

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

Total Petroleum Hydrocarbons (TPHs) in surface seawater in the Gulf of Thailand

Presented by

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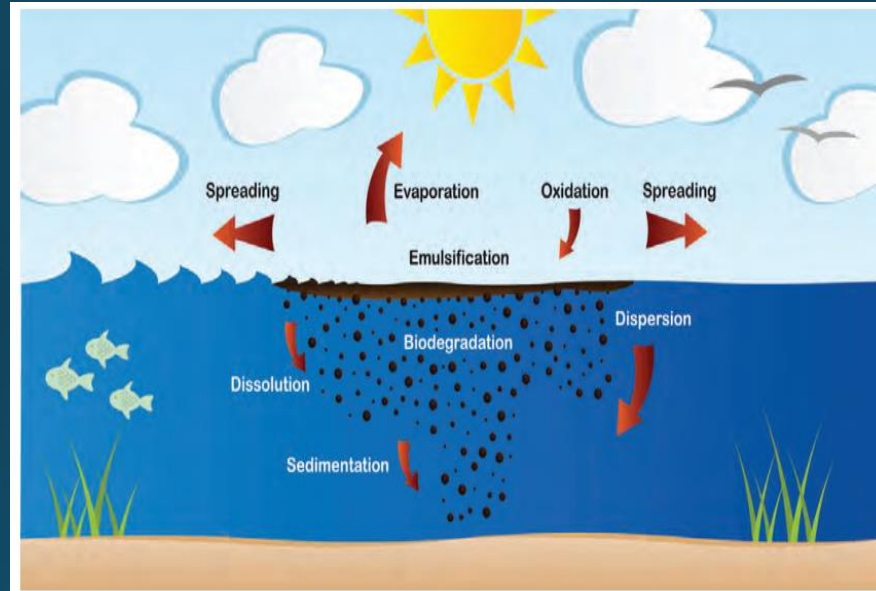
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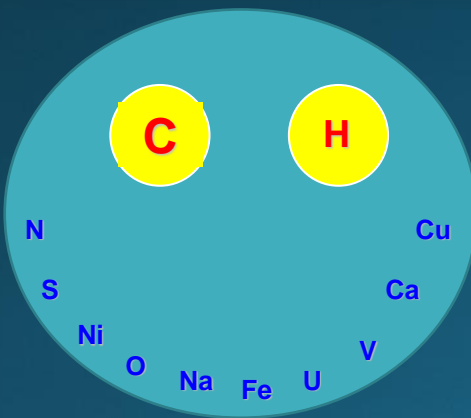
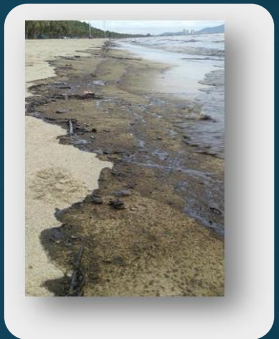
Outlines

- INTRODUCTION
- OBJECTIVES
- SAMPLING & ANALYTICAL METHOD
- RESULTS & DISCUSSION
- SUMMARY

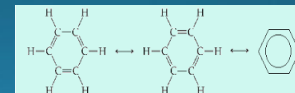
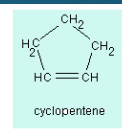
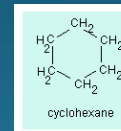
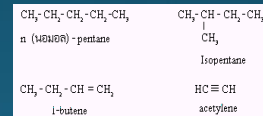
Introduction



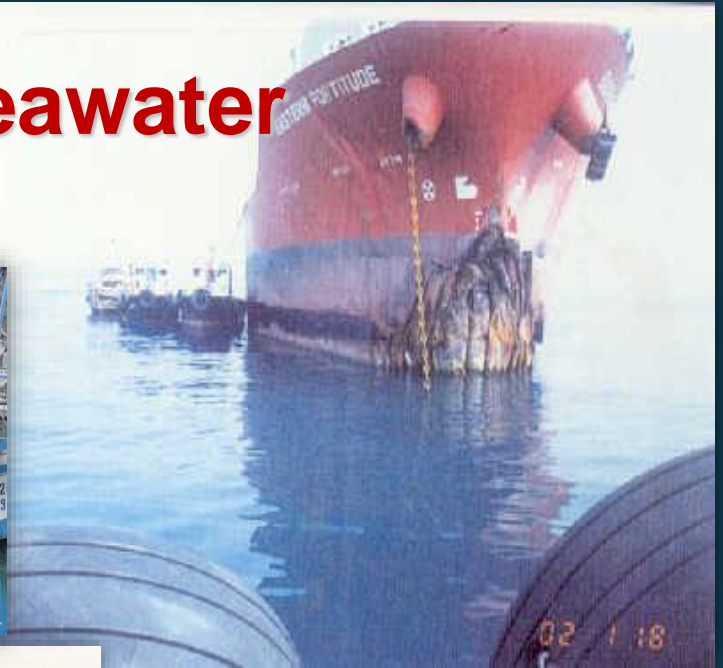
Fate of Marine oil spills (ITOPF, 2011)



- Aliphatic hydrocarbon
(alkane, alkene, alkyne)
- Alicyclic hydrocarbon
(cycloalkane, cycloalkene, cycloalkyne....)
- Aromatic hydrocarbon
(benzene & derivatives, polynuclear aromatic hydrocarbon)



