" Our Soul is for the Benefit of Mankind "

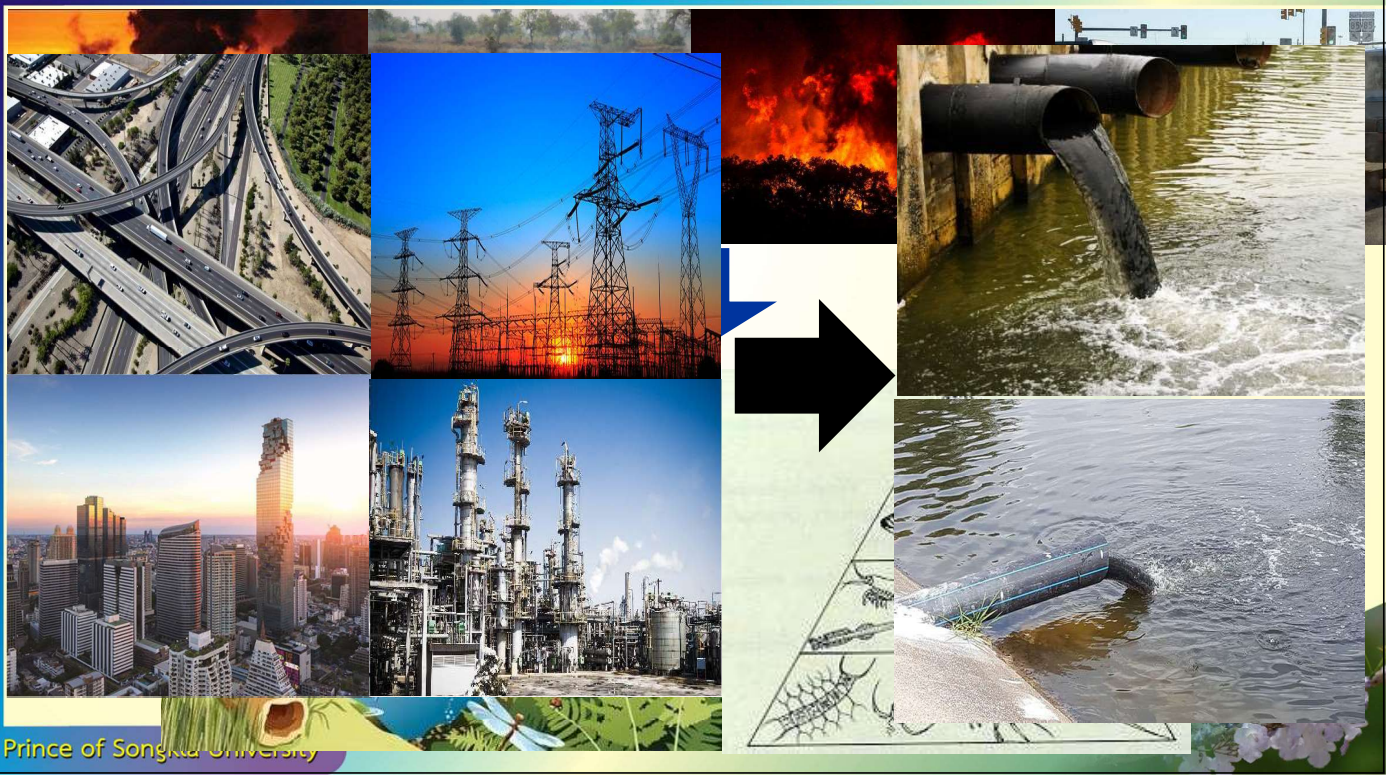
Accumulation of Polycyclic Aromatic Hydrocarbons (PAHs) and Carbon Compositions in Lake Sediment Cores of Thale Noi, Phatthalung

Natthapong Iadtem
Dr. Danai Tipmanee, Prof. Dr. Siwatt Pongpiachan,
Asst.prof. Dr. Oramas Suttinunand
and Woranuch Deelaman

