

The nitric acid digestion technique was selected because, as demonstrated by Agemian & Chau (1976), it leaches out most of the metals despite its inability to attack completely the silicate lattice. Furthermore, it gives very similar results to those obtained by shaking the sediments with 2N hydrochloric acid for 16 h in the cold (Voutsinou-Taliadouri & Satsmadjis, in press). Several intercalibration exercises confirmed its reliability. For the samples examined, the standard deviation depended on the concentration: in the range 1.3–1.8 g kg⁻¹ for iron, 40–80 mg kg⁻¹ for manganese, 5–20 mg kg⁻¹ for zinc, 10–20 mg kg⁻¹ for chromium, 15–35 mg kg⁻¹ for nickel, 2–10 mg kg⁻¹ for lead, 2–5 mg kg⁻¹ for copper, 1–1.5 mg kg⁻¹ for cobalt, 0.1–0.5 mg kg⁻¹ for cadmium, and 0.01–0.02% for organic carbon.

Table 1 indicates that the majority of the sediments sampled lay in shallow waters and contained fairly high amounts of organic carbon and mud. Table 2 demonstrates clearly the impact of the city of Thessaloniki itself, its port and factories, along with that of the Axios and Aliakmon rivers on the distribution of the constituents determined in the Thermaikos Gulf. The unsullied section of the latter, in the south, presents about the same metal concentrations as the Patraikos Gulf (Voutsinou-Taliadouri & Satsmadjis, 1983) and the East Aegian Sea (Voutsinou-Taliadouri & Satsmadjis, in press), but less than the Pagasitikos Gulf (Voutsinou-Taliadouri & Satsmadjis, 1982). The ratios of the average levels in the affected part of the Gulf to those in the clean section depend on the element: cobalt 1.6, nickel 2.0, iron 2.2, chromium 2.2, manganese 2.5, cadmium 2.9, zinc 3.1, lead 3.7 and copper 4.8.

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Iron Accumulation in the Sessile Barnacle, *Balanus amaryllis* (Darwin)

Fouling organisms, because of their sedentary habits, are considered to be efficient and accurate indicators of the average abundance of certain trace metals in any given environment (Phillips, 1977). There are very few data

available about sessile barnacles (Walker, 1977; Barber & Trefry, 1981; Witkowski & Frazier, 1982). The present study on the fouling organisms settled on the iron ore loading platform, *Priyadarshini*, (off Marmugao Harbour, Goa) gave us an opportunity to investigate the accumulation of iron in various organs of the sessile barnacle, *Balanus amaryllis* (Darwin).

Forty-two specimens of *B. amaryllis* were collected from the iron ore loading platform on 20 May 1982, and were

TABLE 1
Iron content in different tissues of *Balanus amaryllis* (mean value and range in µg g⁻¹ wet wt of tissue).

Size group	Sample size	Tissues				Total animal
		Cirri	Gut	Muscle	Gonad	
I	6	1108.6 (619.8–1456.4)	2139.3 (1722.0–2884.9)	525.2 (158.8–737.1)	471.6 (297.7–641.9)	1139.9 (877.0–1468.1)
II	5	1041.8 (718.9–1650.0)	1812.6 (535.5–2943.6)	240.1 (165.8–314.1)	344.2 (240.1–358.3)	1110.1 (504.3–1959.0)
III	17	776.6 (451.6–1320.3)	929.1 (273.0–1325.0)	303.1 (140.9–460.0)	654.9 (255.3–1004.9)	713.0 (509.5–882.2)
IV	9	1048.1 (531.3–1454.1)	979.2 (344.3–1653.5)	416.3 (169.8–780.5)	511.9 (280.8–790.5)	783.4 (478.1–1086.9)
V	5	1339.5 (1276.0–1435.7)	771.1 (619.5–1078.0)	479.8 (191.5–829.6)	658.3 (338.7–1068.6)	802.7 (372.7–1001.2)

frozen at -4°C . These animals were settled on the platform during October 1981–May 1982. Based on the basal diameter, the specimens were grouped into Group I (0–2.5 cm), Group II (2.5–3.0 cm), Group III (3.0–3.5 cm), Group IV (3.5–4.0 cm) and Group V (4.0–4.5 cm). Cirri, gut, muscle and gonads were separated from each individual and digested in a mixture of 5% perchloric/nitric acids. Iron concentration was determined employing Perkin–Elmer Model 5000 Atomic Absorption Spectrophotometer and is expressed as $\mu\text{g g}^{-1}$ wet wt of tissue.

