J. Hyg., Camb. (1976), **77**, 263
Printed in Great Britain

An appraisal of sewage pollution along a section of the Natal coast after the introduction of submarine outfalls

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(*Received* 9 *March* 1976)

SUMMARY

A bacteriological survey on the distribution and occurrence of coliforms and pathogenic indicators of pollution within the surf-zone and near-shore waters along a section of the Natal coast before the use of submarine outfalls was reported previously. In that report more than half the beaches in the region were found to be of Class IV or III quality. After the submarine outfalls became operational, ten further sampling runs were made. A considerable improvement in the sea-water quality was apparent, most of the beaches being regraded to Class II or I, notably in the bathing areas.

INTRODUCTION

The first part of this investigation presented a description of the survey area, the bacteriological methods employed and the results obtained from the surf sampling stations, before the establishment of two submarine pipelines for conveying treated effluent out to sea for dispersal (Livingstone, 1969). A system of water quality gradation based on a method of adverse scoring for the various indicators used was also postulated. The system ranged from the evaluation of 'clean' sea water to grossly polluted. It was thought that the method, which used *Escherichia coli* I counts, parasite units, staphylococci, salmonellas and salinity, would provide an objective evaluation of any further changes in water quality when the various shore-based pipes and drains were sealed and their effluents diverted for ejection via the two submarine outfalls.

On the 22.xi.68 the submarine pipeline in the vicinity of Station 19 (Fig. 1), now referred to as the Southern Works pipeline, started to discharge. On the 24.xi.69 the pipeline in the vicinity of Station 10, known as the Central Works pipeline, started functioning. Both lines extend out to sea approximately at right angles to the coast. Further technical details on the pipelines appear in Table 1.

The present paper provides a brief digest of the changed nature of the surf waters in the region before and after the establishment of the pipelines.

MATERIALS AND METHODS

These adhered precisely to the methods previously described (Livingstone, 1969).