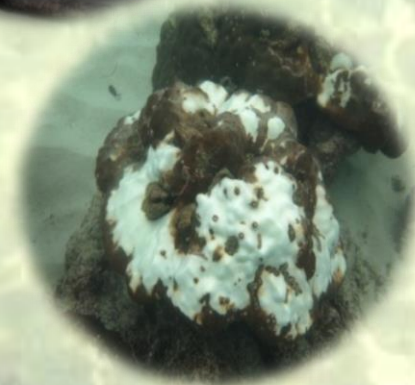
Sources of TPHs in seawater



- *Accident from collision*
- *Transportation*
- *Oil tanker loading&transfer*
- *Fisheries & Tourism boat*
- *Ballast water&Cleaning*

IMPACT

- ‡ Coastal & marine ecosystem
- ‡ Marine life
- ‡ Toxic & accumulation in ecosystem
- ‡ Fisheries
- ‡ Water quality
- ‡ Tourism
- ‡ Seafood
- ‡ Human health



Objectives

- ✓ To determine concentration of TPHs in surface seawater of the Gulf of Thailand
- ✓ To evaluate contamination level of TPHs in marine environment

Sampling & analytical method

Location



Sampling station

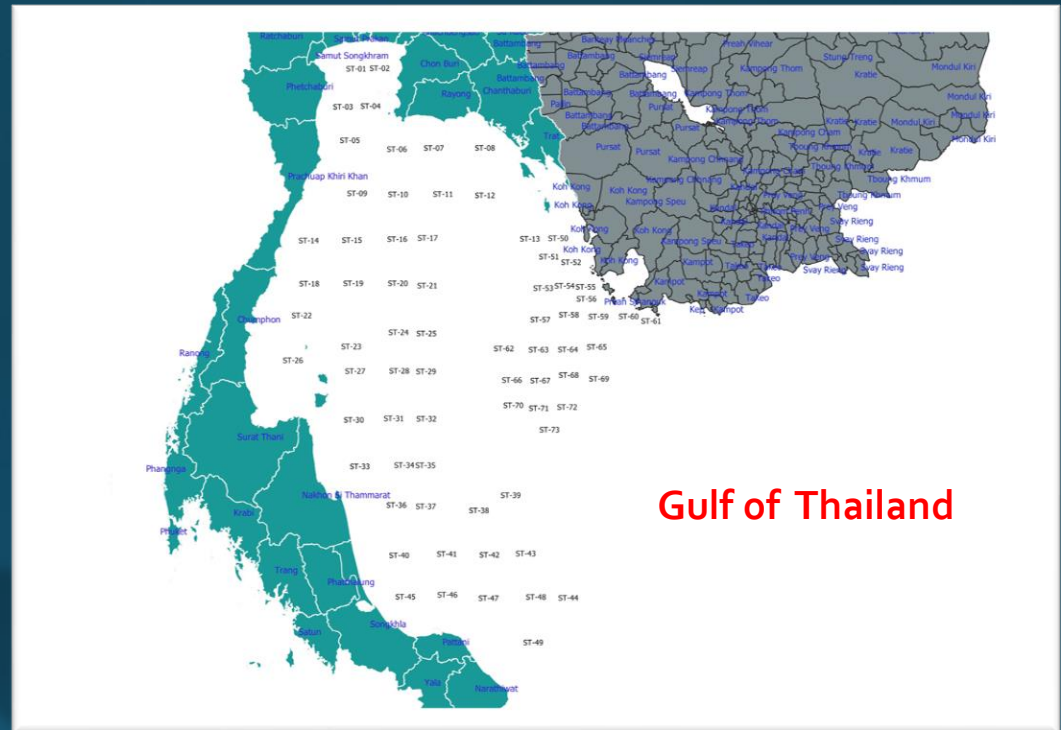


73 stations (146 samples)

Sampling period



18 August – 3 September 2018

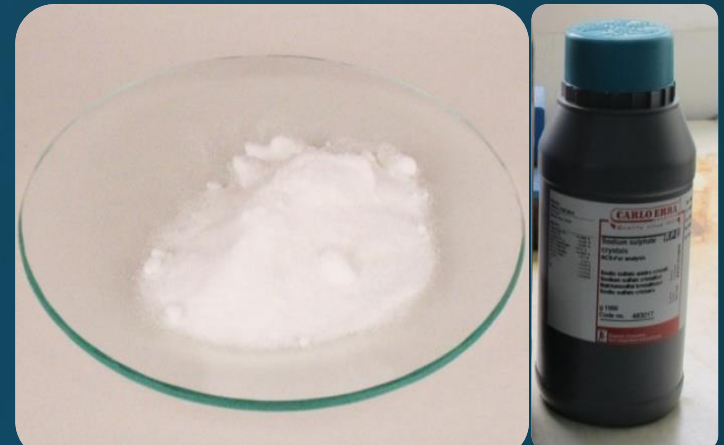


Analytical method

- Duplicate of 3 L of seawater samples of each station were collected from sea surface (1 meter depth).
- Seawater samples were preserved by 50 ml. of n-hexane until analytical procedure (IOC/UNESCO, 1984).
- Seawater samples were extracted by 150 ml. (triplicate extracted by 50 ml. of n-hexane).
- Remove water from extracted samples by using anhydrous sodium sulphate and filtered pass 1 PS phase separator.
- Samples concentrated to 10 ml. by rotary evaporator and analyzed by Fluorescence spectroscopy technique, Luminescence (Perkin-Elmer, model LS-55B, compared with Chrysene standard, Excitation wavelength = 310 nm. and Emission wavelength = 360 nm. (Farrington *et al.*, 1988)

