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ENVIRONMENTAL FACTORS ESTIMATED AT PMBC

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THE PROXIMITY OF PMBC

Tides in the Andaman Sea of Thailand are "semidiurnal", ranging from 2.15–2.27 m at spring tide to 0.85–1.15 m at neap tide. Tidal lag, measured at the Center's pier (see Fig. 1), is about 40 min and 60 min at spring and neap tide respectively.

In 1971 salinity, temperature, and pH were measured in surface and bottom water (8 m depth) at the Center's pier. Average values for the year are shown in Table 1. The highest salinity of 34.9‰ and the lowest value of 0.5‰ were recorded in the upper 30 cm surface water. The latter very low salinity occured during a heavy rainfall and disappeared shortly after due to rapid mixing of the sea water.

Total suspended solids (Table 1) were low and showed relatively uniform distribution throughout the water column. Primary pelagic production was measured with the C-14 method and found to be very high (Table 1). There was no significant difference in values of these parameters measured in 1971 and 1978.

Preliminary measurements of the tidal current pattern of the southern part of Phuket Bay in front of PMBC show that during rising tide, water-flow enters the bay through the passage between Ko Loan and Laem Ka, then flows clockwise around Ko Loan and finally leaves south-westerly to join the northerly flowing water of the incoming tide (Fig. 1). During falling tide, a part of the southern main flow on the Laem Pan Wa side flows between Laem Pan Wa and Ko Loan to meet the out-flowing water from the coast and then turns westerly. Between Ko Loan and Laem Ka, this westerly water flow meets a north–easterly flow of incoming water, causing a resultant water flow which moves north-westerly to Laem Ka coast and leaves south-westerly along this coast to join the south flowing water.

EAST COAST OF PHUKET ISLAND

Along the east coast of Phuket Island, large areas are covered with muddy mangrove forest and the sea water is mixed with fresh water run-off from many localities. During the south-west monsoon (May-October), salinity, temperature suspended solids and phytoplankton biomass were measured as shown in Table 1. During north-east monsoon(November-April), relatively higher salinity and temperature were found while suspended solids as well as phytoplankton biomass were significantly lower than during the south-west monsoon period. Generally, the rising tide flows northerly in offshore localities on the east coast of Phuket Island, and the falling tide flows southerly. The prevailing wind, however, influences the direction of coastal flow, particularly in bays. For example, during north-east monsoon, rising tide flows south-westerly towards the coast, but falling tide flows south-easterly offshore. During south-west monsoon, at rising tide, water flows north-easterly offshore but during falling tide water flows south-easterly offshore.

WEST COAST OF PHUKET ISLAND

Along the west coast of Phuket, the general coastal tidal flow is mainly turbulent flow and water is very clear during rising and falling tides. Salinity, temperature, and suspended solids at the surface and 40 m depth in open sea are shown in Table 1. At the offshore tin dredging area Bang Tao (Fig. 1), surface suspended solids increased from the surface to a depth of 25m

