

NOTES

OIL SPILL IN ABADAN OIL REFINERY (CASE STUDY)

H.T. Al-Saad

Marine Science Centre - University of Basrah

Basrah - Iraq

When crude oil is spilled in an estuary dispersion and weathering processes will alter its properties. The various mode of these processes can be summarized as: Evaporation, dissolution, Emulsification, photochemical oxidation, and microbial degradation. The way in which it spreads on the waters surface are a function of its physical and chemical nature as well as the actions of wind, waves and currents. Environmental stresses such as temperature and salinity changes, wave action and sunlight will rapidly alter the physical state of the oil by formation of emulsions and oxidation of hydrocarbons (Michel et al., 1993). These stresses, which are common to the Shatt Al-Arab estuary will also effect the growth and metabolism of microorganisms which play a role in the degradation of crude oil (Hayes et al., 1993).

It was observed that Abadan oil refinery was discharging wastes of crude and refined oil that formed floating slick at this station and its surrounding. In an attempt to characterize the floating oil at this station, samples of the slick were taken for the period of June 1993- July 1994. (Fig. 1).

Table 1: Total hydrocarbons and n-alkanes with some parameters of floating oil near Abadan oil refinery.

Season	C17	Pri	Phy	Pri	Total	
	C18	C17	C18	Phy	CPI n-alkanes	Total HC(aromatic) (ug/g)
Summer	0.83	1.60	1.16	1.14	0.63	210
Autumn	1.07	0.60	0.76	0.90	0.75	323
Winter	0.94	0.77	0.63	1.16	0.62	480
Spring	0.86	0.94	0.91	0.90	0.10	290