Samples preservation & extraction





Na_2SO_4



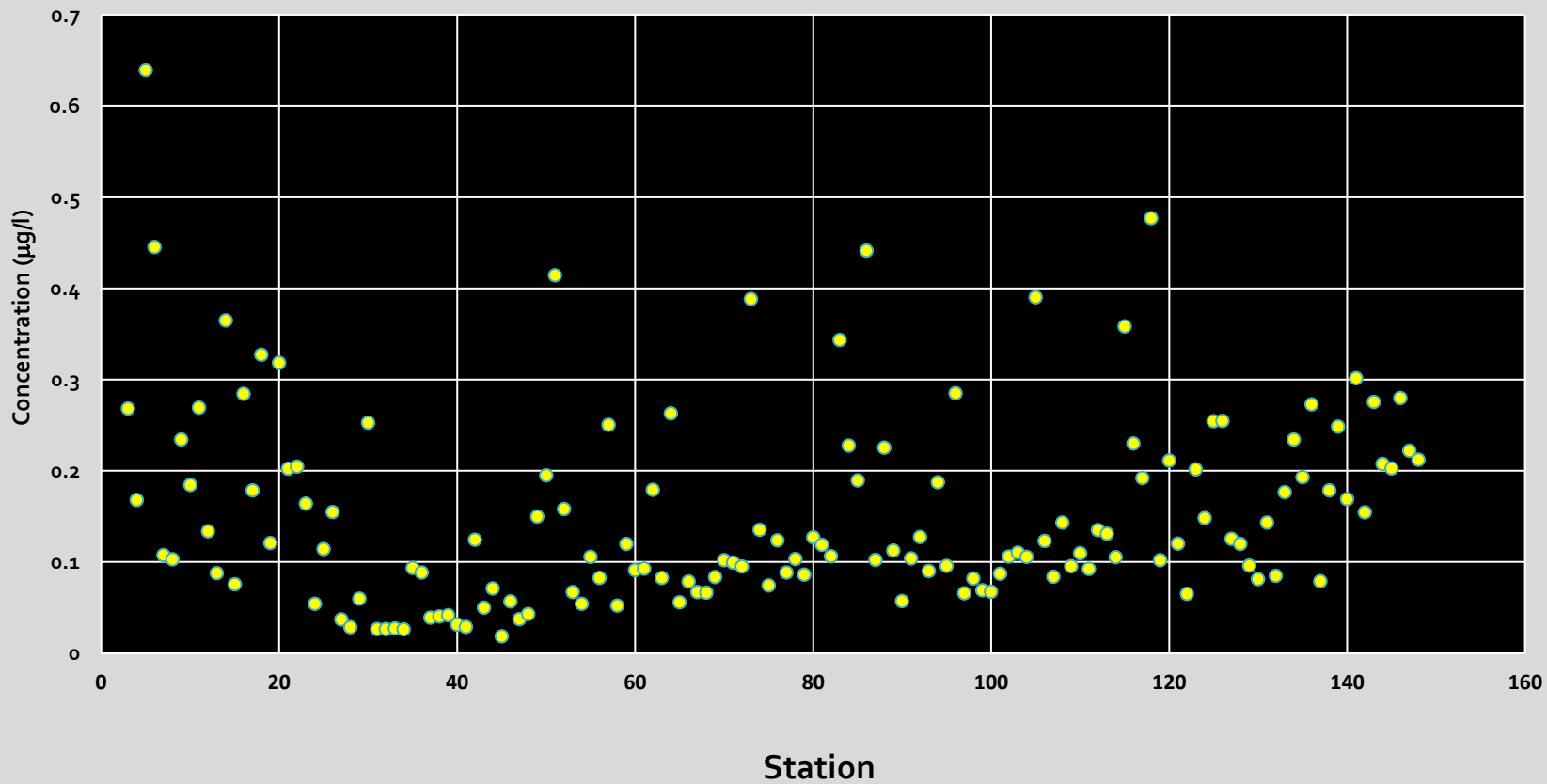
Concentrated & Analyzed by Luminescence
(Perkin-Elmer, model LS-55B, compared with
Chrysene standard, Excitation wavelength =
310 nm. and Emission wavelength = 360 nm.



