Mercury monitoring activities in the Pacific Island Region

Asia Pacific Mercury Monitoring Network - Fiji

9 December, 2025

Taipei, Taiwan R.O.C

APMMN 2025
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Summary

- Background
- APMMN in the Western Pacific 2018 – 2025
- APMMN Activities 2024 - 2025
- Environmental (Water, Air)
- Biota (freshwater fish and mussel species)
- Tuna species (Western Pacific)
- Recommendations
- Acknowledgement

Background

- The IAS Section at the Centre for Sustainable Futures (CSF) is based at the University of the South Pacific (USP) in Fiji. USP is co-owned by 13 Pacific Island Countries. Most member countries are spread over the vast Pacific ocean.
- Papua New Guinea (PNG) is the newest member, joined in 2025
- CSF is working towards building an accredited and reliable analytical laboratory in the Pacific Island Region for testing contaminants
- Facilitating regional research and commercial testing and monitoring of mercury in food, water and environmental samples
- Proficiency testing and Interlaboratory comparison activities for mercury (IAEA, fapas® and UNEP)
- Accredited to ISO17025 since 2004, mercury is an accredited test for food and water samples through Internal Accreditation New Zealand (IANZ)

APMMN in the Western Pacific 2018 - 2025

Asia-Pacific Mercury Monitoring Network

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

2018

September Workshop in Manilla, Philippines (August)

2018

Training workshop "wet-deposition" sampler in Taiwan (June)

2019

APMMN Meeting in Jakarta Indonesia (August)

2019

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

2019

Attend the 12-15th APMMN Meeting in Taipei, Taiwan

2023 - 2025

ICMGP 2024 CAPE TOWN • SOUTH AFRICA • 21 - 26 JULY CAPE TOWN INTERNATIONAL CONVENTION CENTRE

Cape Town (South Africa)

USP THE UNIVERSITY OF THE SOUTH PACIFIC

ICMGP 2019 Kraków (Poland)

Post-Covid Impact on Laboratory operations and funding 2020 – 2023

- Expand Hg monitoring
- Establish a CoE at USP 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.

Human hair samples

Seawater samples

Air samples (Active Sampler) and Training by IDEA, MOEJ (Japan)

Mercury Wet deposition Sampler: Taiwan MOENV and NCU

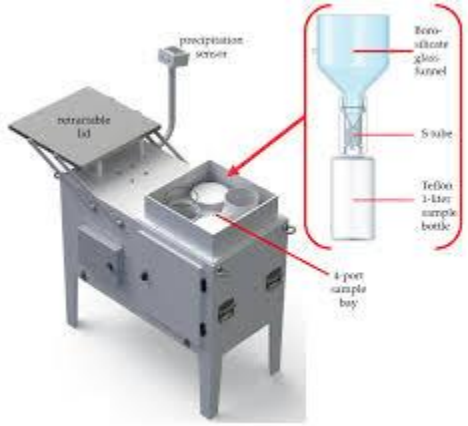
Capacity building and training opportunity at USP (Fiji)

Da-Wei from NCU provided training and installation

Hon. Jessica Lee launch the Wet-Deposition Sampler

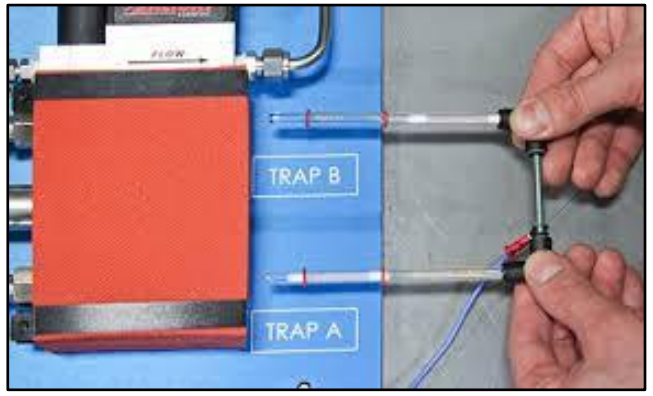
APMMN Activities in 2024 - 2025

- Collection of rainwater samples from the wet deposition sampler
- Air sampling using gold amalgamation trap
- MerPAS passive air samples
- Maintenance of the wet deposition sampler



Wet deposition Sampler

USP Postgraduate Students cleaning the sampler



Mercury sorbent trap

MerPAS (Air) Sampler

Environmental: Water Samples

- Rainwater, Drinking Water Influent, Effluent

Method: Mercury Page 1 Date: 3/6/2025 4:25:14 PM

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Analysis Begun

Logged In Analyst: .\fims Technique: AA FIMS-MHS
Spectrometer: FIMS-400, S/N B050-9560 Autosampler:

