ABSTRACT

A monthly sampling programme was conducted at twenty-three stations between November, 1985 and March, 1987, to examine the phytoplankton communities along the Hellshire coast. The objectives of the study were to: document the level of environmental degradation along Hellshire, attempt to identify the source or sources and establish possible indicator species from the phytoplankton community. A number of indices were employed in the assessment of the phytoplankton population and their suitability evaluated for a study such as this.

The Harbour mouth appeared more eutrophic than was reported ten years previously, with mean biomass of 2.64 mg m^{-3} Chlorophyll *a*, abundance of 1 million cells per litre and primary production of 12 mg C m^{-3} h^{-1}. In the "offshore" area, Kingston Harbour was the dominant source of eutrophication and the effect of Harbour waters decreased exponentially with increased distance from the Harbour, towards Wreck Reef. In the areas closer to the shoreline (bays and "inshores"), the effect of the Harbour was reduced, and some of the bays acted as localised sources.

Phytoplankton population size in the bays were found to be determined by meterological events

especially rainfall and wind velocity. Additional sampling was conducted at selected times, between August, 1988 and May, 1990, at two specific bays, selected as demonstrating the extremes of expected conditions. In Half Moon Bay, it was discovered that in the absence of rainfall, the consistently high phytoplankton population was supplied with sufficient nutrients by human activity on the beach. Wreck Bay, even with significant ground-water percolation, did not have constantly high phytoplankton biomass, as its waters appeared to be phosphorus limited. Ground-water percolation provided over 21.45 μg-at l^{-1} nitrites and nitrates, and only 0.14 μg-at l^{-1} of phosphates. Zooplankton gazing pressure and rapid turnover time of the bay also helped keep phytoplankton populations in check.

Some predictions of the capacity for development in a bay, and recommendations were determined. A bay with phytoplankton biomass values of < 1.0 mg m^{-3} chlorophyll *a* with no unnatural nutrient input and short observed and calculated residence times, may be readily developed. A bay with 2.0 to 7.0 mg m^{-3} chl. *a*, < 1.5 μg-at l^{-1} nitrite-nitrate and < 0.1 μg-at l^{-1} phosphate additions and residence times of less than 3 days, may be developed cautiously. A bay with > 8.0 mg

m^{-3} chl. *a*, > 1.5 µg-at l^{-1} nitrite-nitrate and > 0.1 µg-at l^{-1} phosphate additions may be developed but is recommended if proposed use does not involve body contact.

During June 1986, extreme flooding resulted in dramatic increases in number of cells, biomass and primary production due to the proliferation of the genus *Protoperidinium*. Maximum values for number of cells (3.2 million cells per litre) and biomass (30.22 mg m^{-3}) were recorded at Half Moon Bay while maximum primary production (20.2 mg C m^{-3} h^{-1}) was recorded at Wreck Reef. The rate of recovery of selected areas along the coast were also examined, with the Great Salt Pond showing the most rapid recovery. The occurrence of the flood provided the opportunity of observing the deleterious effect of uncontrolled, large scale enrichment of the coastal waters of Hellshire.