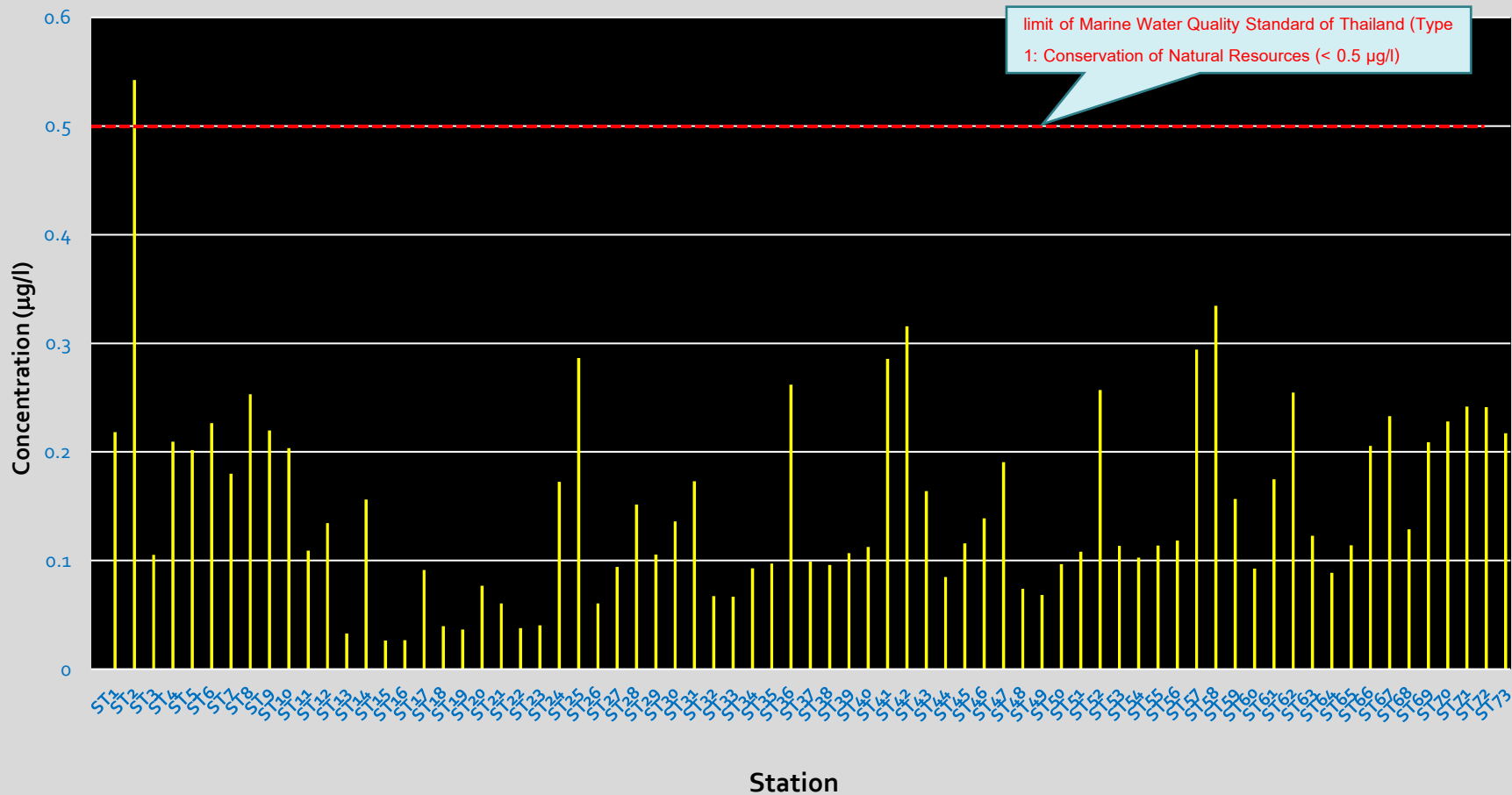
Results

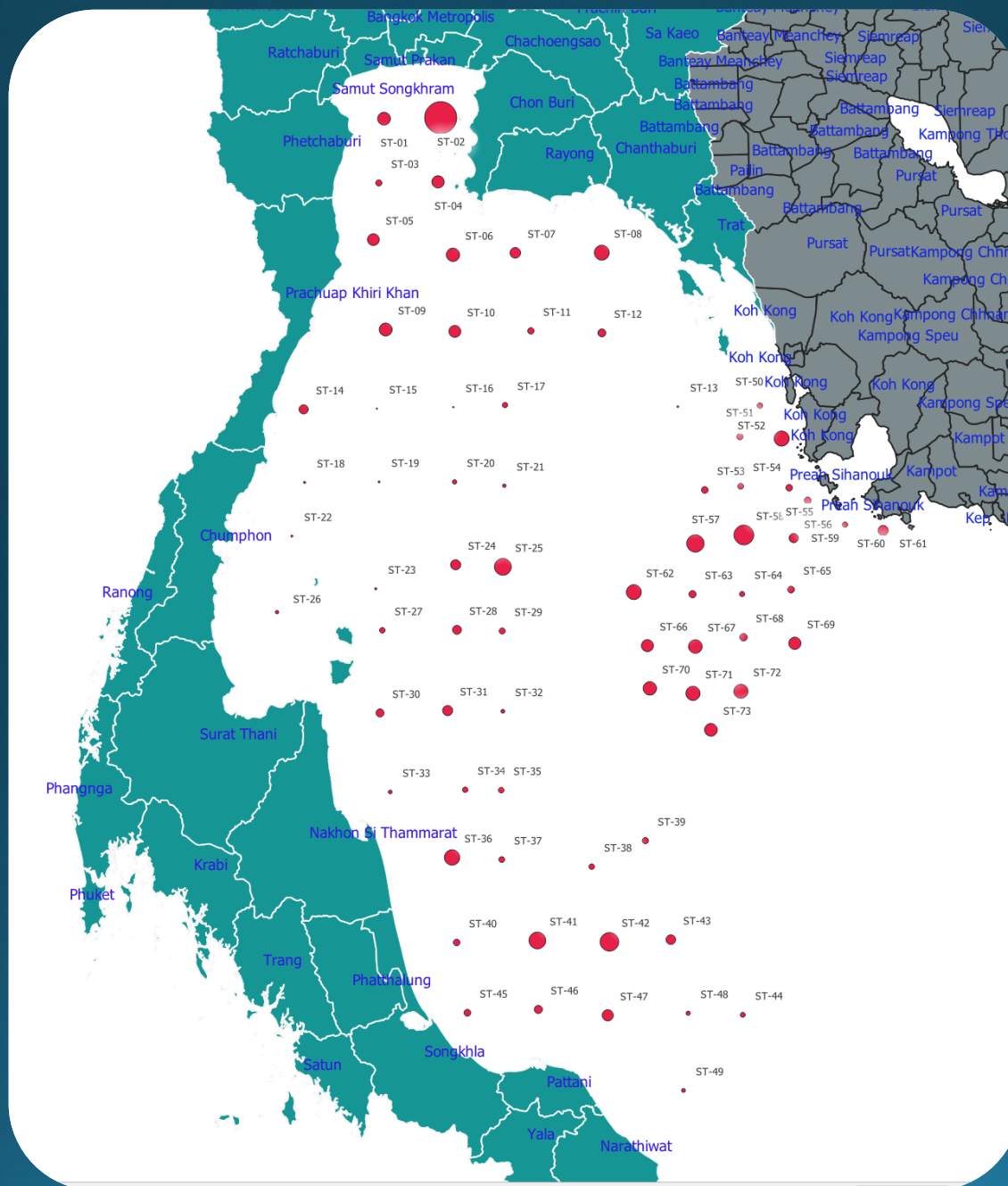
- Concentration of 146 seawater samples from 73 stations of the Gulf of Thailand ranged of 0.03 – 0.54 $\mu\text{g/l}$ with average of 0.15 ± 0.09 $\mu\text{g/l}$.