Sample Information File: C:\Users\Public\PerkinElmer Syngistix\AA\Data\Sample Information\Otiwa.sifx
Batch ID:
Results Data Set:
Results Library:

==========

Method Loaded
Method Name: Mercury Method Last Saved: 7/20/2023 4:11:13 PM
Method Description: Mercury

Analyte	Calibration Equation	Wavelength
Hg 253.7	Non Lin Thru 0	253.7

Method: Mercury Page 3 Date: 3/6/2025 4:25:14 PM

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Sequence No.: 6 Autosampler Location:
Sample ID: NIST 20X Date Collected: 3/6/2025 1:54:06 PM
Analyst: Data Type: Original
Initial Sample Wt: Initial Sample Vol:
Analyst Dilution Factor: Sample Prep Vol:
Wash Time (before sample): 0 System Dilution Factor: 1

Replicate Data: NIST 20X Analyte: Hg 253.7

Repl #	SampleConc µg/L	StndConc µg/L	BlnkCorr Signal	Peak Area	Peak Height	Time	Peak Stored
1	4.853	4.853	0.0968	0.5367	0.0969	1:55:04 PM	No
2	4.852	4.852	0.0968	0.5350	0.0969	1:55:38 PM	No
3	4.860	4.860	0.0970	0.5367	0.0970	1:56:12 PM	No
Mean:	4.855	4.855	0.0969				
SD:	0.0044	0.0044	0.0001				
%RSD:	0.09%	0.09%	0.09%				

Certified Mercury Mass Fraction: 0.1013 mg/kg ± 0.0024 mg/kg ***(0.97mg/kg)***

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

NIST NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY U.S. DEPARTMENT OF COMMERCE

Date of Issue: 06 March 2025

Standard Reference Material® 1641f

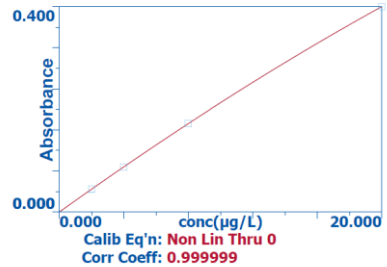
Mercury in Water

CERTIFICATE OF ANALYSIS

Calib

Method: Mercury
Result:

Hg 253.7



FIMS 400

Biota - 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		

Local fish species (*1 species analyzed is endemic to Fiji*)
- muscle tissue

Biota- Freshwater mussel species

- Muscle tissue

Batissa violacea

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		109
S1	SF2	0.2027	0.325	0.1	0.16		
S1	SF3	0.2028	0.266	0.1	0.13	0.15	
S2	SF4	0.2022	0.329	0.1	0.16		
S2	SF5	0.2006	0.286	0.1	0.14	0.15	
S2	SF6-SPIKE	0.2003	4.671	0.1	2.33		109
S3	SF7	0.2004	0.355	0.1	0.18		
S3	SF8	0.2009	0.631	0.1	0.31	0.25	
S4	SF9	0.2013	0.385	0.1	0.19		
S4	SF10	0.2036	0.404	0.1	0.20	0.19	
S5	SF11	0.214	0.42	0.1	0.20		
S5	SF12	0.2042	0.43	0.1	0.21	0.20	

Tuna species (Western Pacific)

- USP Lab receives tuna samples from exporters, importers and distributors
- These include fresh and or frozen tuna slices and canned tuna samples
- Mostly caught from vessels operating in the Western Pacific
- Some samples from Northern Pacific (Micronesia i.e. RMI, Kiribati)
- 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 analyzed by Hydride Generation/Cold Vapor Atomic Absorption Spectrometry (CVAAS)

