5 mg/kg for Hg set by the EU

# Future work

- Continue mercury monitoring activities in Fiji and establish a pacific island regional mercury monitoring laboratory at USP (FIJI)
- Set-up passive air samplers (MerPAS) across the Pacific Island Countries covering Micronesia, Melanesia and Polynesia using USP Campus and Centre's in the 12 PICs
- Set-up wet-deposition samplers at the USP Campus in the Solomon Islands and Samoa Campus
- Purchase a Direct Mercury Analyzer for soil and sediment testing
- Adopt the GC-ECD method in the USP lab for methylmercury
- Continue to support mercury research through graduate student research at USP through scholarships (US Aid, ACIAR, DFAT and MFAT)

# Acknowledgements

- Taiwan EPA for supporting my travel to this meeting
- Taiwan ROC Mission in Suva, Fiji
- National Central University (Prof Guey-Rong Sheu and Da-Wei Lin)
- APMMN
- IDEA Consultants Inc and MOEJ (Government of Japan)
- US EPA (David and team)
- Late Prof Bill Aalbersberg for initiating mercury research in IAS

Thank you...any Questions.