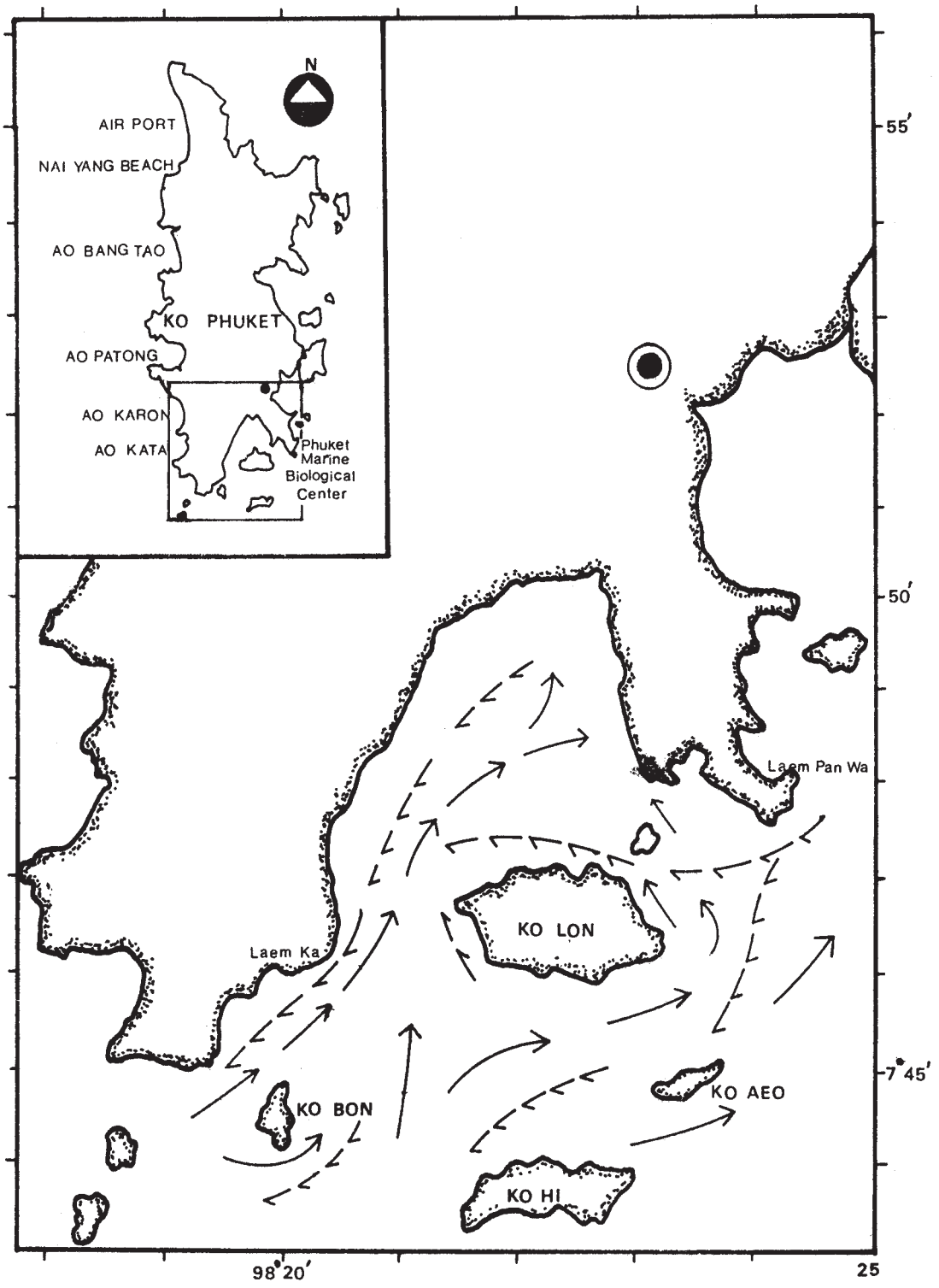

Fig. 1. Preliminary measurements of coastal tidal circulations at selected localities. Solid lines stand for rising tide and broken lines for falling tide.

Table 1. Environmental factors estimated in waters around Phuket Island.

		PMBC pier 1971	East coast of Phuket Island May-October	East coast of Phuket Island November-April	West coast of Phuket Island	Dredging area, west coast
Salinity(‰)	surface	30.5-31.5	31.8	32.2	32.0-33.0	32.0-33.0
-	8 m	32.4-32.7	-	-	-	32.0-33.0
-	40 m	-	-	-	33.0-33.5	-
Temperature(°C)	surface	25-30	27.5	28.9	27.8	27.8
-	8 m	24.5-29.0	-	-	-	27.8
-	40 m	-	-	-	26.8	-
pH	surface	8.0-8.3	-	-	8.0-8.3	8.0-8.3
	8 m	8.15	-	-	8.15	8.15
Total suspended solids ($mg.l^{-1}$)	surface	17.7 ± 1.8	30.4-47.1	17.9-20.0	28.0	75.0
-	25 m	-	-	-	28.8	138.8
-	40 m	-	-	-	38.0	-
Primary production ($mg.\ C\ m^{-2}\ day^{-1}$)		850 ± 21	-	-	120.1	15.4
Phytoplankton biomass ($mg\ m^{-3}$)		-	167-445	66.7-143.5	37.7 ± 6.4	37.7 ± 6.4

(Table. 1). In this area primary production was reduced by 87.2% probably due to shading from discharged suspended solids released during dredging operations. However, it was found that phytoplankton biomass was uniformly distributed, averaging $37.7 \pm 6.4\ mgm^{-3}$ from the intertidal to about 5 km. offshore.

HEAVY METALS AND TAR BALLS

Relatively high levels of heavy metals such as Fe, Cr, Pb, Zn, and Hg were accumulated in east coast bottom sediment, having a very high organic content, compared to the values obtained from the sandy west coast sediments. With respect to deposition of tar balls high amounts were picked from beaches on the west coast compared to the east coast. For example 791 g per meter beach transect was recorded at the Karon beach. Such deposition appeared to decrease in amount from 1977 to 1981.

MANGROVE AREAS

In the mangrove aquatic environments salinity, pH and temperature were much dependent on tidal flushes and higher values were measured during spring tides than neaps. Stratification was obvious at slow water flow coupled with run-off and rainfall, resulting in pH, salinity, and temperature lower at the surface than at the bottom. However, surface temperature generally varied due to surface heating and cooling, e.g., wind blowing, shading etc., whereas the bottom tem-

perature was relatively constant (28.0-29.0° C). During spring tides the bottom erosion effect (up to 173.6 dyne. cm^{-2}) appeared to be significant at the sea-mangrove transitional area but during neap tide this effect was insignificant.

The decomposition and mineralization of suspended matter appeared more intensive at the surface than at the bottom, resulting in lower oxygen content at the surface.

Redox studies of the mangrove sediment showed a few mm thick layer of well oxidized surface, displaying + 420 mV, over-laying reduced sediment with values down to -400 mV, reflecting a microbiologically active layer where recycling of organic matter takes place. Redox values of the deeper sediment appeared locally to be influenced by the density of macrofauna.

OFF SHORE ISLANDS

A study at Surin Island (50 km off the west coast of Takua Pa) showed little stratification, regarding temperature (29.2°-23°C) and salinity (32‰-35‰) from surface water to the lowest depths of 90 m in the offshore water around these islands. Surface oxygen saturation was high (over 88%), surface phosphate (< 0.1 µg - at.l^{-1}), and nitrate (0.4 µg - at.l^{-1}) were low due to photosynthetic activity, whereas the opposite pattern was found in the bottom waters, i.e., 45% saturation, 7.2 µg-at $N\text{-}NO_3 l^{-1}$ and 1.6 µg-at $P\text{-}PO_4 l^{-1}$, respectively. Turbidity was very low at the surface waters but increased with depth and higher nutrient content, suggesting some upwelling, providing flux of nutrients from the deeper depths to the surface waters. Values of pH were around 8 at all depths although slightly higher values were recorded near the surface.