TPHs in surface seawater in the Gulf of Thailand



TPHs in surface seawater in the Gulf of Thailand in 2018

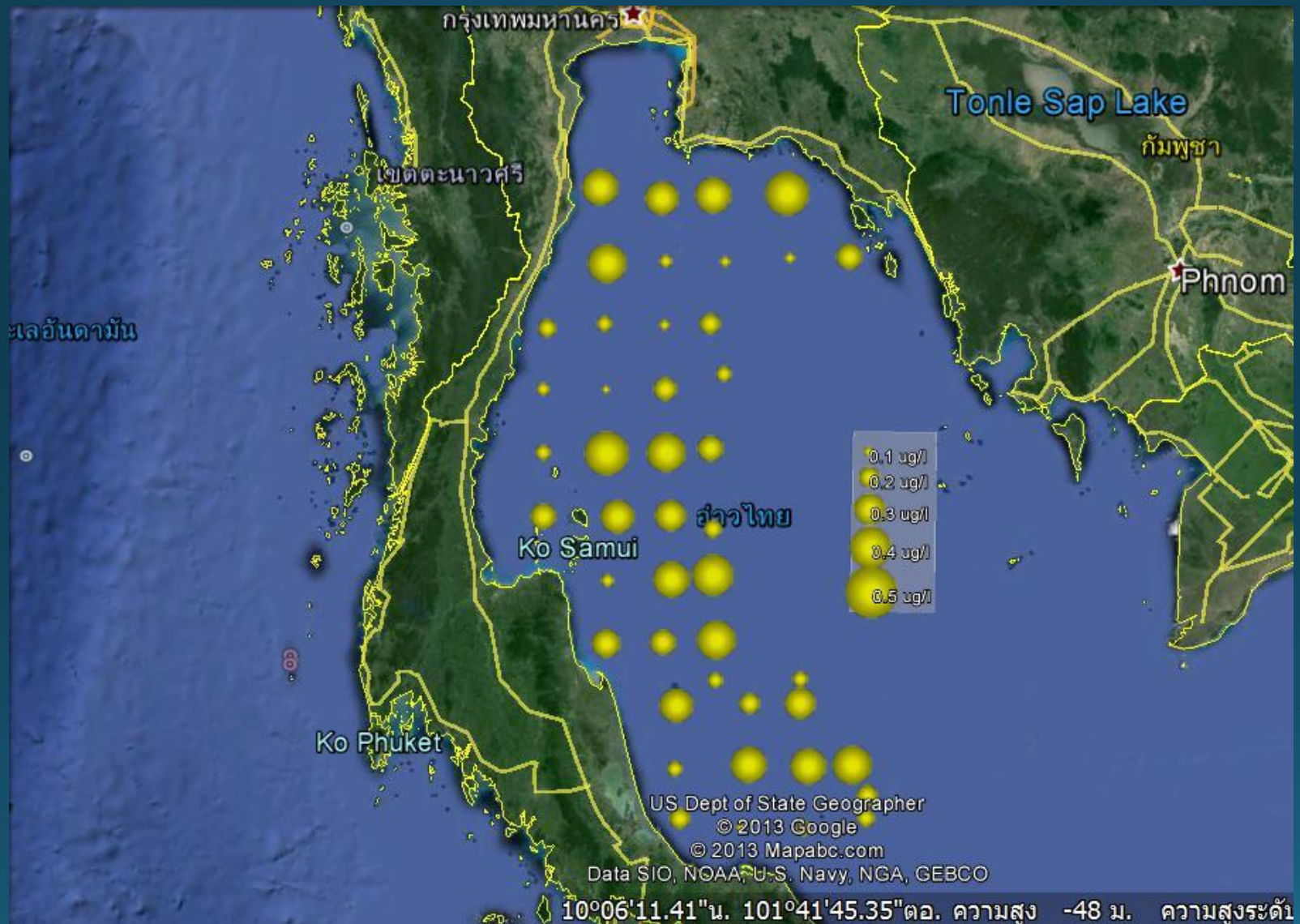




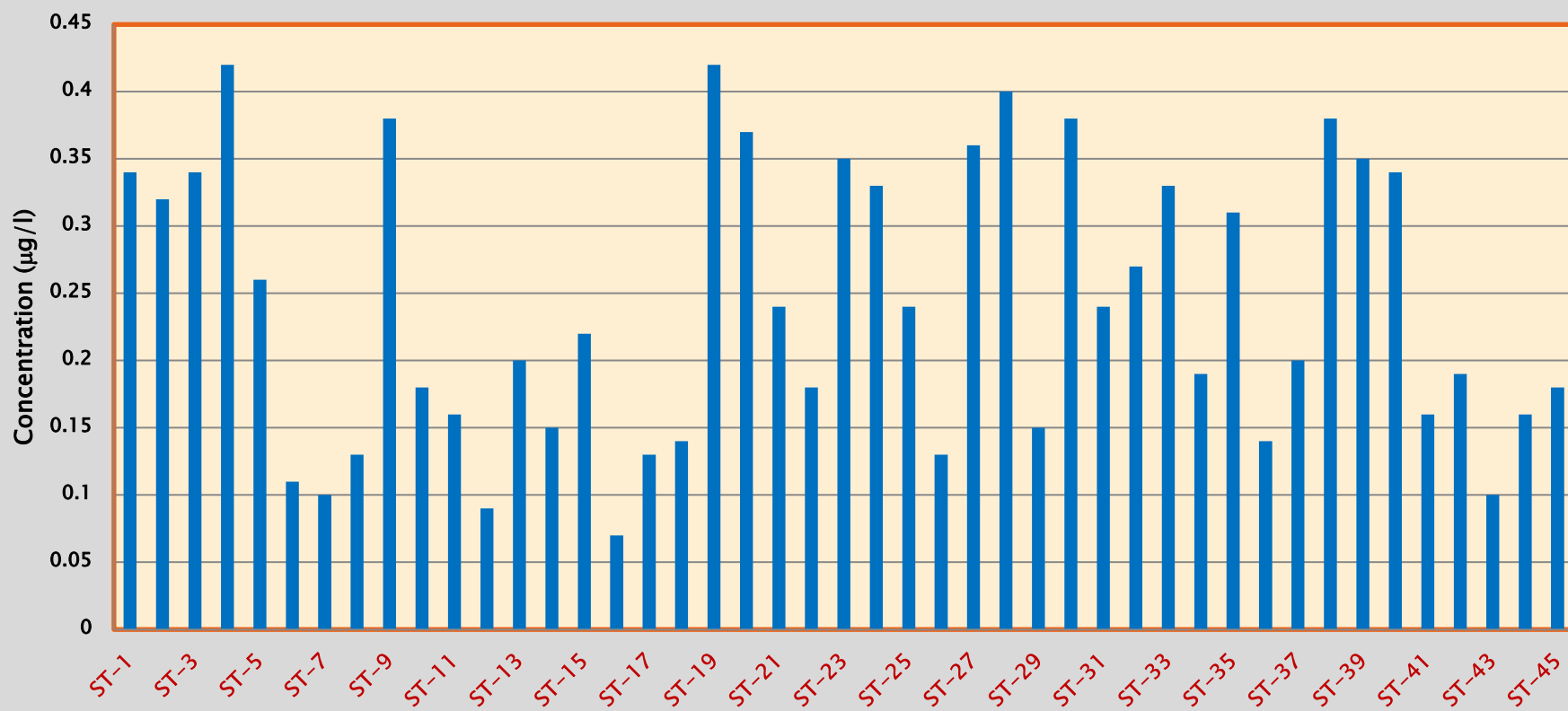
Discussion

- The highest concentration of TPHs was detected at the Upper Gulf of Thailand near coast off Chonburi (ST 2).
- High concentration were detected near coast off Chantaburi (ST 8), Prachuab Khiri Khan (ST 9), Chumporn (ST 25), Nakhon Si Thammarat (ST 36), Songkhla (ST 41, ST42) and coast off Cambodia (ST 57, ST 58, ST 62) as well as around nearshore of Koh Kong (ST 52), respectively which might be caused of transportation and oil drilling platform.
- The average concentration levels were below the limit of Marine Water Quality Standard of Thailand (Type 1: Conservation of Natural Resources, 0.5 µg/l) (Pollution Control Department, 2017).

Background data (2013)



TPHs in seawater in the Central Gulf of Thailand (14 March–12 April 2013)



Concentration of TPHs in surface seawater & Oil drilling platform (Central Gulf of Thailand, 2013)