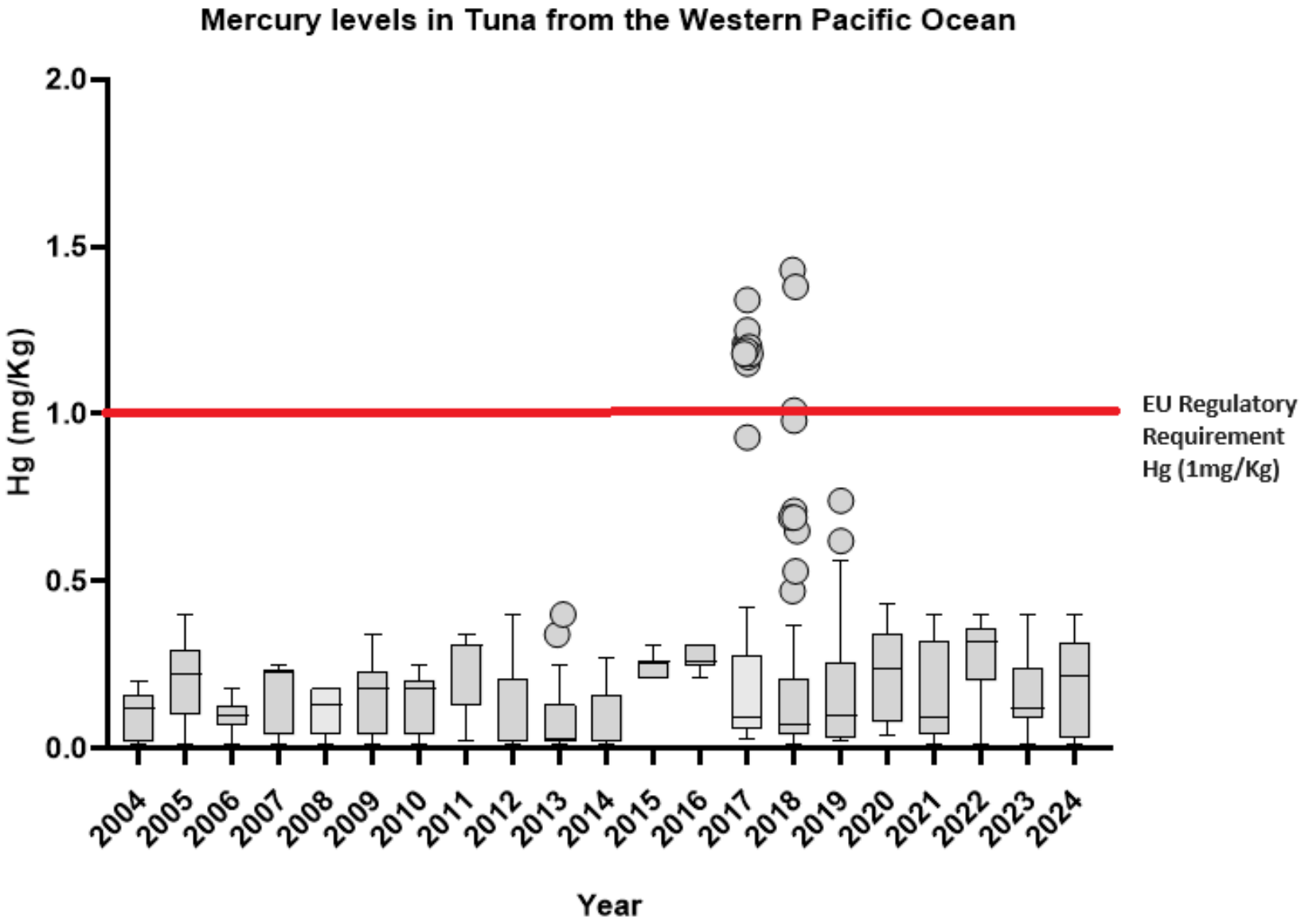
*nitric-sulphuric-hydrochloric acid

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)

