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

The Study of Sediment Distribution Coefficients (K_d) for Radionuclides in the Gulf of Thailand

Presented by

Darunwan CHUENBUBPAR, Chitsanupong Khrautongkieo, Nattchakarn Nakkaew, Rungsuk Suwanklang, Yutthana Tumnoi and Isara Chanrachkij

Office of Atoms for Peace

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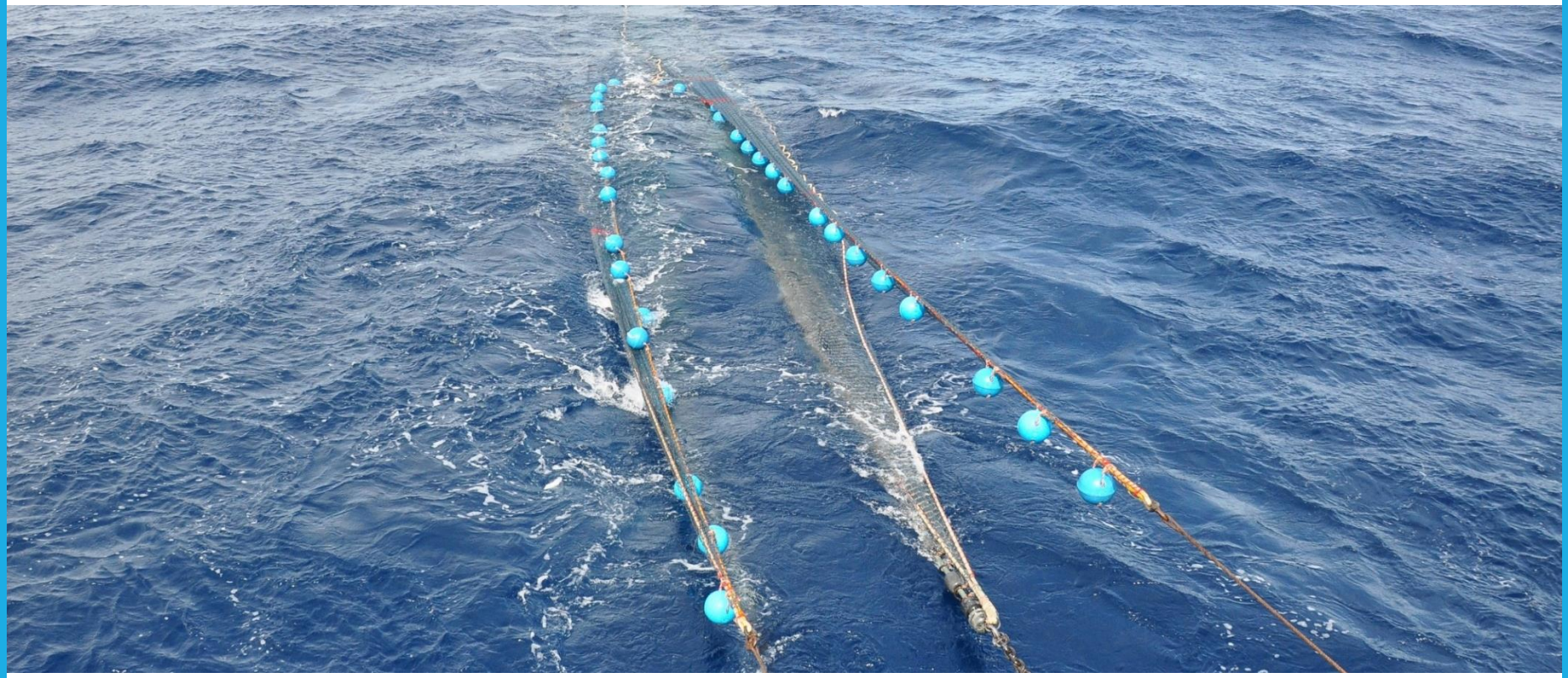
Training Department, Samut Prakan, Thailand