Area	Types/Standard	Concentration ($\mu\text{g}\cdot\text{l}^{-1}$)	Year	References
São Sebastião Channel, São Paulo, Brazil	Carmópolis crude oil (Brazil)	<0.15 – 4.92	1993-1995	Zanardi <i>et al.</i> , 1999
Admiralty Bay, King George Island, Antarctica	Carmópolis crude oil (Brazil)	0.07 – 2.94	1994-1997	Bícego <i>et al.</i> , 2003
Western coast of the Philippines	TPH/Chrysene	0.02 – 1.47	1998	Saramun & Wattayakorn, 1999
Ponggol estuary, Singapore	TPH/Chrysene	4.42 – 248.94	1999-2000	Nayar <i>et al.</i> , 2004
Baltic Sea	Ekofisk crude oil TPH/Chrysene	0.13 – 1.8 0.01 – 0.14	1992-1993	Pikkarainen & Lemponen, 2005
Northern coast of Spain	Prestige oil TPH/Chrysene	<0.05 – 2.86 0.23 ¹	2003	González <i>et al.</i> , 2006
Bohai Bay, China	-	23.7 – 508	1996-2005	Li <i>et al.</i> , 2010
Damietta Harbor, Egypt	TPH/Chrysene	14.545 – 65.455	2006	Shereet, 2009
Central Gulf of Thailand	TPH/Chrysene	0.07 - 0.42	2013	Kan-atireklap <i>et al.</i> , 2013
Eastern Gulf of Thailand	TPH/Chrysene	0.05-51.17	2014	Kan-atireklap <i>et al.</i> , 2014

