

COLLABORATIVE RESEARCH SURVEY ON MARINE FISHERIES RESOURCES AND ENVIRONMENT IN THE GULF OF THAILAND 2018

Mercury level and health risk through consumption of Threadfin bream (*Nemipterus spp.*) from The Gulf of Thailand

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Introduction

Threadfin bream fish



*Nemipterus
nemurus,*



N. tambuloides

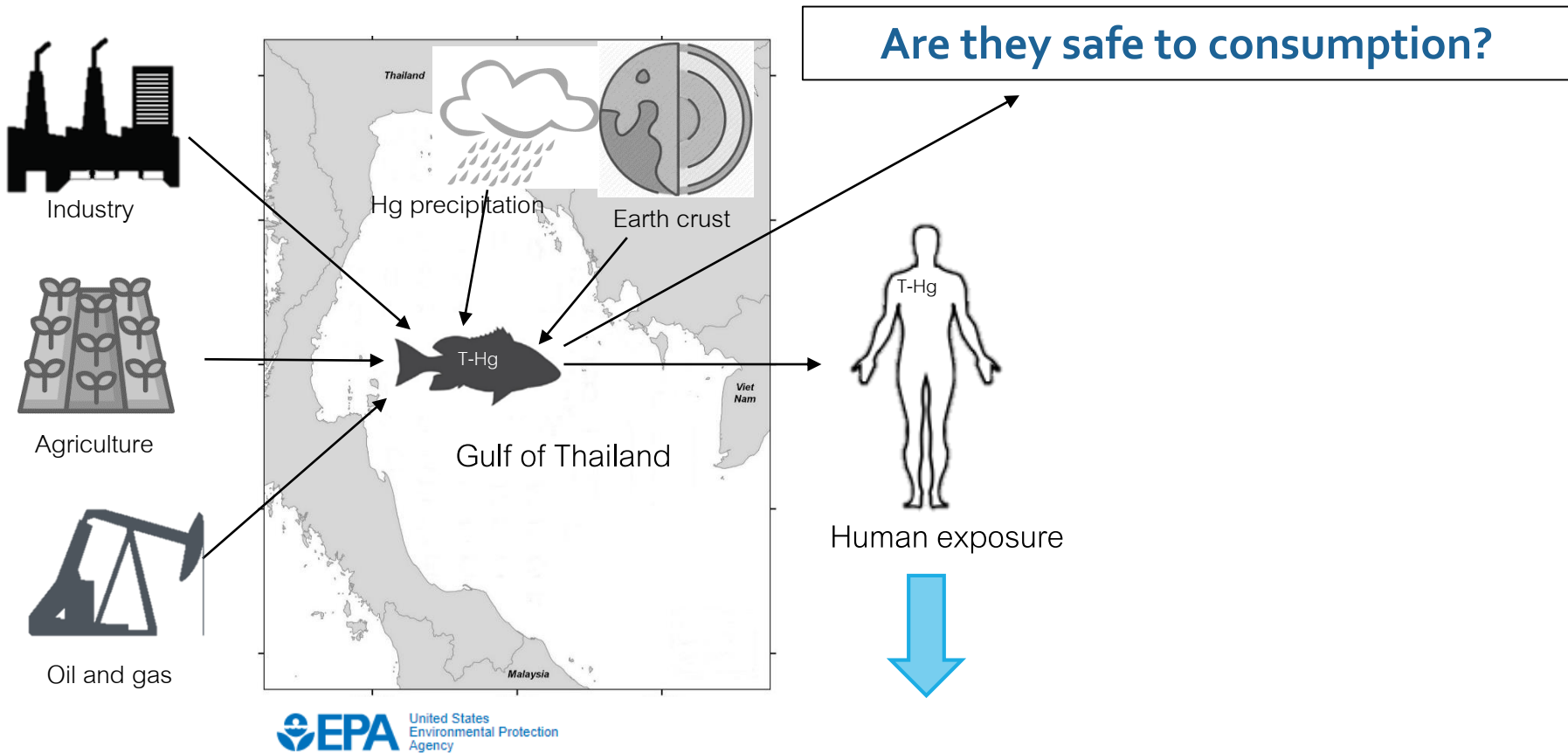


N. peronii

Bangkok market



<https://web.facebook.com/seafoodmarketsukhumvit24/photos/rpp.580768038706003/2061934563922669/?type=3&theater>