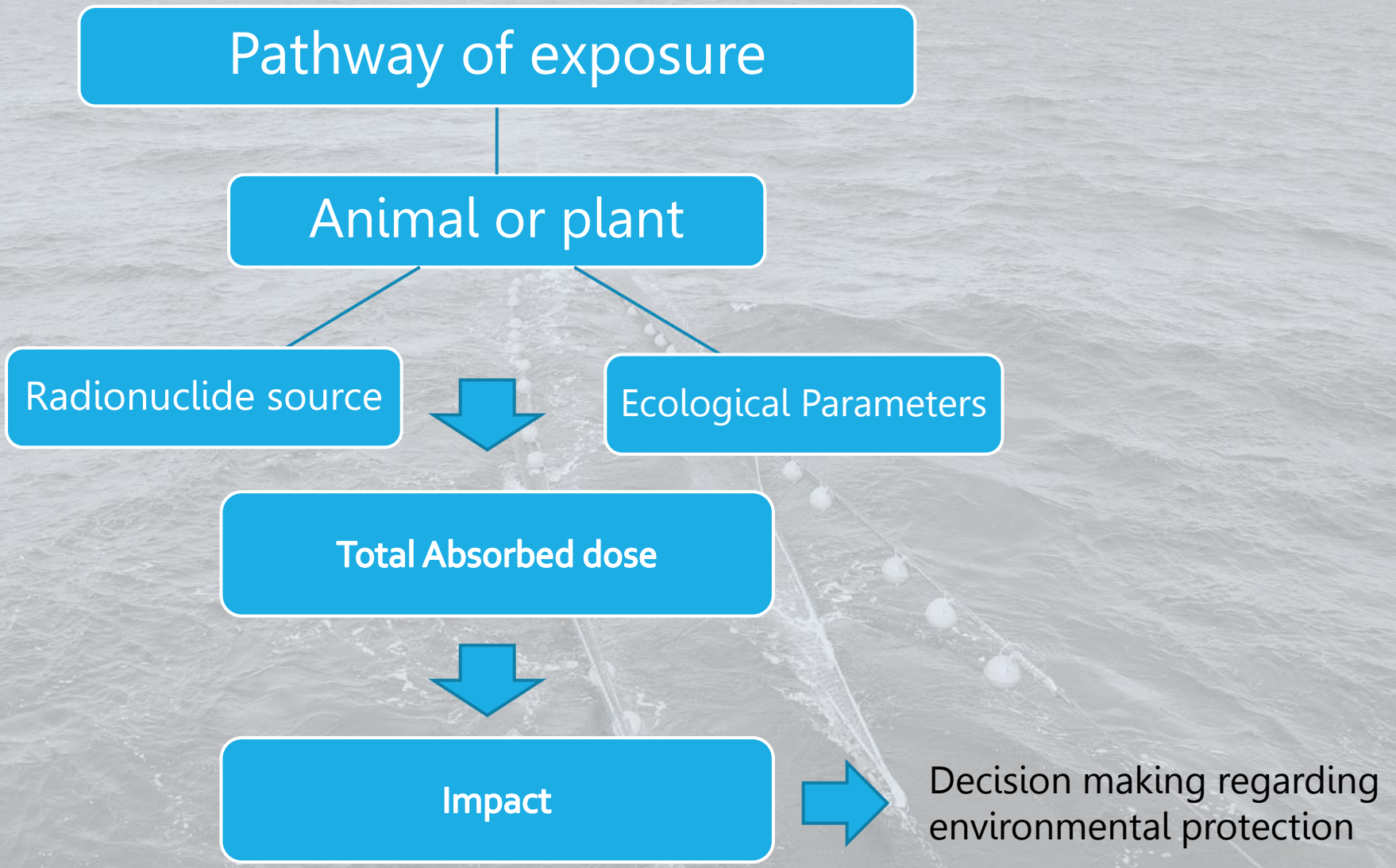
Outline

- Introduction
- Materials and methods
- Results and discussion
- Conclusion

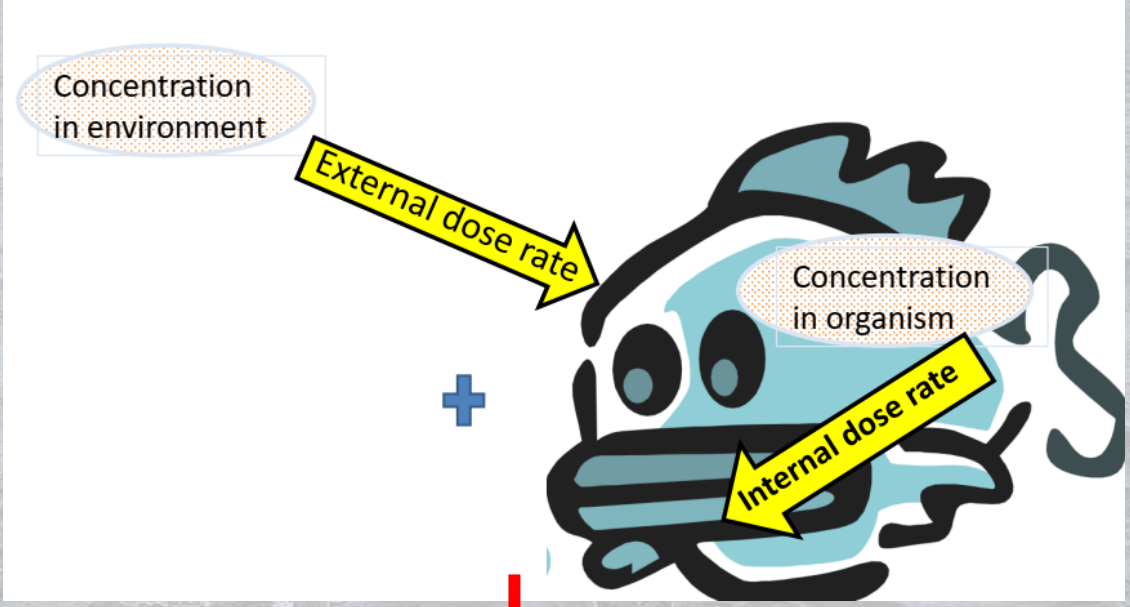


INTRODUCTION

Assessment


Pathway of exposure
Animal or plant
Radionuclide source
Ecological Parameters
Total Absorbed dose
Impact
Decision making regarding environmental protection

Radiation Dose and Risk Assessment in Biota



Total Dose (μGy/h)

$$K_d \text{ (dimensionless)} = \frac{\text{concentration per unit mass of particulate } (\frac{kg}{kg} \text{ or } \frac{Bq}{kg \text{ dry weight}})}{\text{concentration per unit mass water } (\frac{kg}{kg} \text{ or } \frac{Bq}{Kg})}$$

