International Journal of Chemistry Studies
ISSN: 2581-348X; Impact Factor: RJIF 5.44
Received: 16-11-2018; Accepted: 20-12-2018
www.chemistryjournal.in
Volume 3; Issue 2; March 2019; Page No. 32-34

Evaluation of poly aromatic hydrocarbons near Caspian sea and a comparison with similar marine areas

Lida Salimi[1], Amir Hajiali[2]
[1] Department of Marine Environment, Faculty of Marine Science and Technology, Islamic Azad University-Tehran North Branch, Iran
[2] Department of Environmental Engineering, Islamic Azad University (North Tehran Branch), Tehran, Iran

Abstract
This research focused on comparison of the concentration of poly aromatic hydrocarbons (PAHs) in the surface sediments of a spot near Caspian Sea. The evaluation was accomplished in summer and autumn. Then the achieved results were compared with PAHs concentrations and origins in some other similar marine areas of the world. The experiments were completed by SPSS software employed for data processing. Where of the data proceeded an abnormal manner, non-parametric and Mann-Whitney test were applied for further analysis. The results demonstrated that maximum values of PAH concentration in this station was much less than values represented by the other countries, particularly in the Caspian Sea border, except a few countries in the Persian Gulf border.

Keywords: Caspian Sea, marine areas, poly aromatic hydrocarbons, sediment

1. Introduction
Considering the Caspian Sea Environmental Protection agency (CEP) reports, Iran faces sever aquatic and environmental dangers as a result of natural characteristics of the Caspian Sea. While it has the sharpest depth through Iran borders which result in ramping the pollutants. Correspondence of Anzali port to the Caspian Sea, tiding and water fluctuations are responsible for exposure of the aforementioned lagoon to oil contaminants as PAHs. Besides industrial wastewaters of nearly 50 factories, million tons of urban wastewaters which introduced to the lagoon play an important role for contamination via adjacent regions. In the last decades carcinogenic and mutagenic properties of the PAHs increased the worldwide concerns. Most categories of acting as transportation of petroleum fuels, crude oil operational activities, unprincipled discharge of industrial effluents and some others play the important roles as the petrogenic sources which are responsible for entrance of these contaminants to the aquatic environment [1]. But generally deep PAH contamination occurred in the port towns and near the beach border [2].

2. Materials and Method
In this study based on the strategic policies Mahruzeh station selected depends on its geographical zone of interception of different seasonal rivers and adjacency of protection zone. As the literature only two types of climate condition samplings applied as dry and warm seasons and wet and rainy seasons. As a result based on the continental and geographical conditions and local sampling facilities sampling involved June and September seasons. Sampling was done via Van Veen Grab in one kilometer length of the sampling zone. At first samples collected and provided by keeping in the Aluminum vessels at freezer and analyzed based on the MOOPAM, 1999 instruction. The beforehand samples dried completely by the freezer dryer apparatus (VaCo-ZiRBus) and introduced into the micro wave vessels after they were weighted. At this time sediments charged with extractive solvents, normal hexane and acetone, with volume ratio of 1:1 (15 ml respectively) and remained in the macro wave apparatus under 180 ˚C for residence time of 30 minutes. In the next stage samples had been filtered by suitable filter paper behind the aspirator and provided of 1 ml by volume via addition of N_2 gas. Thereafter 0.1 ml of normal hexane added. Then a mixture of 1 g of active copper powder with 5 ml of normal hexane centrifuged with the present samples. Above all in the end samples thickened by N_2 gas to 1 ml volume and passed through a 1 cm diameter column of silica gel, alumina and sodium sulfate. Finally experiments had been completed by SPSS software employed for data processing.

3. Results and Discussion
The analyzed results in this station in June is shown in table 1 while Sed. represented sediment with M_1 as the mean value of pollutant concentration in the first sampling point in this station. Similarly M_2 and M_3 shows the mean value of pollutants at second and third sampling points, respectively. Also “J” refers to June. Considering the results, maximum mean value of PAHs appeared in the sediments followed a range of 57.891-66.754 ng/g in September (Table 2). According to table 3, Oman and the United Arabic Emirates had less PAH contamination than aformentioned stations in Iran. Also Qatar followed the same pollution patern as Iran while Bahrain represented more contaminated environment. In addition Anzali lagoon in maximum amount of pollution, 34.839-80.432 ng/g, had lower contamination grade than other countries around the Caspian Sea such as the northern and southern countries, Kazakhstan and Azerbaijan.

Table 1: PAH concentrations for Mahruzeh station, June

PAH compounds (ng/g)	Sed.M_1/J	Sed.M_2/J	Sed.M_3/J	Mean
NAP	0.906	0.785	1.039	0.91
ACPY	2.346	2.006	1.707	2.019
ACP	0.807	0.744	0.703	0.751
FL	0.758	0.666	0.311	0.578
PHE	6.036	5.259	5.367	5.554
ANT	0.455	5.447	5.663	3.855
FLUR	2.163	1.667	1.302	1.710
PYR	2.378	1.937	1.214	1.843
BAA	0.991	0.665	0.298	0.651
CHRY	2.925	2.745	1.113	2.261
BBF	7.942	6.325	2.182	5.483
BKF	3.191	2.57	0.538	2.099
BAP	0.528	0.334	0.956	0.606
∑ PAH	31.426	31.177	22.393	28.32

