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Oil and detergent pollution on coastal areas of Dardanelles in 1996-1997

Çanakkale Boğazı kıyı şeridinde 1996-1997 yıllarında petrol ve deterjan kirliliği

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Abstract

The oil and detergent pollution was determined in coastal waters and sediments in Dardanelles at entrance, Gelibolu and Lapseki; at exit, Çanakkale. The max. level of oil pollution in sea water was 154.76 μg/L at the entrance and 76.30 μg/L at the exit in 1996; 429.54 μg/L and 539.10 μg/L respectively in 1997. In sediments 51.13 μg/g at the entrance and 338.76μg/L at the exit in 1996 and 369.56 μg/L and 339.56 in 1997.

In detergent pollution the max. level was 50.51 μg/L at the entrance and 61.84 at the exit in 1996 and 80.08 μg/L and 61.43 in 1997.

The findings indicated that the coastal areas were more polluted than mid-points (shipping route) of Dardanelles and also Sea of Marmara in 1996.

Keyword:Dardanelles, sea water ,sediment, oil, detergent .

Introduction

The Dardanelles is a water way connecting the Agean Sea to the Black Sea. There are two currents in this strait, upper layer is the Black Sea water and under layer is Mediterranean Sea water flowing in the opposite directions.

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Shipping traffic is dense; approx. 42.000 ships/a pass and cause oil pollution in the Dardanelles.

The detergents investigated in this work were originated mainly from urban seawage.

Oil pollution was studied in the northern entrance and the southern exit in mid-points of Dardanelles in 1996-2001 (Güven *et al.*, unpublished data)

Anion active substance, LAS is a major component of detergent. It contains mainly $C_{10} - C_{14}$ alkyl groups. Being an important pollutant of seas, it was determined in the Black Sea, İstanbul Strait and Sea of Marmara in 1996 (Güven *et al.*, 1999).

This paper reports the result of oil pollution and detergent levels in coastal water and sediments in Dardanelles during 1996-1997.

Material and Method

The samples of sea water and sediments were taken in Dardanelles in 1996-1997. The sampling stations are shown in Fig.1.

The stations coded as entrance: Gelibolu (G), Lapseki (L), and exit: Çanakkale (C).

Sea water sample was taken from surface in 2.8 L bottles. Sediment samples were taken from approx. 20 cm depth near the coast.

Sea water was extracted with 50 ml dichloromethane (DCM). The extract was distilled under 40° C; the residue was taken with hexane and the volume adjusted to 10 ml. The measurement was made by fluorospectrophotometer (UVF) (Shimadzu RF-1501) at 310/360 nm (ex/em).

50 g sediment sample was mixed with anhydrous sodium sulfate, then extracted with DCM in Soxhlet apparatus for 8 h,organic phase was distilled, the residue taken with hexane and the volume adjusted to 10 ml. The fluorescence intensity was measured in UVF.

The oil level was determined by using a correlation equation calculated from the standard curve equations of the oils; Arabian, Iranian, Syrian,Egyptian,Libyan,Russian which were transported through the strait in 1996(Güven and Çetintürk, unpublished data).

The detergent level in sea water was determined according to Standard Methods (1991) modified by Çetintürk and Güven (unpublished data). The standard curve was plotted with LAS (Lever, Turkey) in conc. of 10-100 μg/ml by using UV spectrophotometer (Shimadzu UV-1601) at 652 nm.The blank was prepared in the same manner with 0,22% NaCL solution corresponding to salinity of Sea of Marmara) omitting LAS.

Results and Discussion

The correlation equation used for oil pollution calculated from the oils indicated above was:

y= 266.5 c+84.867 (Güven and Çetintürk, unpublished data).

Oil pollution measured in the coast of Dardanelles is shown in Table 1.

Table 1- Oil pollution of sea water in Dardanelles, μg/L.

	1996		1997	
	Nov.	Dec.	April	June
G	49.47	105.33	162.79	71.19
L	65.21	154.76	429.59	71.68
C	76.30	44.82	539.10	64.26