Risk Assessment

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Human Health Risk

Human Health Risk Assessment

Basic Information

Children & Risk Assessment

<https://www.epa.gov/risk/human-health-risk-assessment>

Objectives of study

Determined T-Hg in Threadfin bream (*Nemipterus* spp.) from the Gulf Thailand

Evaluated the relationship between T-Hg and capture location and fish size (length and weight)

Assessed the risk assessment of T-Hg for human consumption from the Gulf of Thailand

Research Methods

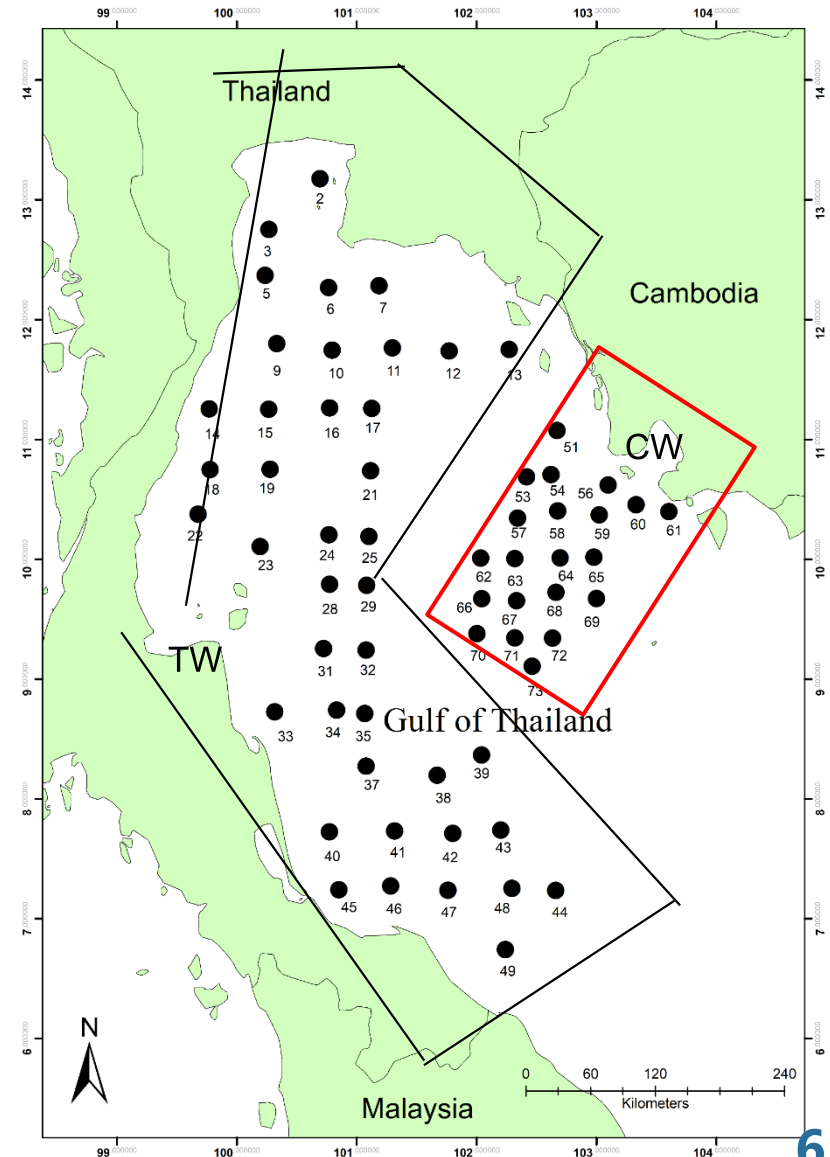
- Research Location :