$$K_d \left(\frac{L}{Kg}\right) = \frac{\text{concentration per unit mass of particulate } (\frac{kg}{kg} \text{ or } \frac{Bq}{kg \text{ dry weight}})}{\text{concentration per unit volume of water } (\frac{kg}{L} \text{ or } \frac{Bq}{L})}$$

Radioactivity in Marine Environment

Terrestrial radionuclides

- Naturally Occurring Radioactive Material (Ra, Th, K)

Cosmogenic radionuclides

- (c-14, Be-7)

Artificial radionuclides

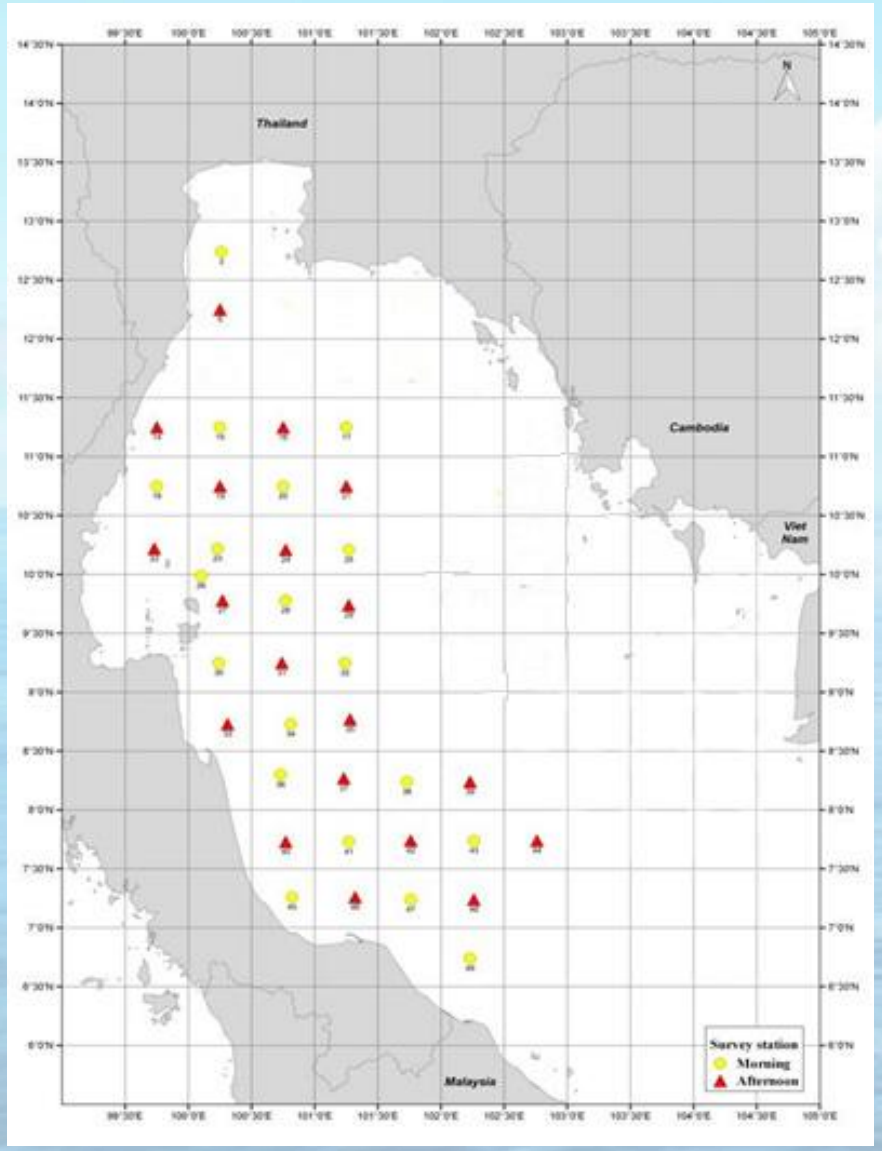
- Short life (I-131)
- Long life (Sr-90, Cs-137)