Area	Types/Standard	Concentration ($\mu\text{g}\cdot\text{l}^{-1}$)	Year	References
Upper Gulf of Thailand	TPH/ Chrysene	0.059-6.095	2526	Sompongchaiyakul <i>et al.</i> , 1986
Pattaya- Trat	TPH/ Chrysene	0.018-5.286	2530	Petpiroon, 1988
Laem Fa Pha, ChaoPhraya river mouth	-	7.67-10.17	2531	Wattayakorn, 1989
Gulf of Thailand and Eastern Peninsular Malaysia	TPH/ Chrysene	0.07-4.13	2539	Wongnapapan, <i>et al.</i> , 1999
Lower Tha Chin river	TPH	0.93-4.25	2532	Sanwanich, 1991
Coast off Rayong	TPH/ Chrysene	0.05-11.84	2537	Tappatat, 1995
Ao Phe, Rayong	TPH/ Chrysene	0.25-1.03	2543	Suwanagosoom, 2001
Khamnoo river mouth, Chataburi Rayong river mouth, Rayong	TPH/ Chrysene	1.75-6.42 5.24-46.49	2547	Mafu, 1994
River mouth, Eastern coast of the Gulf of Thailand	TPH/ Chrysene	0.14-6.72	2547	Kan-atireklap <i>et al.</i> , 2015
Prasae basin, Rayong	TPH/ Chrysene	0.10-2.19 0.42 \pm 0.34	2549-2550	Kan-atireklap <i>et al.</i> , 2008
Koh Srichang, Chonburi	TPH/ Chrysene	0.01-12.55	2551-2552	Wattayakorn & Rungsupa, 2012

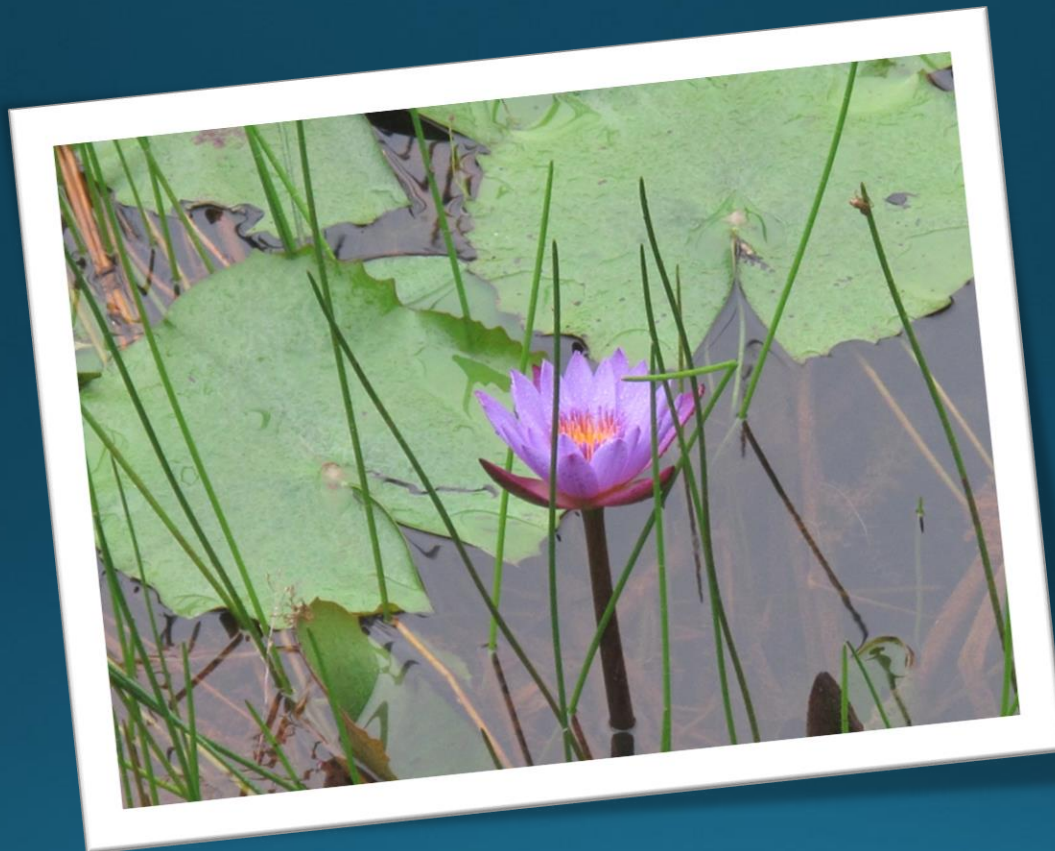
Area	Types/Standard	Concentration ($\mu\text{g}\cdot\text{l}^{-1}$)	Year	References
Eastern coast of the Gulf of Thailand	TPH	N.D.-10.11	2004-2006	Kan-atireklap <i>et al.</i> , 2007
River mouth, Eastern coast of the Gulf of Thailand	TPH	0.14-6.72	2004	Kan-atireklap <i>et al.</i> , 2005
Coral reef, Trat	TPH		2007-2008	Kan-atireklap <i>et al.</i> , , 2009
Koh Suwan		0.15-0.80		
Koh Yak		0.09-0.25		
Koh Wai		0.21-0.56		
Koh Lom		0.16-0.67		
Seagrass beds, Trat				
Ao Thammachart		0.28-0.49		
Ban Mairoot		0.36-0.44		
Ao Makhampom		0.34-0.96		
Koh Srichang-Sriracha,Chonburi	TPH	0.01-12.55	2012	Wattayakorn&Rungsupa, 2008-2009
Samed island and coast of Rayong (oil spilled)	TPH	0.05-51.17	2013	Kan-atireklap <i>et al.</i> , 2013
Gulf of Thailand	TPH	0.03-0.54	2020	Kan-atireklap <i>et al.</i> , 2020