Thailand waters (TW) st. 1 – 50

Cambodian waters (CW) st. 51 – 73

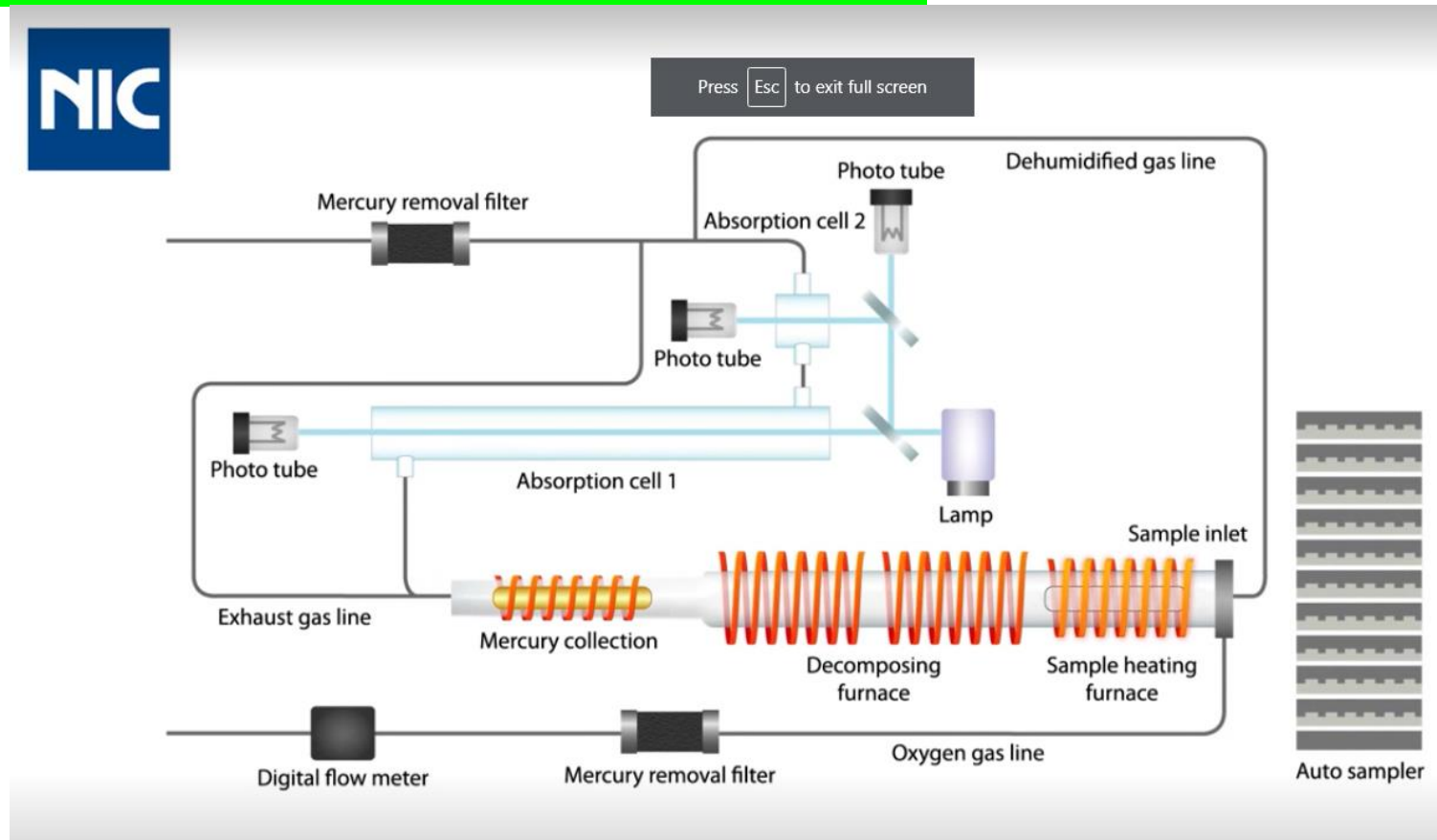
- Sample collection

- All of fish were collected by *bottom trawling* during SEAFDEC-2 cruise in 2018.
- All samples were measured before the muscle samples separated from the fish
- The fish species and feeding habitat were identified based on fish identification book (Ahmad et al., 2018) and www.fishbase.se



Total mercury (T-Hg) Analysis

- All samples were analyzed by NIC MA-3000 Direct Thermal Decomposition Mercury Analyzer (gold amalgamation, cold vapor atomic absorption spectroscopy detection)



Risk Assessment (USEPA, 2000)

$$\text{Estimated daily intake (EDI)} = (\text{FIR} \times \text{Cm}) / \text{BW} \quad (1)$$

$$\text{Hazard Quotient (HQ)} = \text{EDI} / \text{RfD} \quad (2)$$

$$\text{Max. safe weekly consumption (MSWC)} = \text{TRV} \times \text{BW} \times 7 / \text{Cm} \quad (3)$$