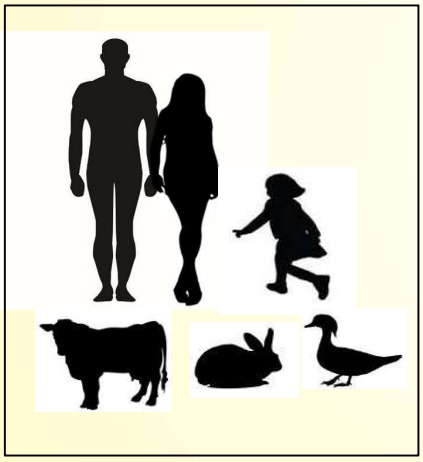
Prince of Songkla University

Presentation scope

Introduction



Introduction

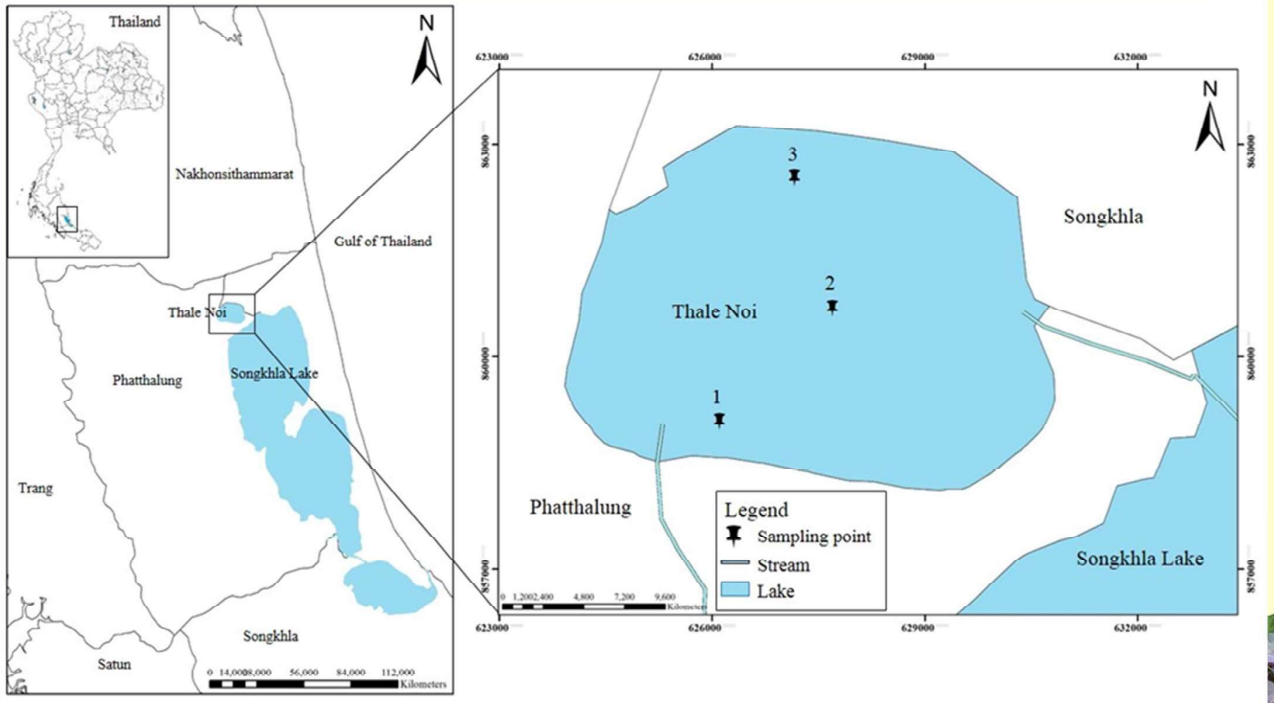


Exposure, health and environmental impact

mutagenic

carcinogenic

STUDY AREA



MATERIALS AND METHODS

Sediment sampling

core sediment

MATERIALS AND METHODS

PAHs Analysis

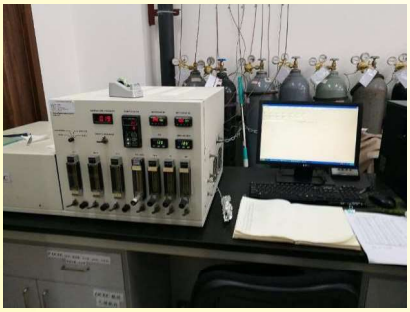
Soxhlet Extraction

Clean up

- The samples were Using technique of Soxhlet extraction.
- Sample extraction dichloromethane.
- Using Deuterated-Fluorene and Deuterated-Perylene as internal standard.
- Clean up using activated silica gel which uses hexane to elute for LPAHs and hexane: Toluene (96:54) for HPAHs.
