

Oil pollution of marine organisms after Nassia tanker accident in the Black Sea, Bosphorus and the Sea of Marmara

Nassia tanker kazasından sonra Karadeniz, Boğaziçi ve Marmara Denizi canlılarında petrol kirliliği

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Abstract

The oil pollution of whiting, horse mackerel, shrimp and algae; *Ulva lactuca*, *Ceramium rubrum*, *Cystoseira barbata* were investigated after Nassia tanker accident. The higher oil contamination was found in shrimp as 253.98 µg/g one month after and in the algae *Ulva lactuca* as 175.53 µg/g at four months after the accident. We propose algae and shrimps as the best means to monitor oil pollution in seawater.

Keyword: Oil pollution, Turkish Straits, Nassia accident, whiting, horse mackerel, shrimp, algae

Introduction

Turkish Straits (Bosphorus, Dardanelles and the Sea of Marmara) are a channel through the Black Sea and the Mediterranean Sea. In the Bosphorus a major tanker accident occurred in March 1994 and various problems on oil pollution after Nassia tanker accident were published in earlier papers (Güven *et al.*, 1995, 1996; Okuğ *et al.*, 1996).

The hydrocarbon (anthropogenic/endogenic) content marine organisms have been investigated by various workers. Mironov *et al.*, (1981) studied autochthonous (endogenic) or allochthonous (exogenic) hydrocarbons in various fish and mussel in Mediterranean Sea. Miranov (1991) also studied the influence of oil pollution on fauna of the Black Sea and found that the grey mullet was the most resistant to oil. Aliphatic hydrocarbons were detected in three fish species which were collected from Canary Islands. The highest C₁₅-C₁₈ levels were found in *Sardina pilchardus* (Quintera and Diaz, 1994). Stress due to benzene was examined on white mullet and it was found that respiration rate increased with raising benzene concentration (Correa and Garcia, 1990).

Chronic exposure of fish to crude oil resulted in increased parasitism (Khan and Kiceniuk, 1988; Khan, 1990). Pollutants and their degradation products increased prevalence of lesions such as fin rots and tumors in fish that appeared to be more susceptible to viral and bacterial infections (Sinderman, 1979, 1982). Hydrocarbon concentration (aliphatics and aromatics) was investigated in *Mullus barbatus*, *Merluccius merluccius* and *Trachurus trachurus*. It was found that the hydrocarbon distributions in various organs were ranked as liver>gonads>muscle (Albaiges *et al.*, 1984).

Hydrocarbon contents of algae were studied by various authors (George, 1961; Clark and Blumer 1967; Youngblood *et al.*, 1974, Youngblood and Blumer 1973; Gearing *et al.*, 1975; Rossi *et al.*, 1978; Miranov *et al.*, 1981; Knutsen and Sortland 1982; Peckol *et al.*, 1990). They identified the aliphatic compounds of C₁₅-C₂₉ in algae.

In this paper the oil pollution is reported in fish, shrimps and in algae after Nassia tanker accident.

Materials

Whiting (*Merlangius merlangus*)

Horse mackerel (*Trachurus trachurus*)

Shrimp (*Parapenaeus longirostris*)

The algae were : *Ulva lactuca* L., *Ceramium rubrum* Huds, *Cystoseira barbata*, C. Agardh.

The sampling stations are shown in Fig 1. The collection date are for fish and shrimps 21-24/04/1994, 5-11/7/1994, 23-28/9/1994 for algae 5-11/07/1994.

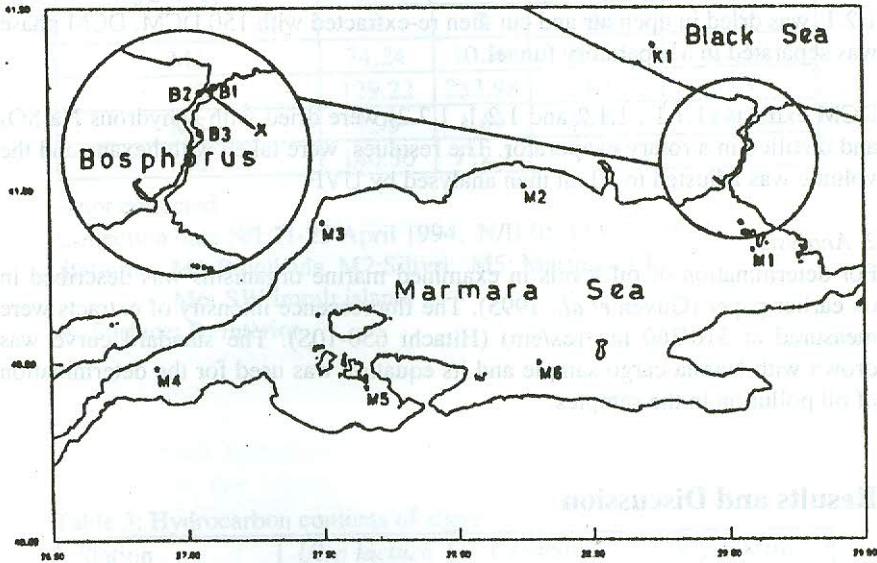


Fig.1 The sampling stations.