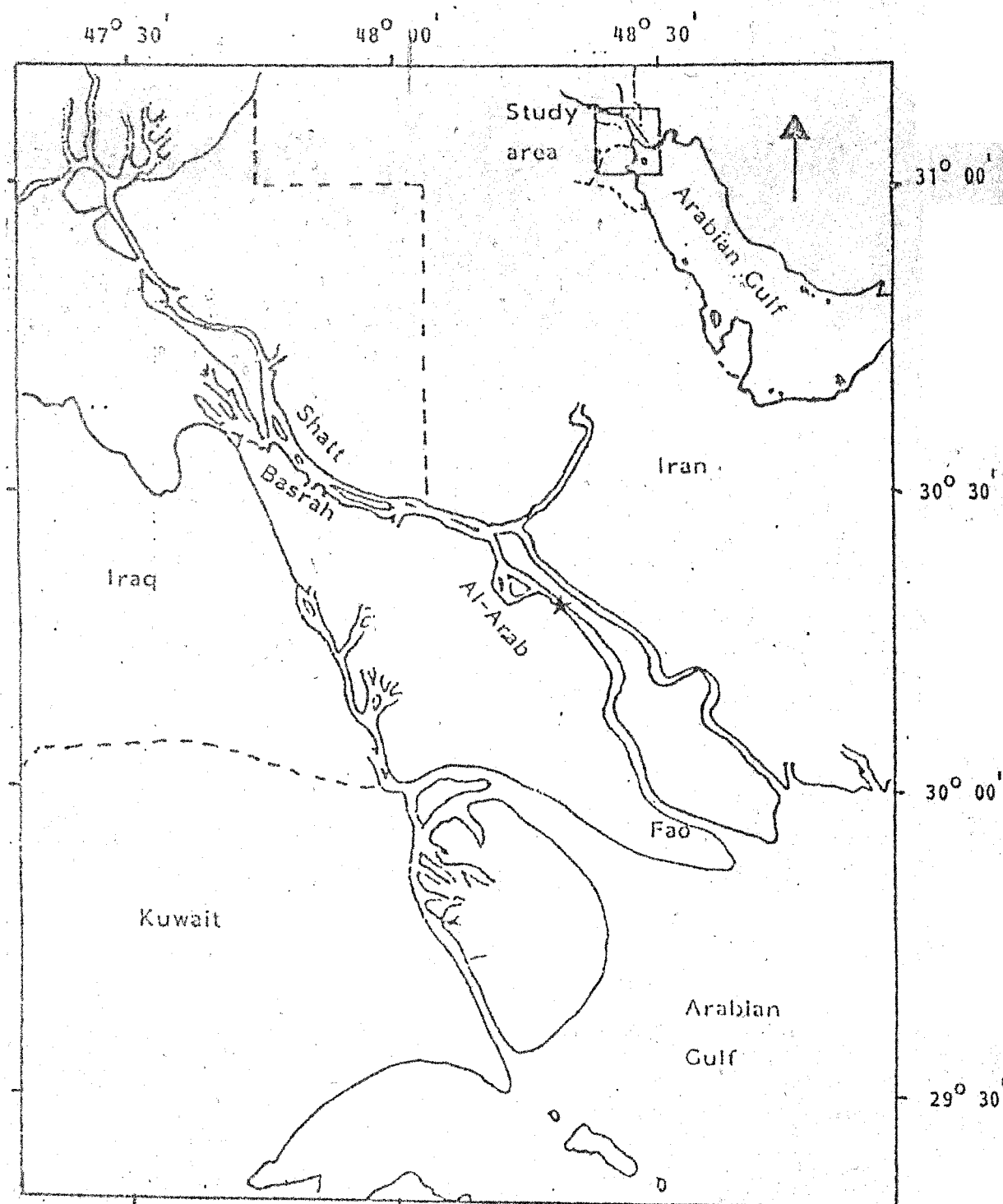


Fig. 1. Map of Shatt Al-Arab estuary and NW Arabian Gulf showing the position of the sampling station.

Fluorescence spectra (Fig. 2) provided an idea about the amount of aromatic hydrocarbons present in these samples. The level of petroleum residues varied from 100 ug/g in summer to 280 ug/g during winter (Table 1). Figure 3 represented some chromatograms of n-alkanes as function of the floating oil slick during different seasons. These chromatograms resemble highly weathering crude oil.

The ratio of C17/ pristane and C18/ phytane decreased with time. Pristane phytane are abundance isoprenoids in crude oil but, they could be found at a lesser amount during weathering (Table 1).

The floating oil is affected by the seasonal variations of water temperature and weathering. In summer evaporation is an important process in oil weathering in Shatt Al-Arab estuary due to high water temperature and turbidity (Al-Saad, 1995). Moreover solar radiation which can photochemically degrade certain oil compounds (Ehrhardt and Burns, 1993) plays an important role in this area.

Shatt Al-Arab has a large water discharge capacity with an annual mean of around [1866 m³/sec] at Fao (Al-Saad 1995). Such a considerable movement of water masses has a great transport capacity, resulting in a high dilution of oil at this station to a negligible amount down stream. Suspended particulate matter are capable of removing considerable amount of an oil slick. Particulate matter, plus the adsorbed oil, will be deposited at the river bank or sink to the bottom as the water current is reduced in speed (Sauer et al., 1993).

After exposure of oil slick to weathering processes, the light weight components will be removed leaving the more viscous residue which are known as [asphaltenes]. Asphaltenes could be observed as a black tripe on the shores that cover the vegetations.

As long as the oil in Shatt Al-Arab estuary floating as a liquid on the water surface or distributed in the water column it is obviously biodegraded without problems. Thus it may be expected that possible residues of oil, which have not been