Table 2: PAH concentrations for Mahruzeh station, September

PAH compounds (ng/g)	Sed.M_1/S	Sed.M_2/S	Sed.M_3/S	Mean
NAP	3.521	3.964	11.897	6.460
ACPY	7.663	8.169	9.915	8.582
ACP	2.991	2.93	3.325	3.082
FL	1.296	1.236	2.659	1.730
PHE	4.991	5.428	7.57	5.996
ANT	5.025	5.608	1.521	4.051
FLUR	2.515	2.511	2.323	2.449
PYR	1.292	4.68	2.891	2.954
BAA	3.424	1.319	1.856	2.199
CHR	2.402	3.403	4.773	3.526
BBF	5.87	5.598	6.557	6.008
BKF	2.29	2.174	2.765	2.409
BAP	4.914	0.52	1.217	2.217
∑ PAH	48.194	47.54	59.269	51.663

Table 3: Different reports of PAH concentrations and origins in different parts of the world [3-8]

Zone	∑PAHs (ng/g) [1]
North America	
Entire US coast	13.4-40453
Entire US coast	4.87-30674
Pales Verdes Shelf,CA, USA	1252-7037
Alaska stations	2.17-733
West Beaufort Sea (Polar Star sediments)	159-1092
Europe	
Eastern Mediterranean Sea	20-18700
Baltic Sea	3.16-30100
Irish estuaries	83-22960
Gironde Estuary (France)	3.5-853
Lazaret Bya (central Mediterranean)	86.5-48060
White Sea (Russia, Arctic Ocean)	13-208
Africa	
Cotonou coast (Benin)	80-1411
Asia	
Kyeonggi Ba (Korea)	9.1-1400
Surface Sediment (Hong Kong)	7.25-4420
South china Sea (China)	24.7-275.4
Bohai Bay (China)	31-2513
Yellow Sea (China)	20.5734
Persian Gulf Surrounding Countries	
United Arabic Emirates	4.9-39
Qatar	55-92
Bahrain	13-6600
Oman	6.1-30
Caspian Sea Bordering Countries	
Azerbaijan	338-2988
Kazakhstan	6-294
Russia	6-345
Caspian Sea (Iran)	84-1789

It is necessary to introduce the abbreviations of the whole PAHs compounds which are presented in the result tables.

Table 4: Abbreviations of the whole PAHs compounds

PAHs compounds	Abbreviations	PAHs compounds	Abbreviations
Naphthalene	NAP	Benzo (a) anthracene	BAA
Acenaphthylene	ACL or ACPY	Chrysene	CHR
Acenaphtene	ACN or ACP	Benzo (b) fluoranthene	BBF
Fluorene	FLU or FL	Benzo (k) fluoranthene	BKF
Phenanthrene	PHE	Benzo(a)Pyrene	BAP
Anthracene	ANT	Indeno (1,2,3 – cd) pyrene	INP
Fluoranthene	FLR or FLUR	Dibenzo (ah) anthracene	DBA
Pyrene	PYR	Benzo(ghi)perylene	BPR

4. Conclusion

Regarding to the PAH hazardous identity most of the aquatic environments encounter the dangerous effects of these pollutants. In this research it was found that mean

value of PAH concentration in Mahruzeh station was 34.839 ng/g and 61.439 ng/g in June and September, respectively. Fortunately Mahruzeh station didn't touch the critical values of contamination while recent studies clarified pollution levels. Moreover, while rainy seasons showed high value of PAH contamination it is estimated that petrogenic and pyrogenic parents of contamination strengthened with other pollution sources as industrial wastewaters combined with flowage.

5. References

1. Latimer JS, Zheny J. [The sources transport and fate of PAH in the marine environment, PAHs: An Ecotoxicological Perspective] John Willey and Sons Ltd, 2003.
2. Pruell RJ, Norwood CB, Bowen RD, Boothman WS, Rogerson PF, Hackett M. Butterworth, [Geochemical study of sediment contamination in New Bedford Harbor, Massachusetts] Marine Environmental Research. 1990; 29:77-110.
3. Baumard P, Budzinski H, Garrigues P. [Polycyclic aromatic hydrocarbons in sediments and mussels of the Western Mediterranean Sea] Env. Toxicology and Chemistry. 1998; 17:765-776.
4. Kim GB, *et al.* [Distribution and sources of polycyclic hydrocarbons in sediments from Kyeonggi Bay, Korea] Marine Pollution Bulletin. 1999; 38(1):7-15.
5. Zheng GJ, Richardson BJ. [Petroleum hydrocarbons and polycyclic aromatic hydrocarbons (PAHs) in Hong Kong marine sediments] Chemosphere. 1999; 38(11):2625-2632.
6. Eqtesadi Salimi A. [Estimation of poly aromatic hydrocarbons (PAHs) in Bandar-e Anzali lagoon, Siah-Keshim by: HPLC method], Marine Science and Technology J, 2010, 86-96.
7. Eganhouse RP, Gossett RW. [Historical deposition and biogeochemical fate of polycyclic aromatic hydrocarbons in sediments near a major submarine wastewater out fall in Southern California] American Chemical Society. 1990; 30:22-27.
8. Valette-Silver N, Hameedi Jawed M, Efurd DW, Robertson A. [Status of the contamination in sediments and biota from the Western Beaufort Sea (Alaska)] Marine Pollution Bulletin. 1999; 38(8):702-722.
9. ng/g: nanogarm/dried weight