DISTRIBUTION OF ALIPHATIC AND AROMATIC HYDROCARBON IN DATED SEDIMENT CORES OF THE GULF OF THAILAND

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Oil pollution from shipping accident is the most outstanding and chronic ones for marine environment. Tanker operations and leakages from production platforms also have been thought to be the major sources of oil pollution in the sea. Therefore,for many years most of the studies have devoted to contaminations from these sources i.e. the studies to clean up of oil slicks, assessment of environmental impacts, recovery of oil-polluted natural resources as well as co-operative to establish protective measures. Up to now, we can say that these circumstances can be controlled at some level. There is also realization that these circumstances always occur in the deep sea which have a large dilution capacity due to the large volume of sea water, accordingly, they can hardly affect the coastline. In addition, many studies reported that oil pollution in marine environments from human acitvities have much decreased during the last 10 years.

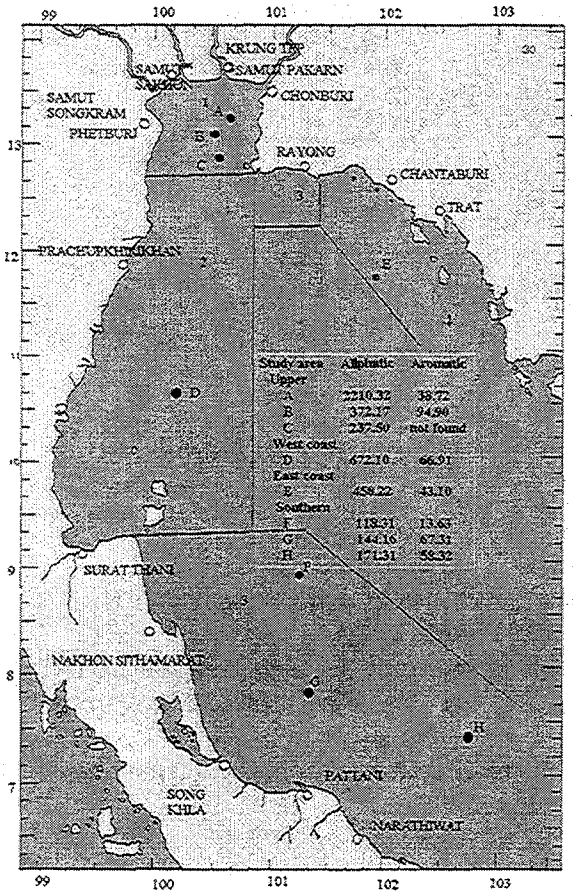

Fig 1. Sampling locations in the gulf of Thailand indicated area 1 is very high risk area, area 2, high risk area, area 3, medium risk area, and area 4, low risk area (Rungruangsin, 1989 (in Thai)).

Recently, many scientists have turned their attentions from those major sources which affect very limited areas to small but routine discharges from land-based sources which can accumulate and cause a long term effect on the environment.

In this study sediment core samples from 8 stations in the Gulf of Thailand were collected during September 1992- August 1994. The sample sites were chosen in the followings (Fig 1) : Upper Gulf of Thailand, near Chao Phraya River mouth (very high risk area), Upper Gulf of Thailand down to Ban Don Bay, Surat Thani (high risk area), along the coastal area of Rayong, Nakhon Srithamarat and Phuket Island (medium risk area), and along the coastal area of Chantaburi and Trad province (low risk area) [1] .

Sediment cores have been dated by ^{210}Pb dating method [2]. Aliphatic and aromatic hydrocarbon have been analyzed by GC and GC/MS technique. Total n-alkane in surface sediment were 0.237 - 2.210, 0.672, 0.458, and 0.118-0.171μg/g dry weight with the average of 0.940, 0.672, 0.458, and 0.144μg/g dry weight for area 1,2,4 and 3 respectively.

Total n-alkane in surface sediment in area 4 were higher than those in area 3 eventhough area 4 was considered as the lowest risk area probably due to the development of industrial complex along the east coast(Rayong, Chantaburi and Trad provinces). Comparison of total n-alkane in the Gulf of Thailand showed the high value at the station near-shore and tend to decrease with the distance away off-shore.

Hydrocarbon contamination was found in near-shore sediments particularly around industrial and urbanized sites. Source of contamination has been studied based on several methods i.e. chromatogram characterization, UCM study, LMW/HMW ratio [3] n-C16 ratio [3,4] (Carbon preference index (CPI) [5], C17/pristane ratio [3] , C18/phytane ratio [3] and pristane/phytane ratio(4). It is concluded that hydrocarbon found in near-shore sediment derived from both biogenic (phytoplanktons and higher plants) and anthropogenic sources. In off-shore area, hydrocarbon were mostly from biogenic sources particularly from phytoplanktons. This indicated that fallout on to land and transport of with terrigenous particles from the drainage basin is more important source of hydrocarbon contamination than fallout directly into the Gulf.

The aliphatic hydrocarbon concentrations decrease with respect to depth in all cores. UCMs have been found at 0-22, 0-16, 0-12 and 0-10 cm depth layer at station A, B, D and E,respectively. By using sediment dating technique, it is concluded that contamination of aliphatic hydrocarbon from pyrogenic sources were found at much earlier date at station near-shore (1940AC and 1947AC at station A and B, respectively) when compared to station off-shore (1981AC and 1960AC at station D and E respectively). Thailand's first import of kerosene is 100 years ago during King RamaV reign [6].

Total n-alkane concentrations correlate with depth and organic carbon concentrations in sediment samples. Therefore, the regression equations to predict total n-alkane concentration in sediment samples can be formulated (Table I).

TABLE I. REGESSION EQUATIONS TO PREDICT TOTAL N-ALKANE CONCENTRATION IN SEDIMENT OF THE GULF OF THAILAND

Study area		Regression equation	R^2
Upper Gulf -	A	-45.93+1293.36(OC)-10.05(D)	0.81
	B	98.65+87.92(OC)-10.54(D)	0.90
	C	185.04+80.32(OC)-5.47(D)	0.91
East Coast	D	903.07-351.62(OC)-16.86(D)	0.74
West coast	E	72.22+355.43(OC)-3.89(D)	0.26
Southern	F	69.81+62.83(OC)-0.35(D)	0.21
	G	-44.06+403.72(OC)-0.10(D)	0.32
	H	274.46-230.60(OC)-2.45(D)	0.76

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