Objectives

To establish K_d derived from the Thai marine environment leading to more accurate estimation on assessment of **radiation dose and radiological risk**

MATERIALS AND METHODS

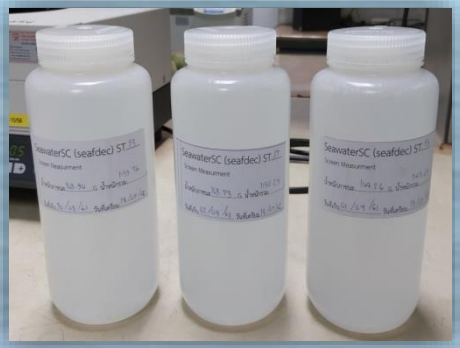
Sampling point

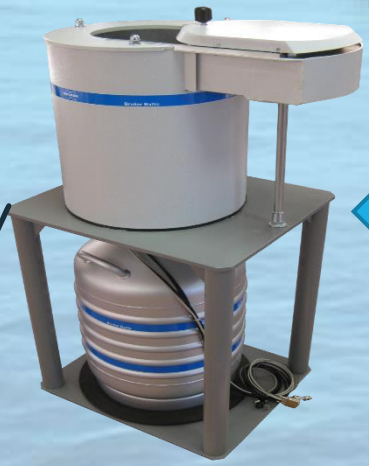


38 Stations in the gulf of Thailand (Between Aug – Sep 2018)

Seawater (γ-emitting radionuclides) Collection & Measurement

Van Dorn Water Sampler

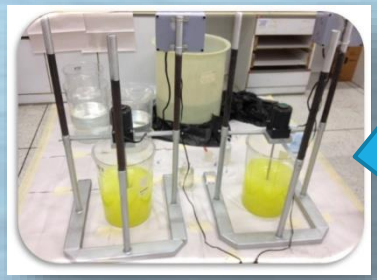