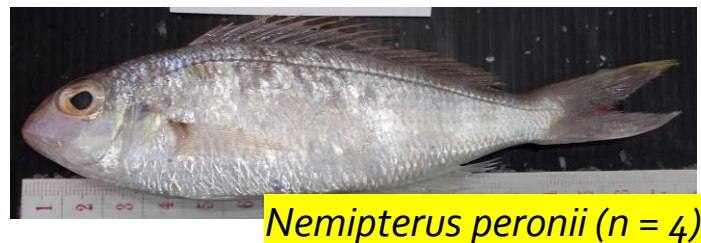
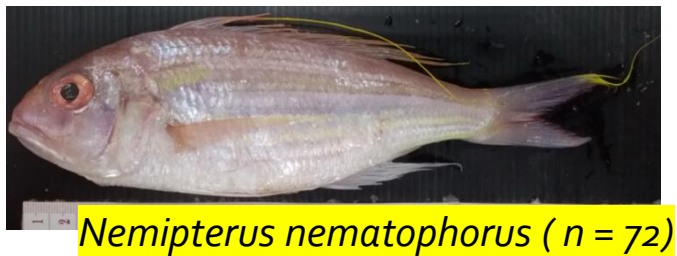
Where;

- **Cm** is the proportionality between T-Hg and MeHg (methyl mercury) (in $\mu\text{g}/\text{kg}$ wet weight) based on a ratio of 93% in fish species being both common and acceptable (Anual et al., 2018),
- **FIR** is the fish ingestion rate in Thailand ($0.086 \text{ kg day}^{-1} \text{ person}^{-1}$) (Needhan & Funge-Smith, 2015),
- **BW** is the adult body weight average in Thailand (56 kg for adults) (Mathuramon et al., 2009).
- **RfD** is oral reference dose for MeHg ($0.1 \text{ kg day}^{-1} \text{ person}^{-1}$) (USEPA, 2019),
- **TRV** is the toxicological reference value at $0.23 \mu\text{g kg}^{-1} \text{ day}^{-1}$; (JECFA, 2007) and 7 is the number of days in one week.

Results & discussion

Thai waters

(8 species; *N. furcosus*, *N. hexodon*, *N. japonicus*, *N. marginatus*, *N. nematophorus*, *N. nemurus*, *N. peronii*, *N. tambuloides* (Ahmad et al., 2018).



Cambodian waters

(6 species; *N. furcosus*, *N. japonicus*, *N. marginatus*, *N. nematophorus*, *N. nemurus*, *N. Tambuloides*. (Ahmad et al., 2018)



Nemipterus furcosus (n = 10)



Nemipterus marginatus (12)



Nemipterus japonicus (n = 1)



Nemipterus nemurus (n = 21)