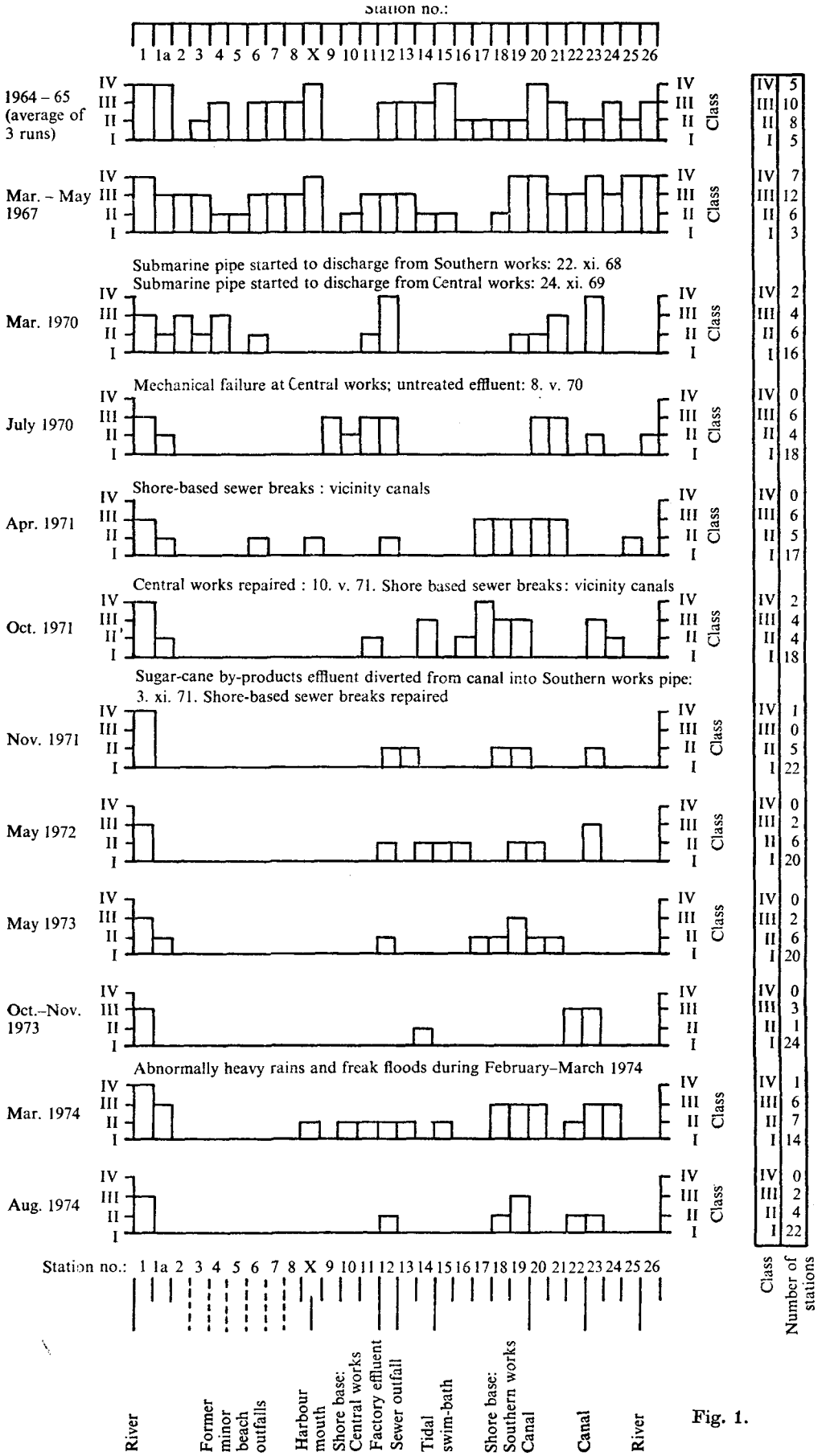

Fig. 1.

https://doi.org/10.1017/S0022172400024694 Published online by Cambridge University Press

Table 1. *Hydrographic data on the submarine outfalls*

Pipe from	Total length from shore (km.)	Length of diffuser section (m.)	Main diameter (m.)	Diameter of tapered diffuser section (m.)	Average depth of diffuser section (m. from sea level)	Average discharge Ml./d. (gal./d.)
Central Works	3·2	427	1·22	0·76	−48 to −53	77·40 (19×10^6)
Southern Works	4·2	525	1·37	0·92	−54 to −64	72·03 (18×10^6)

RESULTS AND DISCUSSION

The system of evaluating indicators and of classifying sea waters (Livingstone, 1969) was applied to the results obtained from the samples collected after the pipes started to discharge treated sewage. Fig. 1 shows the classification of these waters, an average of three runs in 1964–5 appearing first, followed by a run in 1967, before the pipelines were constructed. More than half of the beaches in the region fell into Class IV or III. These included the main swimming areas Stations 2, 3, 4, 5, 6, 7, 14 and 15 (Livingstone, 1969). Thereafter, in chronological order, the classification of the waters is depicted for ten subsequent sampling runs.

Attempts to detect the discharged effluent at sea by employing tracer dyes, and bacteriologically, failed except on one occasion during the period when untreated effluent was being discharged from the Central Works and the plume surfaced beyond the end of the pipeline at Station d3 (Fig. 4 in Livingstone, 1969) between changes of current direction.

The sensitivity of the system of measurement is reflected by the run of March 1974, when abnormally heavy rains took place. These caused localized sewer and stormwater overflows which affected the quality of the adjacent surf.

Apart from contributions of adverse hygienic significance from the river in the north (Station 1) and the pair of canals in the south (Stations 19/20 and 22/23) a general measurable improvement in the sea-water quality of this region has occurred. Many of the former Class IV and III beaches have changed to the altogether more desirable grades of Class II and I, notably in the bathing areas, after the pipelines became fully operational, thereby confirming the calculations used for designing the outfalls.

Fig. 1. Gradation of the surf water by indicator values, with the progressive chronology outlined, and certain past and present actual or potential polluting features shown.

https://doi.org/10.1017/S0022172400024694 Published online by Cambridge University Press

This paper is published with the approval of the Director of the NIWR and the Durban Corporation, who sponsored the project. Thanks are due to Mr W. D. Oliff and colleagues of the Natal Regional Laboratory for their assistance and encouragement.

REFERENCE

LIVINGSTONE, D. J. (1969). An appraisal of sewage pollution along a section of the Natal coast. *Journal of Hygiene* **67**, 209.