HPGe Gamma Spectrometry 20,000 sec

Seawater (Cs-137) Collection & Measurement

Van Dorn Water Sampler



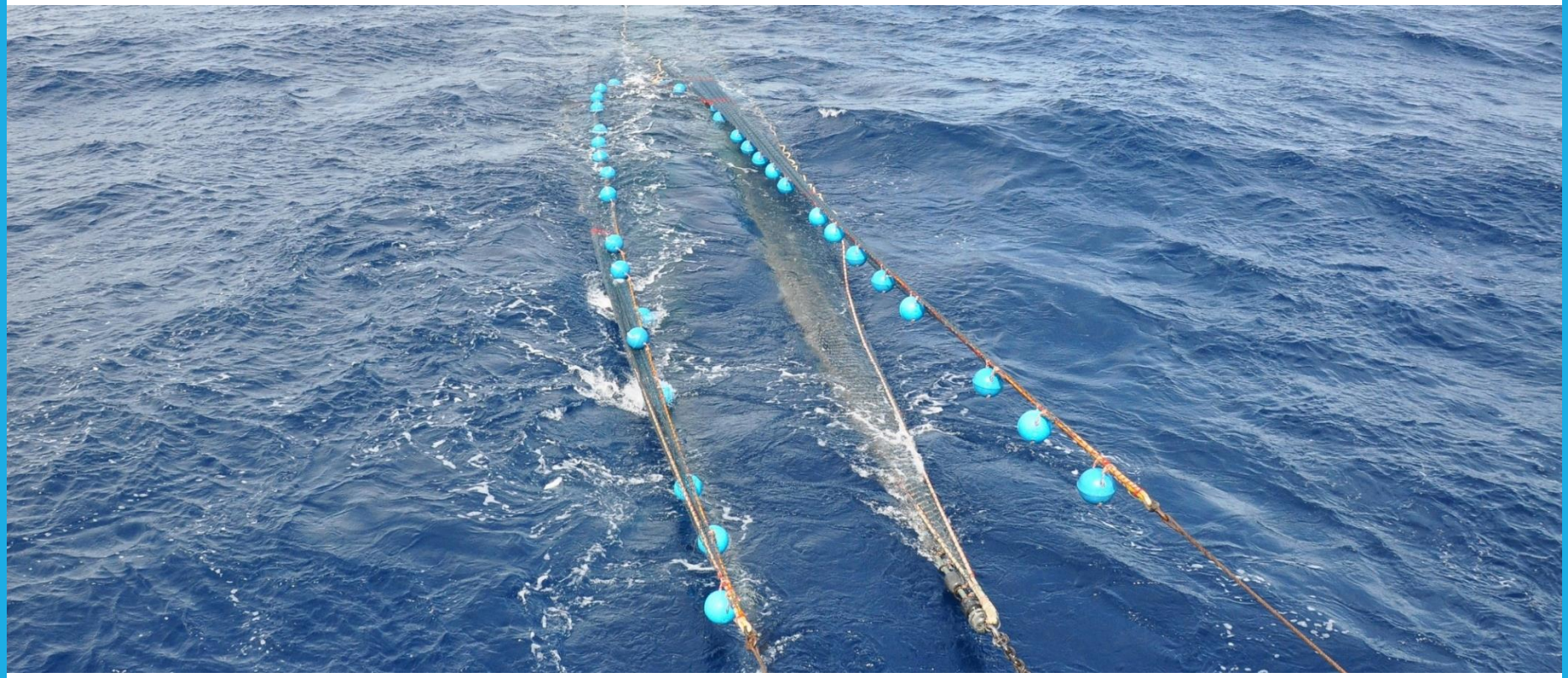
HPGe Gamma Spectrometry 100,000 sec

Ammonium Molybdophosphate (AMP) technique

Sediment Collection & Measurement

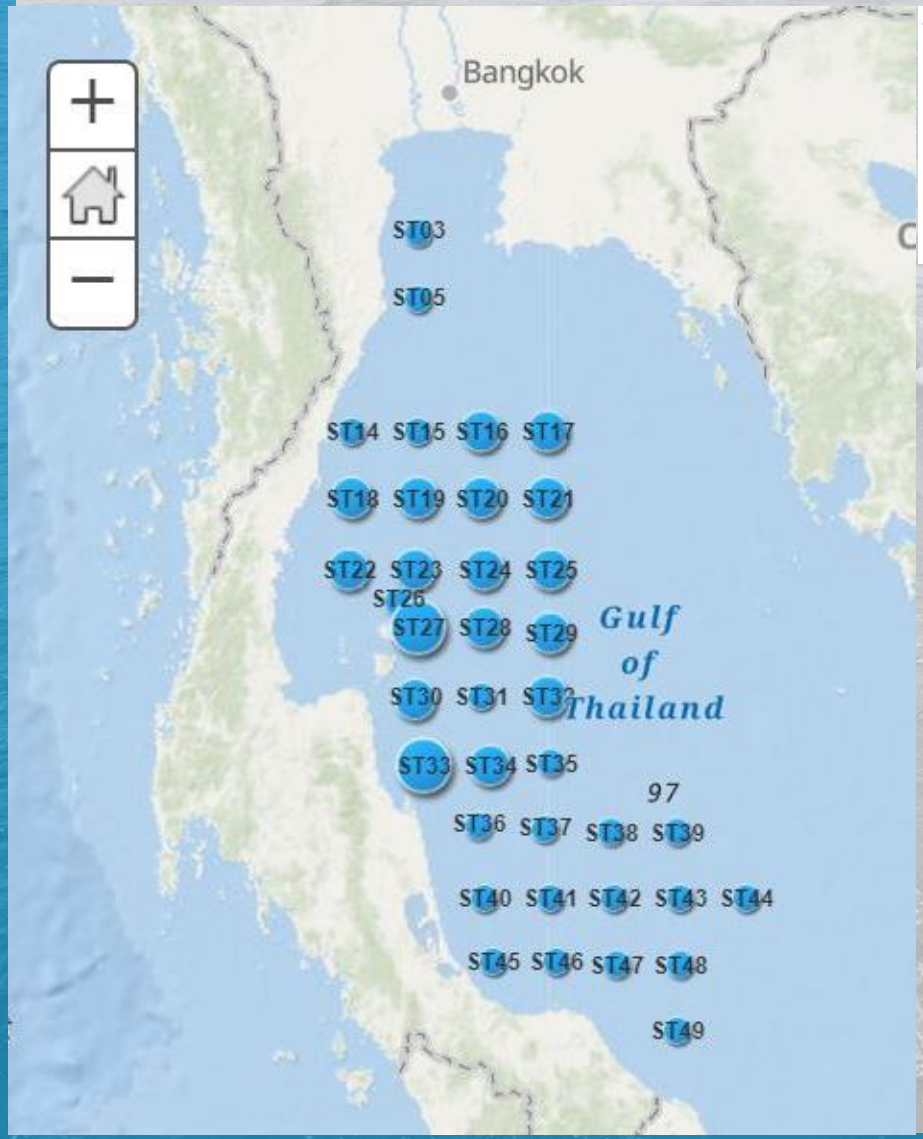
Smith Mac Intyre Grab

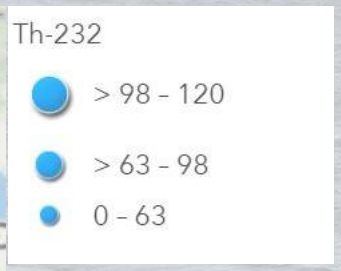
HPGe Gamma Spectrometry 80,000 sec



RESULTS AND DISCUSSIONS

K_d of Th-232 (L/kg)