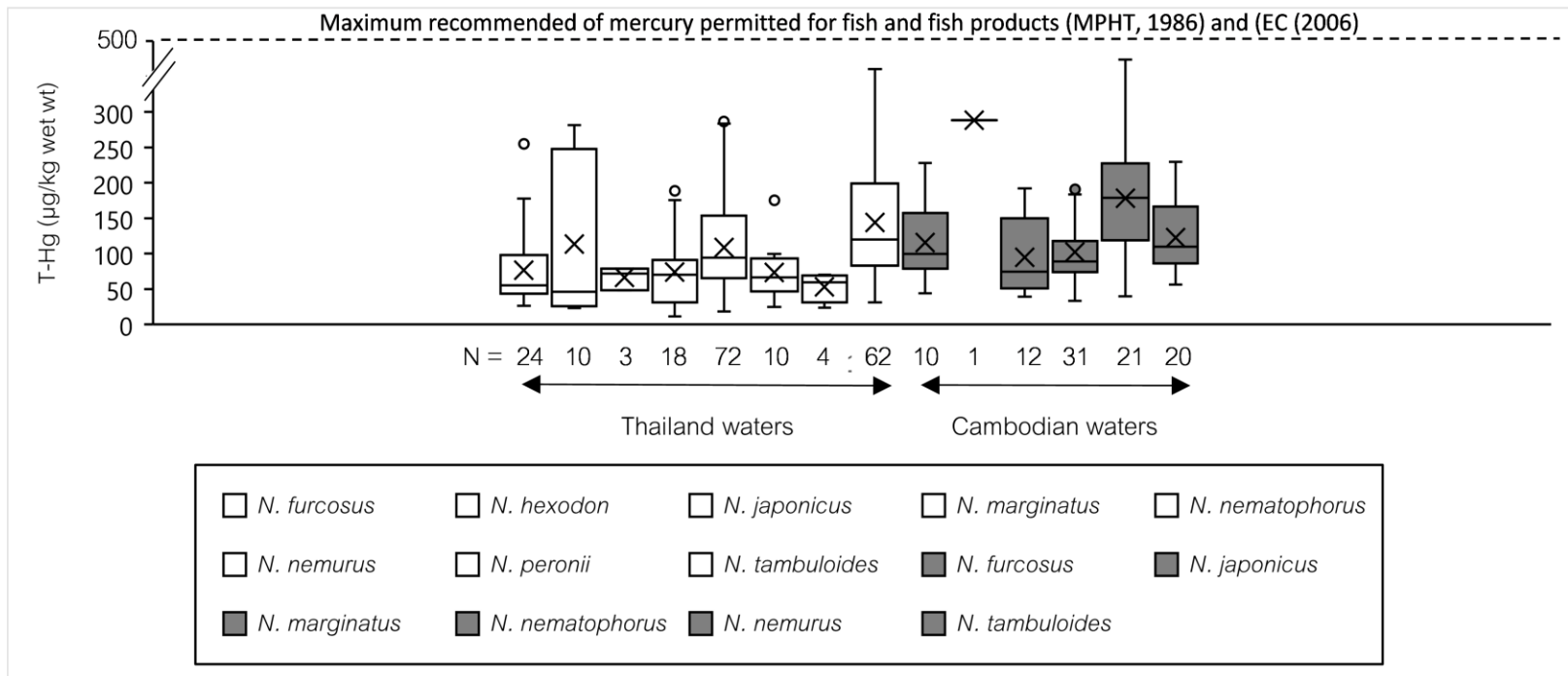


Nemipterus nematophorus (n = 31)



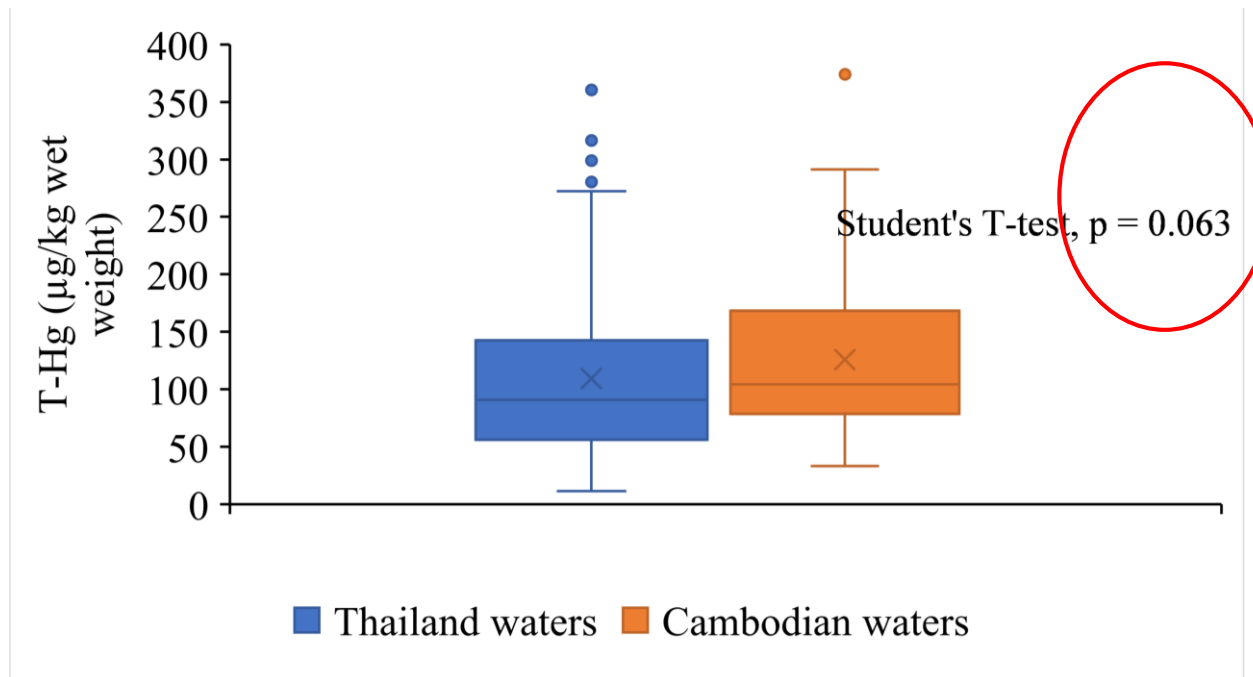
Nemipterus tambuloides (20)