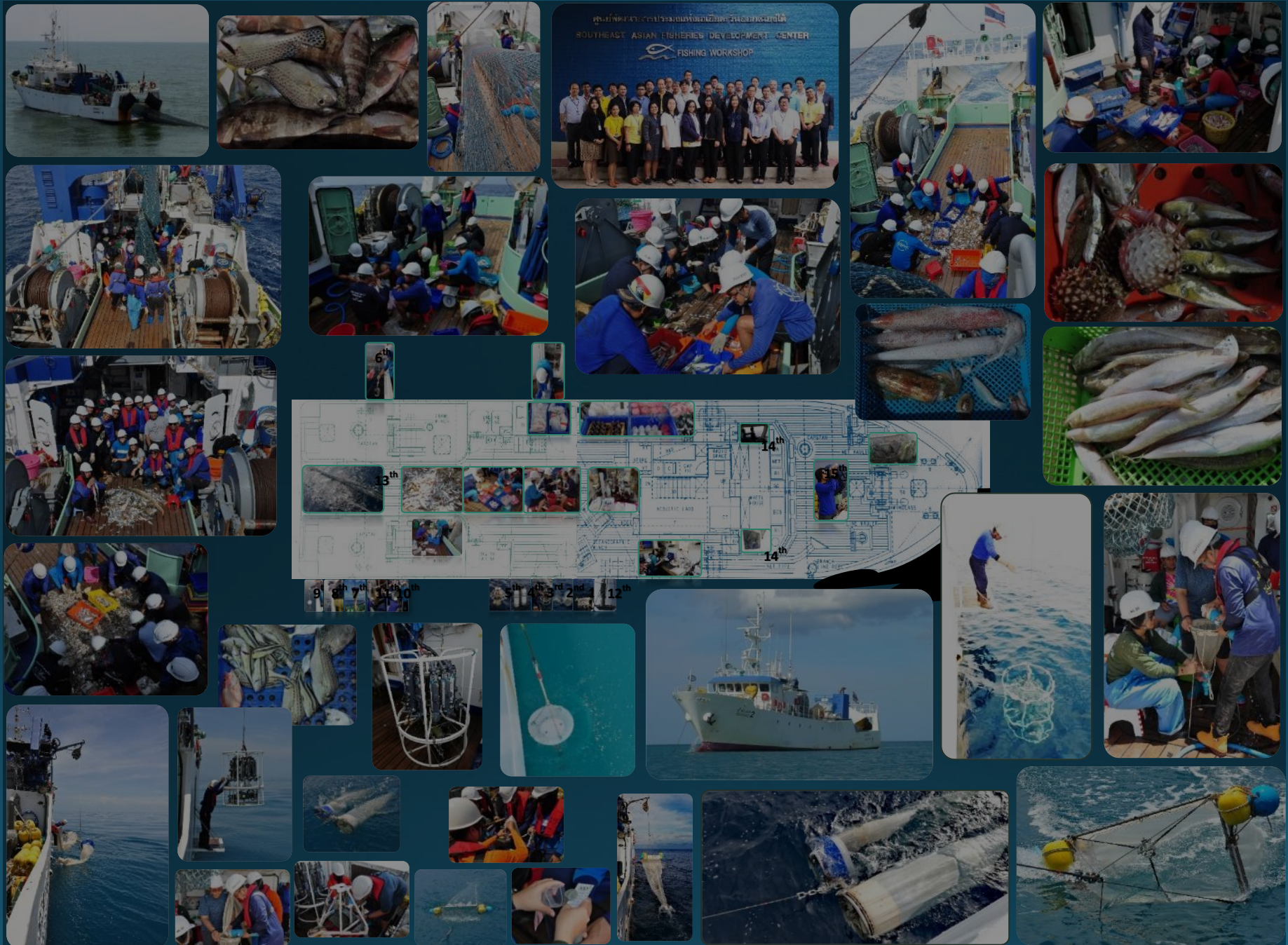
Summary

- Utilization activities in the Gulf of Thailand (transportation, illegal waste desludging from oil tanker and oil drilling platform) made high impact to TPHs contamination and accumulation in marine ecosystem.
- Law enforcement and evaluation of contamination level of TPHs in marine environment in the Gulf of Thailand is necessary to decrease high impact to marine ecosystem.

ขอบคุณค่ะ

THANK YOU FOR YOUR ATTENTION





Collaborative Research Survey on Marine Fisheries Resources and Environment in the Gulf of Thailand, 2018