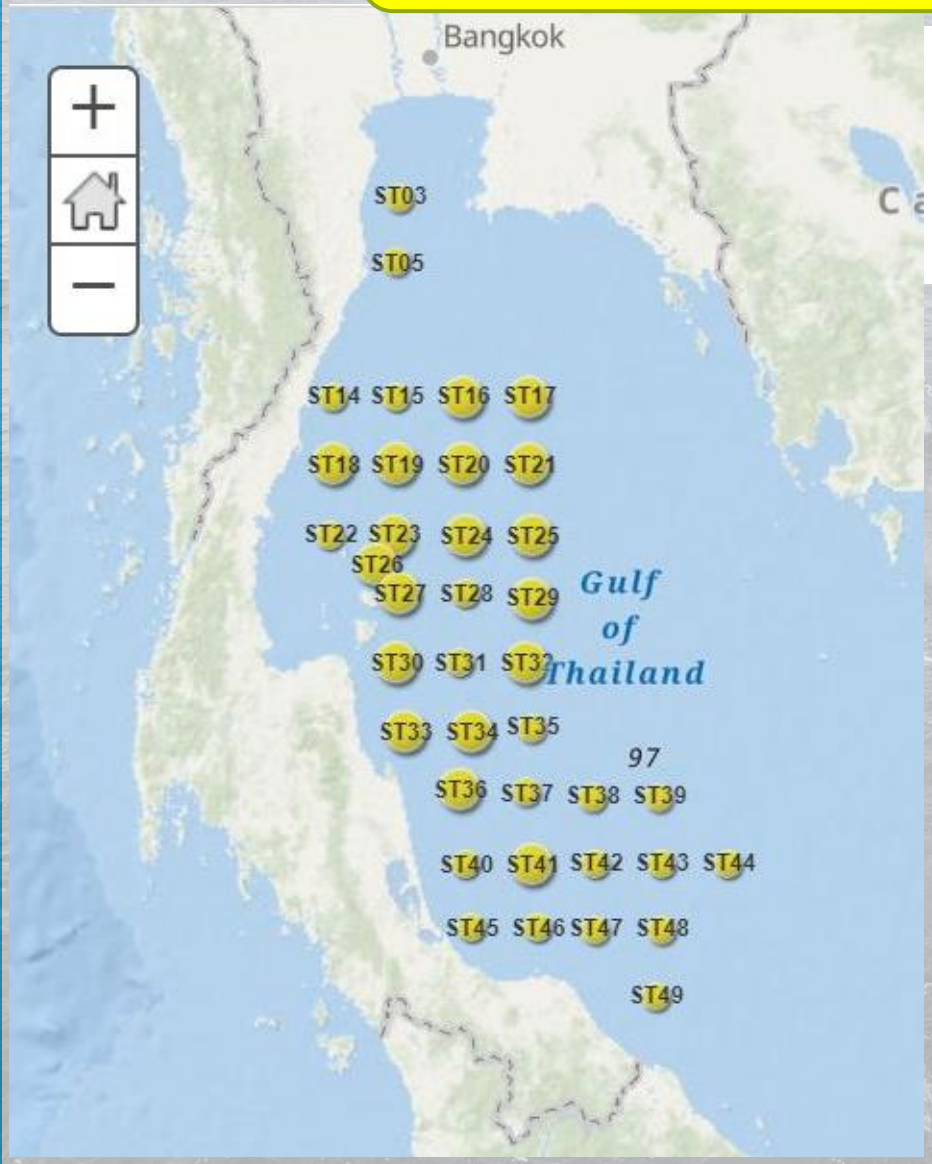




Th-232	
Mean	62.79
Standard Error	2.21
Median	61.78
Standard Deviation	13.62
Minimum	44.22
Maximum	109.78