(x): Rumeli Feneri Çakarı (location of accident)

K1: To where Nassia tanker has been pulled after the accident.

Method

1. Hydrocarbons extraction techniques

1.1. Fish, shrimps

1.1.1. For the separation of oil hydrocarbon on surface of fish and shrimps; 20 g sample (wet weight) was macerated with 150 ml dichloromethane (DCM) for 15 min, and DCM phase was separated in a separatory funnel.

1.1.2. For the separation of oil hydrocarbon in inner part of fish and shrimps; The sample 1.1.1. was cut then re-extracted in a mixer with 150 ml DCM for 30 min and then DCM phase separated in a separatory funnel.

1.2. Algae

1.2.1. For the separation of oil hydrocarbons on surface of algae: 100 g algae (wet weight) was macerated with 150 ml dichloromethane (DCM) for 15 min, DCM phase was separated in a separatory funnel.

1.2.2. For the separation of oil hydrocarbon of interior in algae: The algae 1.2.1. was dried in open air and cut then re-extracted with 150 DCM. DCM phase was separated in a separatory funnel.

DCM extracts (1.1.1 , 1.1.2 and 1.2.1, 1.2.2) were dried with anhydrous Na_2SO_4 and distilled in a rotary evaporator. The residues were taken with hexane and the volume was adjusted to 10 ml then analysed by UVF.

2. Analysis

For determination of oil levels in examined marine organisms was described in on earlier paper (Güven *et al.*, 1995). The fluorescence intensity of extracts were measured at 310/360 nm (ex/em) (Hitachi 650-10S). The standard curve was drawn with *Nassia* cargo sample and its equation was used for the determination of oil pollution in the samples.

Results and Discussion

The oil levels found in examined samples are shown in Table 1, 2 and 3.

Table 1: Oil levels in fish ($\mu\text{g/g}$, wet weight)

Stations	<i>Merlangius merlangus</i>						<i>Trachurus trachurus</i>	
	N/I		N/II		N/III		N/I	
	A	B	A	B	A	B	A	B
K1	5.19	22.56	3.10	24.5	2.43	30.7	-	-
M1	-	-	0.35	26.7	-	-	20.1	78.7
M3	4.08	5.20	-	-	-	-	-	-
M4	0.36	11.14	-	-	1.07	15.0		
M5	3.82	54.4	0.42	1.0	13.6		-	-
M6	-	-	-	-	7.42	18.7	-	-

-:not collected

Collection date N/I:21-25 April 1994, N/II:05-11 July 1994,

Stations : K1: Karaburun, M1:Büyükada, M3:Tekirdağ, M4: Şarköy,

M5: Marmara island , M6: SW İmralı island.

A: Surface; B: Interior

Table 2: Oil levels in shrimps ($\mu\text{g/g}$, wet weight)

Stations	<i>Parapenaeus longirostris</i>			
	N/I		N/II	
	A	B	A	B
M1	74.24	10.50	79.50	22.50
M2	129.22	253.98	10.53	63.99
M5	4.95	1.67	42.44	13.35
M6	140.36	112.1	-	-

-:not collected

Collection date N/I:21-25 April 1994, N/II:05-11 July 1994,

Stations : M1:Büyükada, M2:Silivri, M5: Marmara island,

M6: SW İmralı island.

A: Surface; B: Interior

Table 3: Hydrocarbon contents of algae

Station	<i>Ulva lactuca</i>		<i>Ceramium rubrum</i>		<i>Cystoseira barbata</i>	
	N/II		N/II		N/II	
	A	B	A	B	A	B
K1	53.9	-	60.78	290.00	-	-
B1	-	-	-	-	27.42	90.80
B2	-	-	-	-	30.61	-
B3	175.5	-	-	-	-	-
M1	55.74	-	4.77	-	-	-
M2	29.11	-	-	-	-	-
M5	103.11	-	-	-	-	-

-not collected

N/II:Collection date; 05-11 July 1994

Stations : K1: Karaburun, B1:Poyraz, B2:Altinkum, B3: Beykoz,

M1:Büyükada, M2:Silivri, M5: Marmara Island,

A: Surface; B: Interior

The highest oil level contamination was found in the samples collected in the first month after the accident.