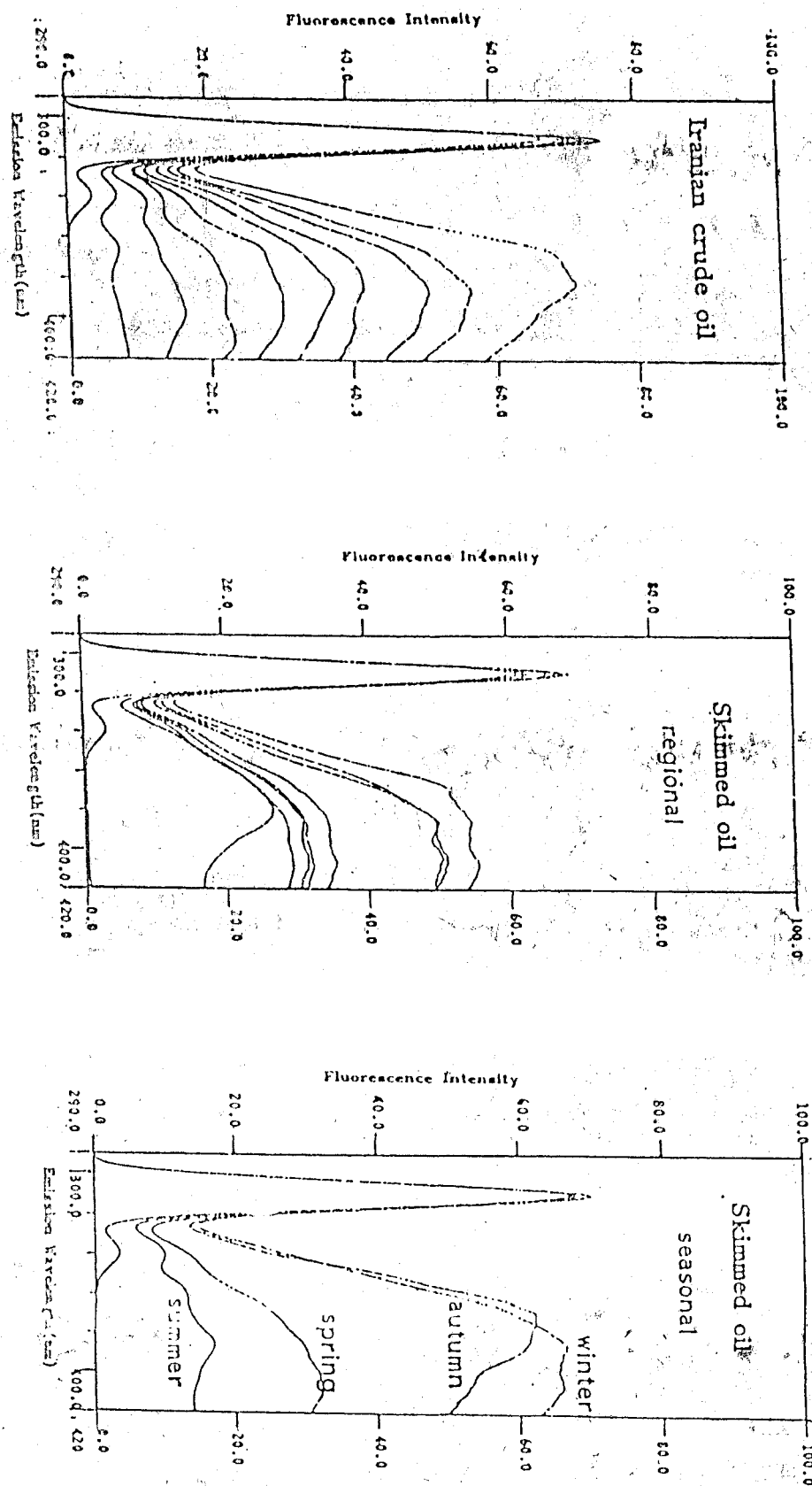


Fig. 2- Fluorescence spectra of Iranian crude oil with samples of floating (skimmed) oil collected near Abadan oil refinery