- Analyze with GC / MS.

MATERIALS AND METHODS

Organic Carbon (OC) & Elemental Carbon (EC) Analysis

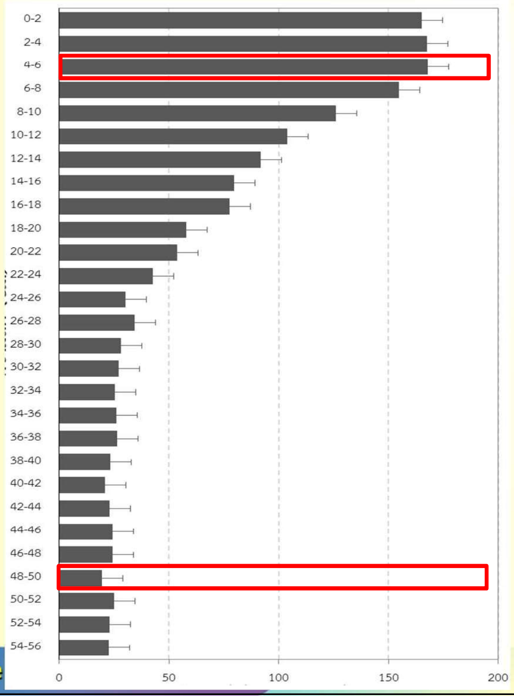


- analyzed for OC and EC using a Thermal/Optical Carbon Analyzer protocol was used for the carbon analysis.
- EC were tested in an oxidizing atmosphere of 2% oxygen in a balance of helium.
- The ion was analyzed with flame ionization detector at the absorbance of 663 nm.

Prince of Songkla University

RESULTS AND DISCUSSION

PAHs Analysis



- -Core 1 which ranged from 169 to 1,217 ng g^{-1} with the mean concentration value of 344.85 ng g^{-1}.