T-Hg in *Nemipterus* spp collected from Thai and Cambodian waters



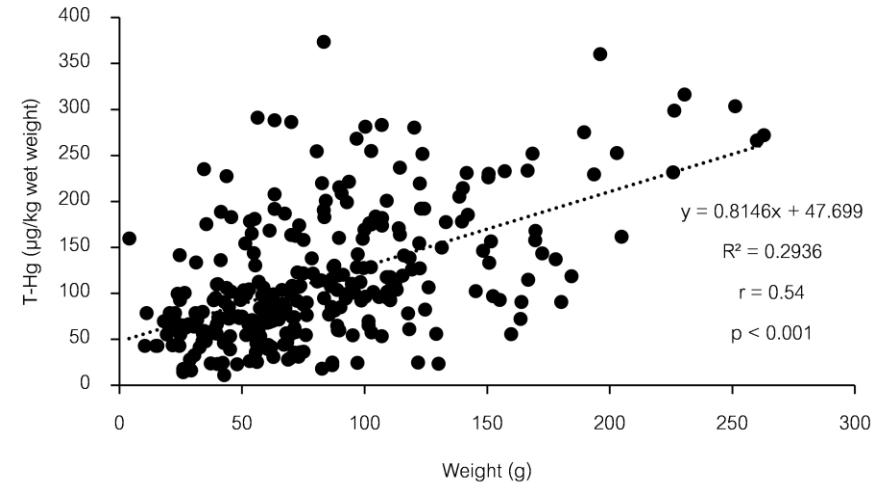
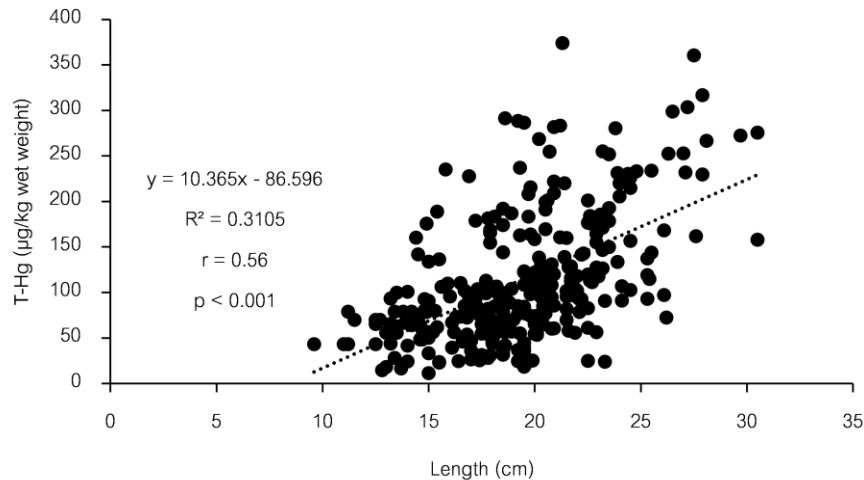
- All samples below the standard guidelines from Ministry of public Health, Thailand (1986), and European Commission Regulation (2006).
- The variation of T-Hg levels in this study might be related to feeding habit and habitat, which *Nemipterus* spp feeding on crustaceans, fishes, and mollusks (Afshari et al (2013)).