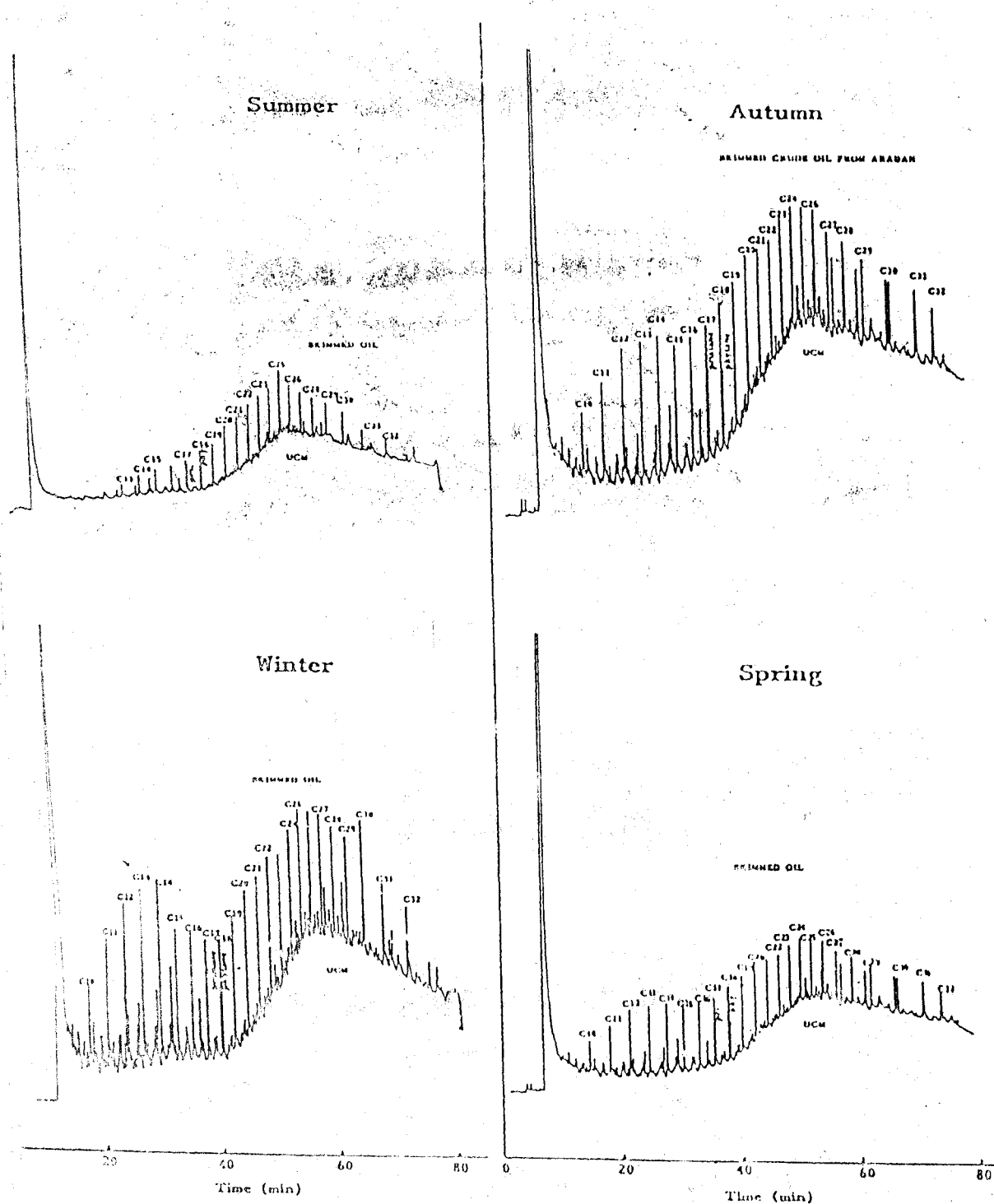


Fig.3'- Representative capillary gas chromatograms (GC/FID) of n-alkanes of skimmed crude oil near Abadan oil refinery during the different seasons

skimmed off or sunk down will disappear rapidly and without any damage resulting from them.

As a conclusion:

- 11- The floating oil restricted to the point source at Abadan oil refinery and an area about 3 Km down stream.
- 11- Oil residues remained in the water column for a relatively short period of times due mainly to both flushing and deposition.
- 11- The chronic effects of floating oil was limited to bank sediment and vegetation, where terrestrial plants were adversely effected, particularly at the upper reaches of the river.
- 11- Apparently, fish were not affected to a great extent since, there were no reports of fish-kill in the area.

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