Ref	Th
IAEA , Tecdoc 422 (open sea)	5E+6
NOZAKI, 1990	3E+6

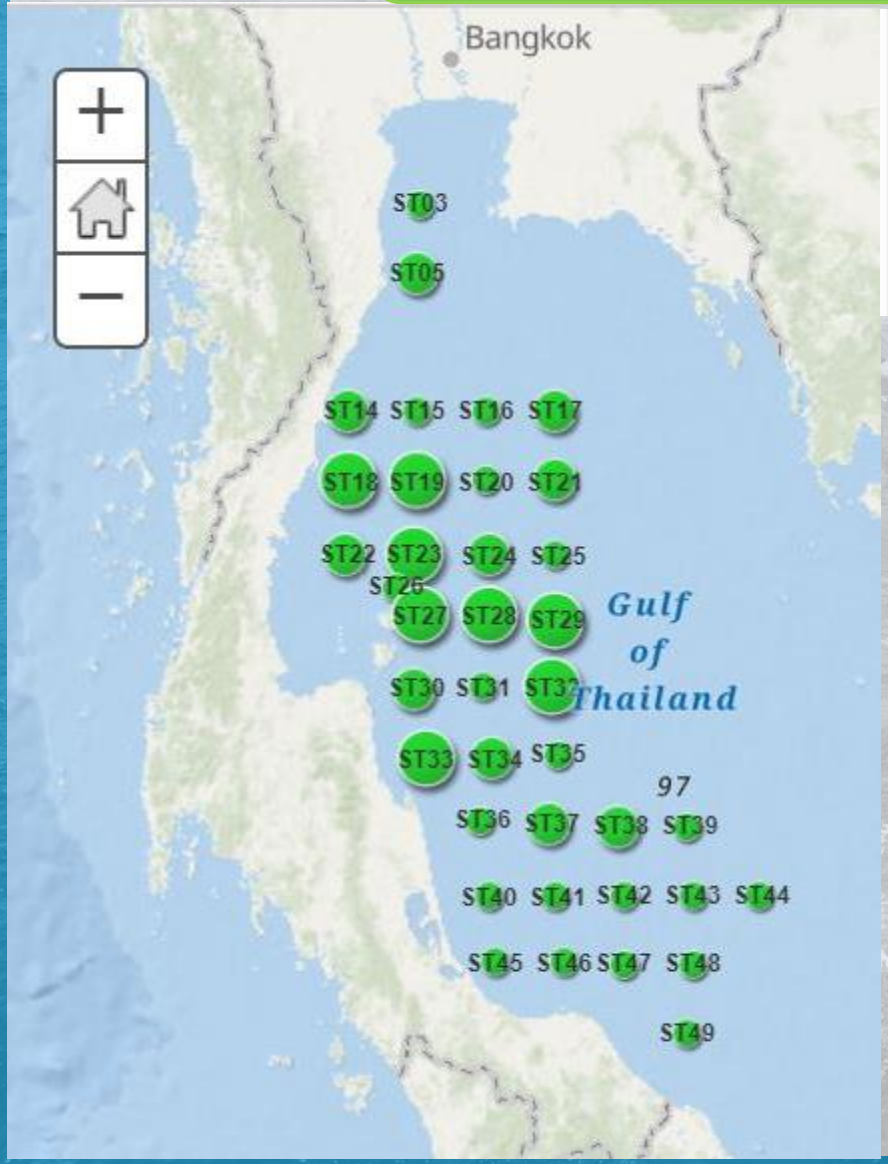
K_d of Ra-226 (L/kg)



Ra-226	
Mean	44.46
Standard Error	1.32
Median	43.25
Standard Deviation	8.15
Minimum	33.92
Maximum	75.03

Ref	Ra
IAEA , Tecdoc 422 (open sea)	4 E+3
MOORE, 1996	2 E+2

K_d of K-40 (L/kg)