T-Hg in Thai vs Cambodian waters



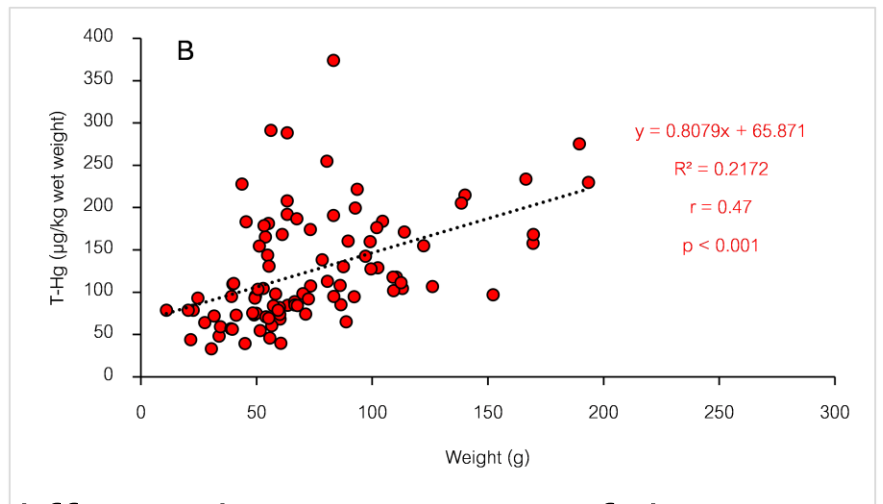
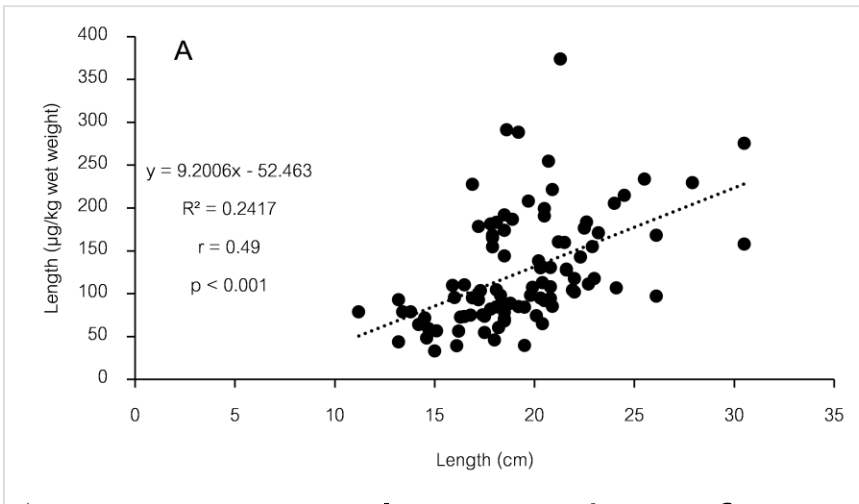
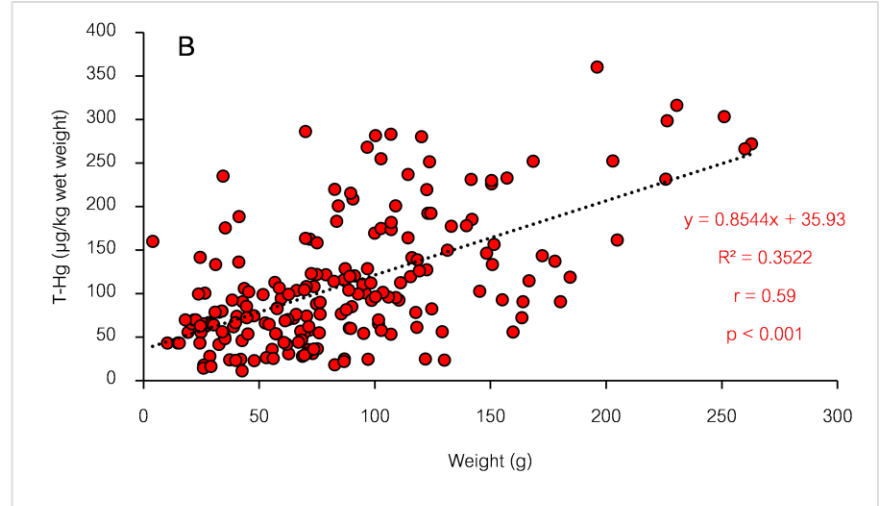
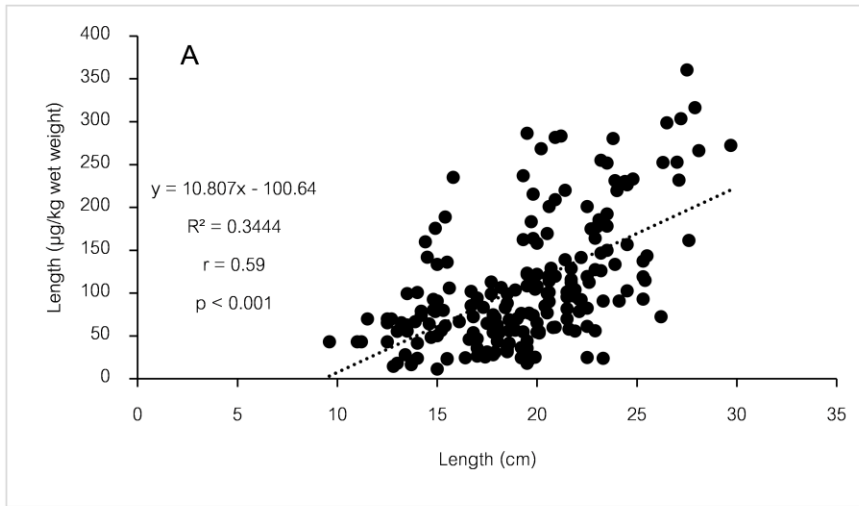
No significant difference were found between T-Hg levels in *Nemipterus spp* in Thailand and Cambodian waters
(Student's test, $p = 0.063$)