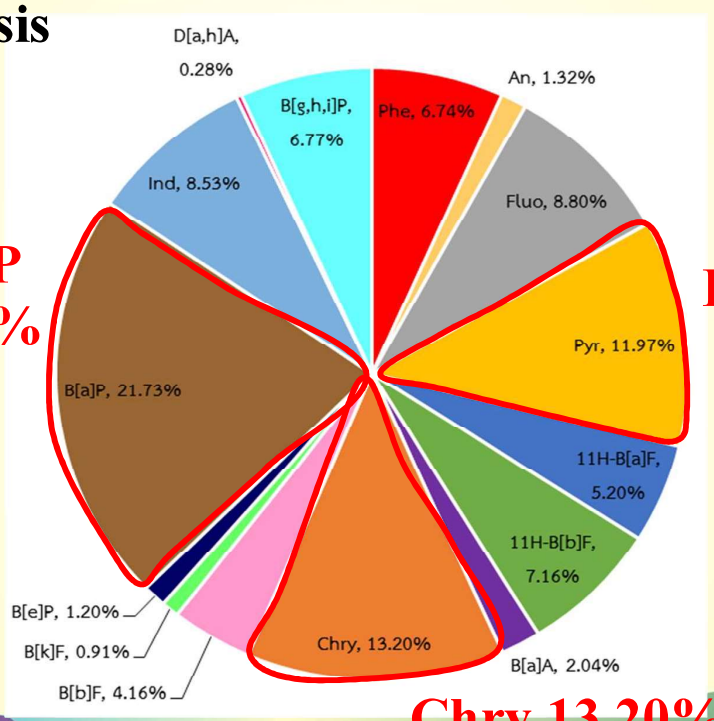
RESULTS AND DISCUSSION

Table: Comparative data for sediment ΣPAH concentration. (values in ng/g, dw.)

Location	Range	References
Thale Noi, Phatthalung Thailand	C.1: 169 -1,217 C.2: 20 - 169 C.3: 19 - 167	This study
Lake Kitaura, Japan	380 - 520	Nobuyasu Itoh et al., 2010
Kaohsiung Harbor, Taiwan	472 - 16,201	Chiu-Wen et al., 2011
Lake Baiyangdian, China	97 - 2,402	Wei Guo et al., 2011
Hongfeng, Southwestern China	2,934 - 5,282	Jian-Yang Guo et al., 2011

RESULTS AND DISCUSSION

PAHs Analysis



RESULTS AND DISCUSSION

Table: ratios plot of sources

ratios	sources	References
Ind/(Ind + B[g,h,i]P)	> 0.2 grass, wood, and coal combustion < 0.2 petrogenic	Yunker et al., 2002
B[a]A/(B[a]A + Chry)	> 0.35 grass, wood, or coal combustion 0.2-0.35 petroleum combustion < 0.2, petrogenic	

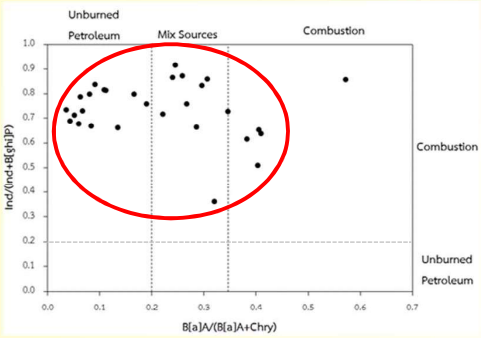
Ind: Indeno[1,2,3-cd]Pyrene, B[g,h,i]P: Benzo[g,h,i]Perylene
B[a]A: Benzo[a]Anthracene, Chry: Chrysene