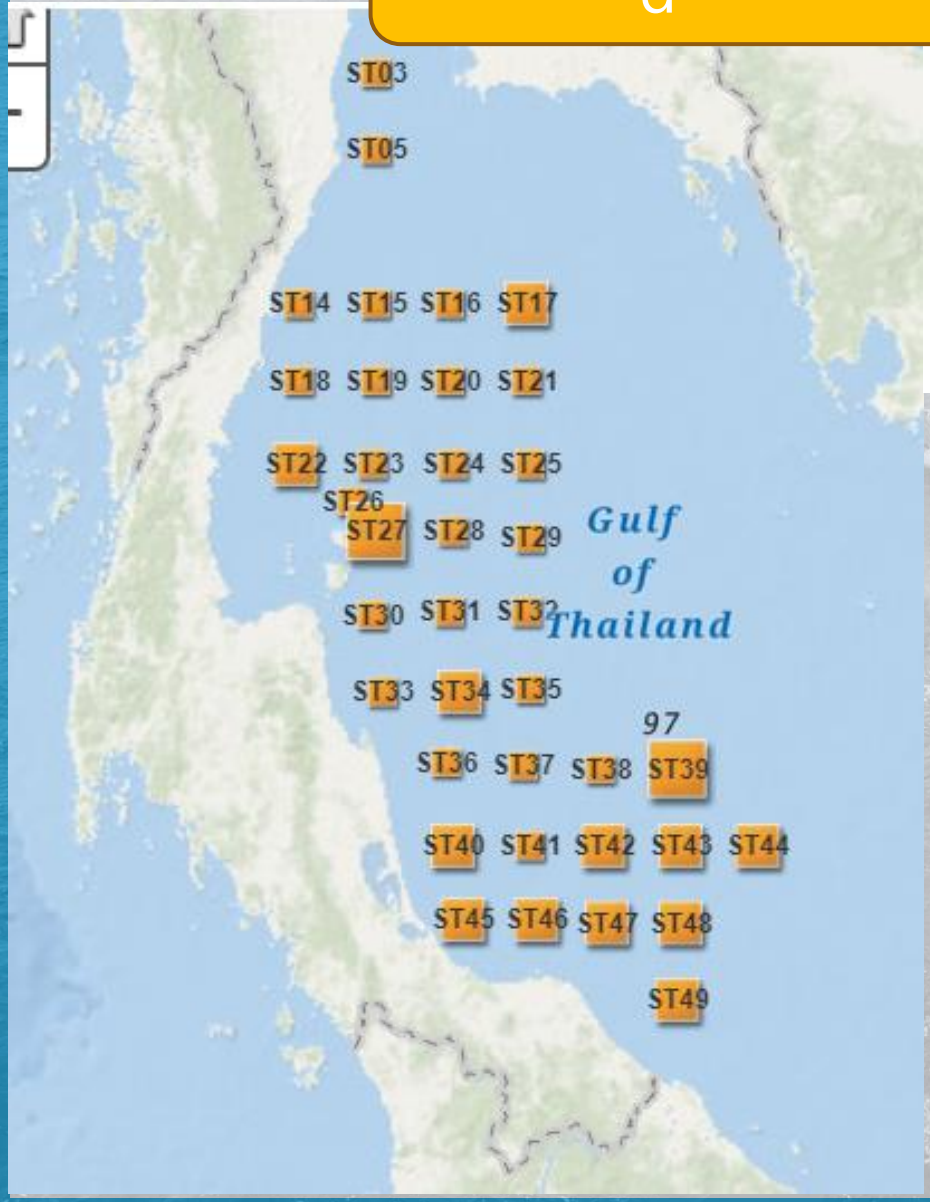
K-40

- > 86 - 120
- > 68 - 86
- 0 - 68

K-40	
Mean	68.69
Standard Error	3.37
Median	66.96
Standard Deviation	20.76
Minimum	36.06
Maximum	114.41

Ref	Th
OAP , 1989	28

K_d of Cs-137



Cs-137

- > 2,382 - 3,035
- > 672 - 2,382
- 0 - 672

Cs-137	
Mean	667.51
Standard Error	108.85
Median	357.60
Standard Deviation	671.0
Minimum	74.3
Maximum	3035.1

REF	Cs
IAEA , Tecdoc 422 (open sea)	2E+3
KENNISH, 1997	4E+4
OAP 1989-1991 (Cs-137)	428 l/kg

CONCLUSIONS

The results reveal that averaged K_d values for ^{226}Ra, ^{232}Th, ^{40}K, and ^{137}Cs are 44.46, 62.79, 68.69, and 667.51 L/kg, respectively.

The obtained results was furthermore compared with the recommended values from the International Atomic Energy Agency (IAEA). It was found that the IAEA-recommended K_d values are several magnitude higher than those from this study. Therefore, the assessment using K_d derived from different geographical locations would have to be carried out with caution.





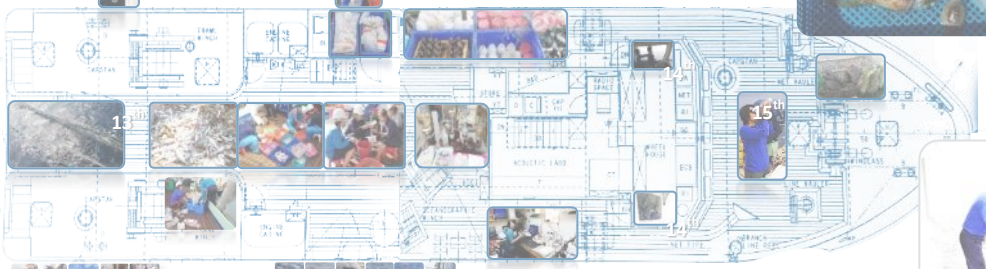


















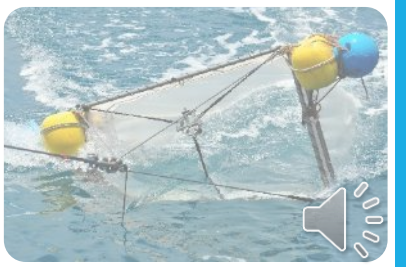










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