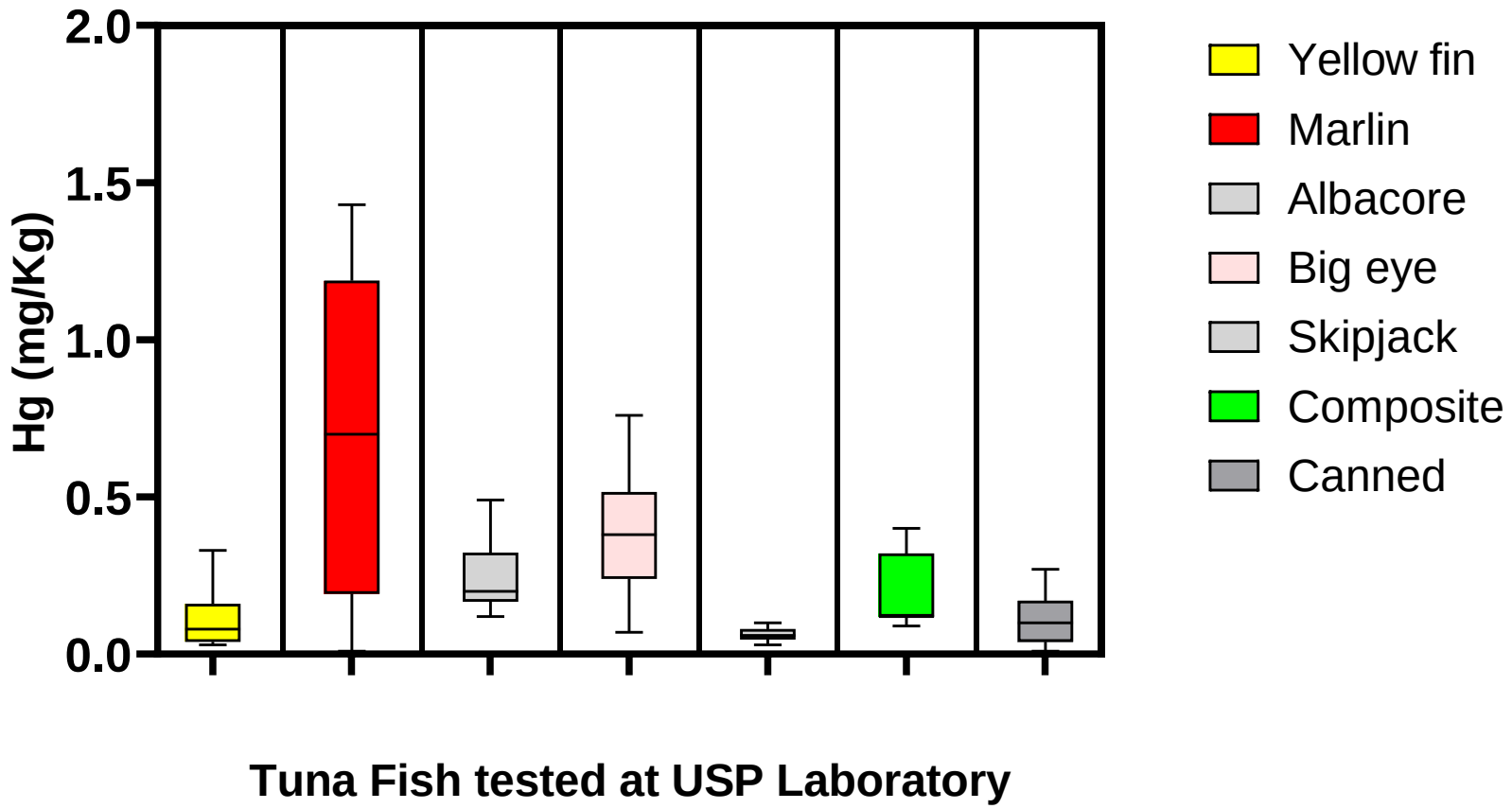
Tuna

- 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 ± 0.10 mg/kg based on 0.2g dry weight of the SRM)
- Spike recoveries within 90-110%
- The detection limit for Hg 0.020 mg/kg based on the analysis of 2 g of the fish sample



- Most tuna samples tested below the maximum EU and FAO/WHO (Codex) Requirement of 1 mg/Kg
- No significant changes in Hg concentration over 20 years in tuna from the SWP Region
- Influx of samples for testing 2017 – 2019, tuna species often not specified in slice fish

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

Recommendation

1. APMMN to Sign an MoU with USP and the Centre for Sustainable Futures for long-term mercury monitoring in the Pacific Islands
2. Taiwan MOENV, Japan MOEJ, IDEA and US EPA with USP to set-up a Centre of Excellence (CoE) for testing of contaminants at USP
3. Taiwan R.O.C. and USP to have PhD, MSc and Research Staff exchange through existing scholarships and mobility program
4. Supply of sample bottles to store and send samples to NCU laboratory in Taiwan
5. Possible funding for a negative 80 degree freezer (sample bank)
6. Assistance in analysis of MerPAS and Sorbent trap samples
7. Possible funding or training support for DC-AAS (Direct combustion – AAS)

Acknowledgements

- IDEA Consultants Inc and MOEJ (Government of Japan) for funding support and active sampling for air in Fiji
- Taiwan MOENV for APMMN Meeting as Host
- Taiwan ROC Mission in Suva, Fiji
- National Central University (Prof Guey-Rong Sheu and Da-Wei Lin)
- APMMN for supporting Hg monitoring activities MerPAS
- US EPA (David and team)
- Late Prof Bill Aalbersberg for initiating mercury research in IAS

Thank you…any Questions.