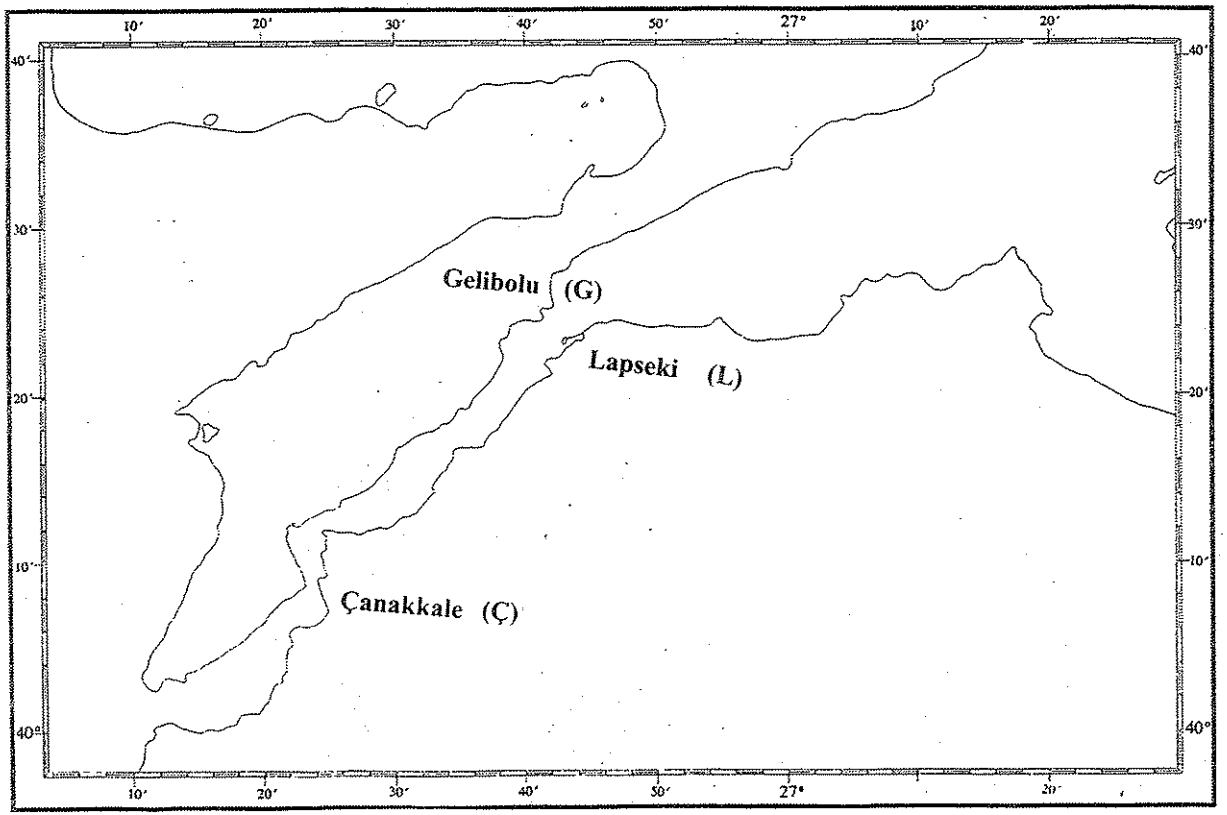
Pollution level varied 49.47- 154.76, μg/L at the entrance and 44.82-76.30 μg/L, at the exit in 1996. It varied 71.18-429.5 μg/L. and 71.18-429.5 μg/L and 64.26-539.10 μg/L respectively in 1997.

The oil pollution in sediments are shown in Table 2 According to these results sediment was more polluted in Dardanelles.

Table 2. Oil content in sediment, μg/g.

	1996	1997	
	Dec.	April	June
G	12.24	195.72	369.56
L	51.13	369.56	34.80
C	338.76	-	339.56

Fig 1. Sampling station



The equation of standard curve used for the detergent was: y= 0.26.40 c-0.0072 (Çetintürk and Güven unpublished data).

The detergent pollution is shown in Table 3. The detergent levels are compared, Asian coast of Dardanelles seemed more polluted than the European coast. Meanwhile Çanakkale, the exit of Dardanelles, was slightly more polluted than Gelibolu and Lapseki at the entrance.

Table 3. Detergent pollution in sea water of Dardanelles, μg/L.

	1996		1997			
	Oct.	Nov.	Feb.	March	June	July
G	37.96	50.23	39.70	35.82	26.88	25.38
L	22.07	50.51	80.08	39.99	-	58.36
C	24.34	61.84	50.0	34.45	61.43	39.36

Thus, the entrance was more polluted than the exit in Dardanelles.

In the years of 1995 and 1996 the samples were taken from the entrance and exit in mid- points (shipping route) of the Strait. The maximum oil pollution level was measured at northerm entrance 5.24 μg/L in 1995 and 43.5 μg/L in 1996 at soutern end 5.29 μg/L in 1995 and 40.9 μg/L in 1996 (Güven *et al.*, 1998)
The comparison the oil level between the coastal area and mid-point of Dardanelles in 1996 shows that the oil consantration was highest in coastal areas.

In the Sea of Marmara the high level of detergent amount was in surface water as 28.98 μg/L in 1996. The findings indicated that the coastal areas of Dardanelles were more polluted than Sea of Marmara.

Özet

Bu çalışmada Çanakkale Boğazı kıyı şeridinde girişte Gelibolu ve Lapseki, çıkışta Çanakkale'de petrol ve deterjan kirliliği incelendi. Çanakkale Boğazı giriş ve çıkış sedimentinde de petrol kirliliği araştırıldı. Buna göre en yüksek petrol kirliliği yüzey suyunda 1996'da Boğaz girişinde 154.76 µg/L, Boğaz çıkışında 76.30 µg/L, 1997 yılında Boğaz girişinde 429.59 µg/L, Boğaz çıkışında 539.10 µg/L'dir.

Sedimentte en yüksek kirlilik 1996'da Boğaz girişinde Lapseki'de 51.13 µg/g, Boğaz çıkışında Çanakkale'de 338.76 µg/L, 1997 yılında Boğaz girişinde Gelibolu'da 369.56 µg/l, ve Boğaz çıkışında Çanakkale'de 339.56 µg/g'dir.

En yüksek deterjan kirliliği 1996'da Boğaz girişinde 50.51 µg/L Boğaz çıkışında 61.84 µg/L ve 1997 yılında Boğaz girişinde 80.08 µg/L ve Boğaz çıkışında 61.43 dır.

Bu sonuçlara göre Çanakkale Boğazı'nın kıyı şeridinde 1996 yılı verilerine göre petrol ve deterjan kirlilik miktarı Çanakkale Boğazı gemi trafiği yolu üzerindeki kirlilik miktarından daha yüksektir.

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