The results (Table 1) show that iron is heavily accumulated in the barnacles compared to the findings of Walker (1977) and Witkowski & Frazier (1982). There is greater accumulation of iron in cirri and gut than in muscle and gonad reflecting the accumulation of iron ore particles suspended in the sea water in cirri and gut during filter feeding. Group I (youngest) shows maximum accumulation of iron which may be due to more active feeding than in older ones.

As the results showed accumulation of iron in the sessile barnacles which are constantly exposed to the iron ore (consists of ferric oxide (86.76%) mostly), sessile barnacles may serve as indicators of contamination of the surrounding waters.

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CONFERENCE

Cleaning up Oil

The Eighth Biennial Oil Spill Conference was held at San Antonio, Texas, from 28 February to 3 March 1983. It was again sponsored by the Environmental Protection Agency, the American Petroleum Institute and the US Coast Guard. Its topics were prevention, behaviour, control and clean-up, a list which enabled almost any paper on any aspect of oil spills to be presented. There were some 1050 delegates, including a record number from outside America.

There were over 90 papers divided between several sessions each day. Sometimes four took place at the same time, so an individual with a range of interests might have wished to be quads. There were nine major headings. These were: The technology of spill control, 19 papers; Contingency planning, also with 19 papers; Training and clean-up techniques, 11 papers; Computer applications, 6 papers; Spill detection and risk analysis, 5 papers. Case histories, perhaps because of the reduction in major spills, numbered only 7 papers. Spill behaviour and effects had 10 papers. Coastal zone impacts also had 10 papers. The last group, on social-economic and legal aspects, numbered 6 papers. A new feature was a display of poster presentations, 18 in all. Each person putting one on was given 45 min. to describe it to anyone interested, though many stood by afterwards to continue the discussion. There were also two Panel Discussions. The first was on Contingency Planning, the second on Natural Resource Damage Assessment. The latter was very successful, as there was a good argument between those who wanted a value to be placed on every dead fish or oiled strand of sea-weed and proposed a 'price list' to be multiplied by the number 'guessed at' of

damaged victims, and those who argued that a fine was adequate for negligence together with the cost of a reasonable clean-up, letting natural replenishment do the rest, the cost of replacement really having no meaning except as another sort of fine.

The Conference Centre at San Antonio was very good. The lecture rooms were spacious and airy. The public address system worked well, when the speakers knew how to use the microphone! The exhibition hall was very large, well lit and air conditioned. The usual exhibition of equipment and Service companies, etc. seemed to be rather better than usual, perhaps because they were well arranged and there was plenty of space to see everything, and not miss stands. There were 95 exhibitors, possibly a record number at this Conference. There were some firms who have exhibited since the first conference in 1969, some even with the same exhibit, but there were a number of new firms, including some offering services for hazardous substances as well as oil. There was a British contingent with specially designed matching stands.

One wonders if this Conference is losing some of its 'steam' – its urgency. Are all the papers accounts of new work or of the effects of oil on the environment or of massive spills in hostile seas, or are some of them just rewrites of data which the author has described elsewhere? However, the great importance of this Conference is that it provides a forum where US government officials can meet, on equal terms, their opposite numbers from the oil industry, which otherwise they never do. They can also meet the many subsidiary companies who make up the clean-up industry, not only the American ones but also those from the rest of the western world.

As usual, the preprinted proceedings will provide an invaluable record of all the main activity for the past two years.

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