Prince of Songkla University

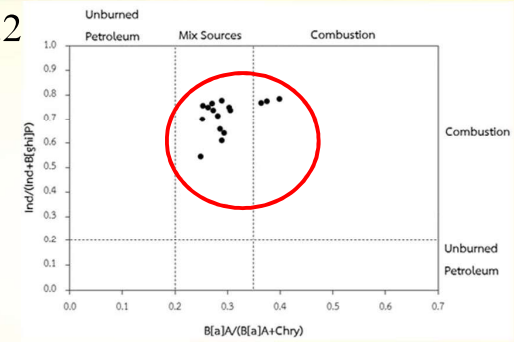
RESULTS AND DISCUSSION

Sources of PAHs

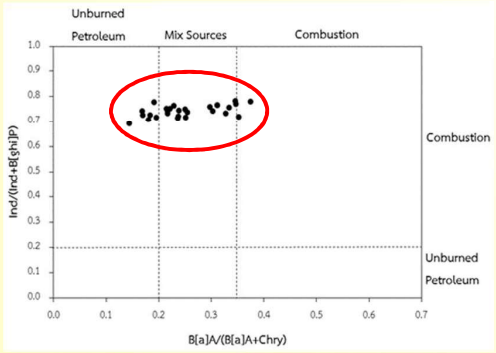
C.1



C.2



C.3



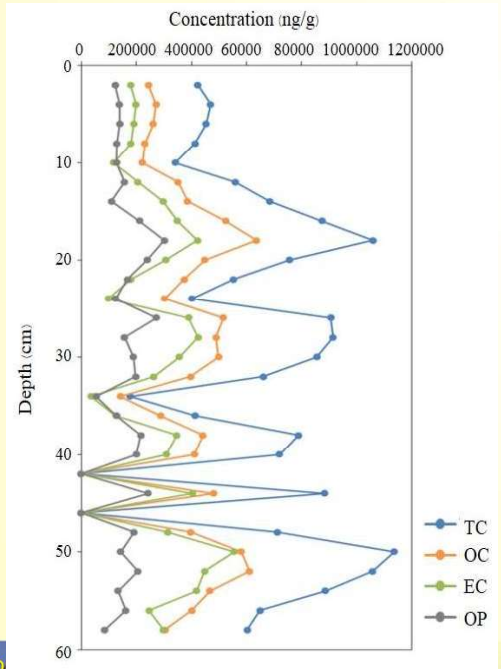
Core	B[a]A/(B[a]A+Chry)	Ind/(Ind+B[ghi]P)
1	0.04-0.57	0.36-0.92
2	0.25-0.40	0.55-0.78
3	0.14-0.37	0.69-0.78

- incomplete combustion of petroleum product and biomass burning

Fig. Diagnostic ratios Ind/(Ind + B[g,h,i]P) versus B[a]A/(B[a]A + Chry) identifying sources of PAHs in sediments

RESULTS AND DISCUSSION

OC/EC Analysis



- Total carbon (TC) ranged values of 632-590 ng g^{-1}
- Organic carbon (OC) ranged values of 290-368 ng g^{-1}
- Elemental carbon (EC). ranged values of 264-300 ng g^{-1}

RESULTS AND DISCUSSION

Table: ratios plot of sources

sources	OC/EC	References
Gasoline vehicular exhaust	1.0-4.0	Schauer et al., 1999, 2002
Diesel vehicular exhaust	< 1.0	Schauer et al., 1999, 2002
Biomass burning	4.0-8.0	Zhang et al., 2007
Wood combustion	16.8-40.0	Schauer et al., 2002
Coal combustion	2.5-20.5	Chen et al., 2006
Cooking combustion	32.9-81.9	He et al., 2004

RESULTS AND DISCUSSION

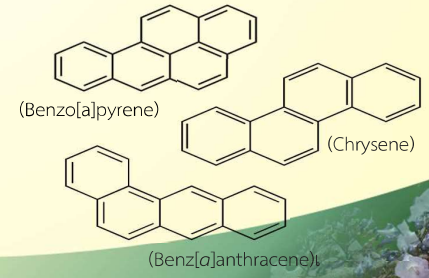
Sources of OC/EC

- The OC/EC ratio concentration value of 1.39, belonging to the interval of 1.0-4.0, suggested gasoline vehicular exhaust emission as the source.
- The lake sediments were contaminated by the incomplete combustion of vehicular exhaust emission and biomass combustion.



CONCLUSION

- The concentrations of total PAHs in the studied sediment samples were substantially lower than those found in many other lakes, consistent with the OC/EC ratios.
- For the PAHs found in lake, the most predominant had 4-6 aromatic rings.
- The main sources of PAHs found in this study were from hydrocarbons derived by incomplete combustion of petroleum products, forest fires, or biomass combustion.



ACKNOWLEDGMENTS

This work was supported by Distribution and characteristics of black carbon from biomass burning in the middle-and-low-latitude Asian and its impact on regional climate and monsoon precipitation from The Thailand Research Fund (TRF).

Division of Environmental Science and Technology, Faculty of Science and Technology, Rajamangala University of Technology, Phra Nakhon.

Thank you

Prince of Songkla University