T-Hg vs fish size from the Gulf of Thailand



- Positive correlation and significance different were found between T-Hg vs all fish size ($p < 0.001$).
- These findings indicate that the T-Hg in *Nemipterus* spp increased along with fish size.

T-Hg vs All fish size (Thai and Cambodian waters)



- Positive correlation and significance different between T-Hg vs fish size ($p < 0.001$).
- Indication of an increase of T-Hg in *Nemipterus* spp with fish size.

Risk Assessment

Thai waters

No	Scientific name	n	T-Hg (µg/kg ww)	HQ	MSWC (kg/week)
1	<i>N. furcosus</i>	24	76.4	1.09	1.26
2	<i>N. hexodon</i>	8	113	1.62	0.85
3	<i>N. japonicus</i>	3	66.2	0.95	1.45
4	<i>N. marginatus</i>	18	73.8	1.05	1.31
5	<i>N. nematophorus</i>	72	109	1.55	0.89
6	<i>N. nemurus</i>	10	73.5	1.05	1.31
7	<i>N. peronii</i>	4	53.2	0.76	1.81
8	<i>N. tambuloides</i>	62	144	2.06	0.67
MPHT (1986)			500		
EC (2006)			500		
USEPA (2000)				1	

HQ values in Thai waters

= 0.76 – 2.06

The highest of MSWC was *N. peronii* (1.81 kg/week) and the lowest was *N. tambuloides* (0.67 kg/week).

Cambodian waters

No	Scientific name	n	T-Hg (µg/kg ww)	HQ	MSWC (kg/week)
1	<i>N. furcosus</i>	10	116	1.65	0.83
2	<i>N. japonicus</i>	1	288	4.12	0.33
3	<i>N. marginatus</i>	12	94.6	1.35	1.02
4	<i>N. nematophorus</i>	31	102	1.46	0.94
5	<i>N. nemurus</i>	21	178	2.55	0.54
6	<i>N. tambuloides</i>	20	122	1.75	0.79
MPHT (1986)			500		
EC (2006)			500		
USEPA (2000)				1	

HQ values in Cambodian waters

= 1.35 – 2.55

The highest was of MSWC *N. marginatus* (1.02 kg/week) and the lowest was *N. japonicus* (0.33 kg/week).

Overall, *Nemipterus* spp from Thai and Cambodian waters **might cause health risk for human consumption, except *N. peronii***".16

CONCLUSION

- THg in *Nemipterus* spp from the Thailand and Cambodian waters were below the standard guidelines
- T-Hg levels collected from Thai and Cambodian waters were not significance different
- Positive correlation was observed between T-Hg levels and fish size (length and weight)
- Most of Hazard Quotient (HQ) values > 1 , except *N. peronii* from Thai waters
- Threadfin bream (*Nemipterus* spp.) might pose a potential risk for the human consumption (HQ > 1)

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Thank you



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