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BACTERIOLOGICAL SURVEY OF DARNLEY BASIN PRINCE EDWARD ISLAND SHELLFISH GROWING AREA 2

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Atlantic Region

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BACTERIOLOGICAL SURVEY OF DARNLEY BASIN
PRINCE EDWARD ISLAND SHELLFISH GROWING AREA 2

by

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MICROBIOLOGY SECTION

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ENVIRONMENTAL PROTECTION SERVICE

ATLANTIC REGION

EPS-5-AR-76-6

FOREWORD

This report is the result of a joint investigation conducted by the Environmental Protection Service and the Prince Edward Island Department of the Environment.

Without the exceptional cooperation and assistance provided by the Prince Edward Island Department of Environment, this report would not have been possible. The authors, however, are completely responsible for the interpretation of the data and the conclusions of this report.

ABSTRACT

A bacteriological survey of Baltic River and Malpeque Cove in Darnley Basin, Prince Edward Island, was conducted from May 21 to August 11, 1975. The purpose of the survey was to reasses the present classification of these areas for the harvesting of shellfish.

A total of 195 sea water samples from 44 locations were collected and analysed for fecal coliform densities by the standard 5-tube MPN method. Results of the analyses indicate that the upstream sectors of the south and east branches of Baltic River are grossly contaminated with fecal coliforms. The sources of pollution to the river were direct discharges of domestic and process wastes from three piggeries and a cannery in the area. Runoff from the campsite and residential cesspool and septic tanks apparently contributed a significant number of fecal coliform to the north western sector of Malpeque Cove after a heavy rainfall.

It is recommended that the existing closure (2-10) at the Baltic River upstream from the Darnley Bridge be retained and a new closure be established at the western sector of Malpeque Cove near the campsite as indicated in Figure 6.

Résumé

Une étude bactériologique de la rivière Baltic et de l'anse Malpeque du Bassin Darnley, Ile du Prince-Edouard, a été entreprise du 21 mai au 11 août, 1975. Le but de cette étude était d'établir l'efficacité de la classification de ces secteurs en vue de la pêche mollusquienne.

Un total de 195 échantillons d'eau salée ont été ramassés et analysés pour les densités de colibacilles fécaux en utilisant l'étendard NPP avec cinq éprouvettes. Les résultats de cettes analysés indiquent que les portions supérieures des branches sud et ouest de la rivière Baltic sont très contaminés de colibacilles fécaux. Les sources de pollution à la rivière sont les décharges directs d'égouts domestiques et de procédés provenant de trois établis à porcs et une conserverie dans les environs. Le ruissellement provenant de l'emplacements de camps et des puisards residentielles, aussi que des réservoirs septiques, manifestement contribuent un nombre significatif de colibacilles fécaux à la portion nord-ouest de l'anse de Malpeque après des chutes de pluies sévères.

Il est recommendé que la fermeture présentement établie (2-10) sur la rivière Baltic en haut du pont de Darnley soit retenue et qu'une nouvelle fermeture soit établie à la portion ouest de l'anse Malpeque près de l'emplacement de camps, comme il est indiqué sur figure 6.

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1 INTRODUCTION

A bacteriological survey of two sectors of the shellfish growing waters in Darnley Basin, P.E.I., was conducted by a mobile laboratory unit of the Environmental Protection Service during the period of May 21 to August 11, 1975. The two sectors surveyed were (1) Baltic River and (2) Malpeque Cove. At present, the portion of Baltic River in the Darnley Basin upstream from the Darnley Bridge (P.E.I. closure 2-10) is closed to direct harvesting of shellfish. There are a number of oyster leases within this closure. The Malpeque Cove is presently open to direct shellfish harvesting and there are only a few oyster leases here.

This study was carried out as part of the continuing EPS surveillance of shellfish growing areas for the purpose of updating the classification of shellfish closure regulations in this area.

2 MATERIALS AND METHODS

2.1 Sampling

Water samples were collected in sterile glass bottles at a depth of approximately one foot by means of a rod sampling device. All samples collected were kept in an insulated cooler and transported to the mobile laboratory for analysis within two hours of collection.

2.2 Bacteriological Analysis

All water samples were tested for fecal coliform levels by multiple tube dilution (MPN) method according to the A.P.H.A. "Recommended Procedures for the Bacteriological Examination of Sea Water and Shellfish"[1]. Bacto-Lauryl Tryptose Broth was used as the presumptive test medium with incubation at 35±0.5°C for 24 and 48 hours, and positive cultures were transferred to Bacto-EC Medium and incubated in a water bath at 44.5±0.2°C for 24 hours. The most probable number (MPN) of fecal coliform was derived using a 5-tube decimal dilution MPN table.

The criterion used for the classification of approved shellfish growing waters is a median fecal coliform value of 14 MPN per 100 ml with no more than 10 percent of the samples exceeding an MPN of 43 for a 5-tube decimal dilution test. In addition to bacteriological data, sanitary information of the study area is also included in assessing the closure.

2.3 Physical Data

To facilitate the interpretation of bacteriological data, the following physical parameters are also determined:

Salinities (ppt) were determined by the Knudsen Method[2] from water samples collected from selected stations. Water temperatures were also recorded at several stations. The tidal stage was estimated and recorded for the time

period encompassing the beginning and end of each sampling run. In addition, records of daily precipitation at New London, P.E.I., was provided by the Atmospheric Environment Service, Environment Canada, Atlantic Region.

3 AREA DESCRIPTION

Darnley Basin is located at the north eastern sector of Malpeque Bay, P.E.I. Three communities are located within the watershed of the basin, namely: Malpeque Cove, Malpeque and Darnley. At Malpeque Cove there are a number of wharf facilities and fisherman's huts. A newly established recreational facility and campground is located on the northern peninsula. Sanitary sewage is discharged to a package treatment plant. Effluents are chlorinated and discharged to the cove. At Malpeque several homes are supplied with running water. The village is about one quarter of a mile from the water. Cesspool and septic tanks are used for the disposal of sewage. Darnley is a small community and most of the houses are located a good distance from the water.

The Baltic River flows into Darnley Basin on the eastern shore of Malpeque Bay. A cannery is located at the wharf near Darnley Bridge. Domestic waste is discharged to a septic tank while floor drain and some process wastes are discharged to the river. There are several livestock operations in the area, including cattle, poultry and pigs. The

three piggeries located at the headwaters of Baltic Creek each produce about 1500 hogs per year. Wastes are collected in large holding tanks and disposed periodically on fields.

4 RESULTS AND DISCUSSION

4.1 Baltic River

The location of 37 sampling stations established in the Baltic River is shown in Figure 1. Water samples were collected from these stations on six days during the study period. Fecal coliform MPNs obtained from these samples are presented in Table 1 of the Appendix. A record of daily rainfall preceeding sampling days is provided in Table 2. Salinity and temperature data obtained at selected stations are present in Table 3.

High levels of fecal coliforms were found in the upstream sectors of the south and east branches of Baltic River. The median fecal coliform levels for most of these stations were greater than 14, and occasionally counts of greater than 2400 were also detected (Figure 2 and 3). Significant fecal coliform counts were also obtained periodically at several stations near the cannery. It is evident that the North Shore Packing Company contributes a certain degree of fecal pollution to the river. Coliform densities were generally very low and bacteriologically acceptable for direct shellfish harvesting in most of the stations downstream from Darnley Bridge.

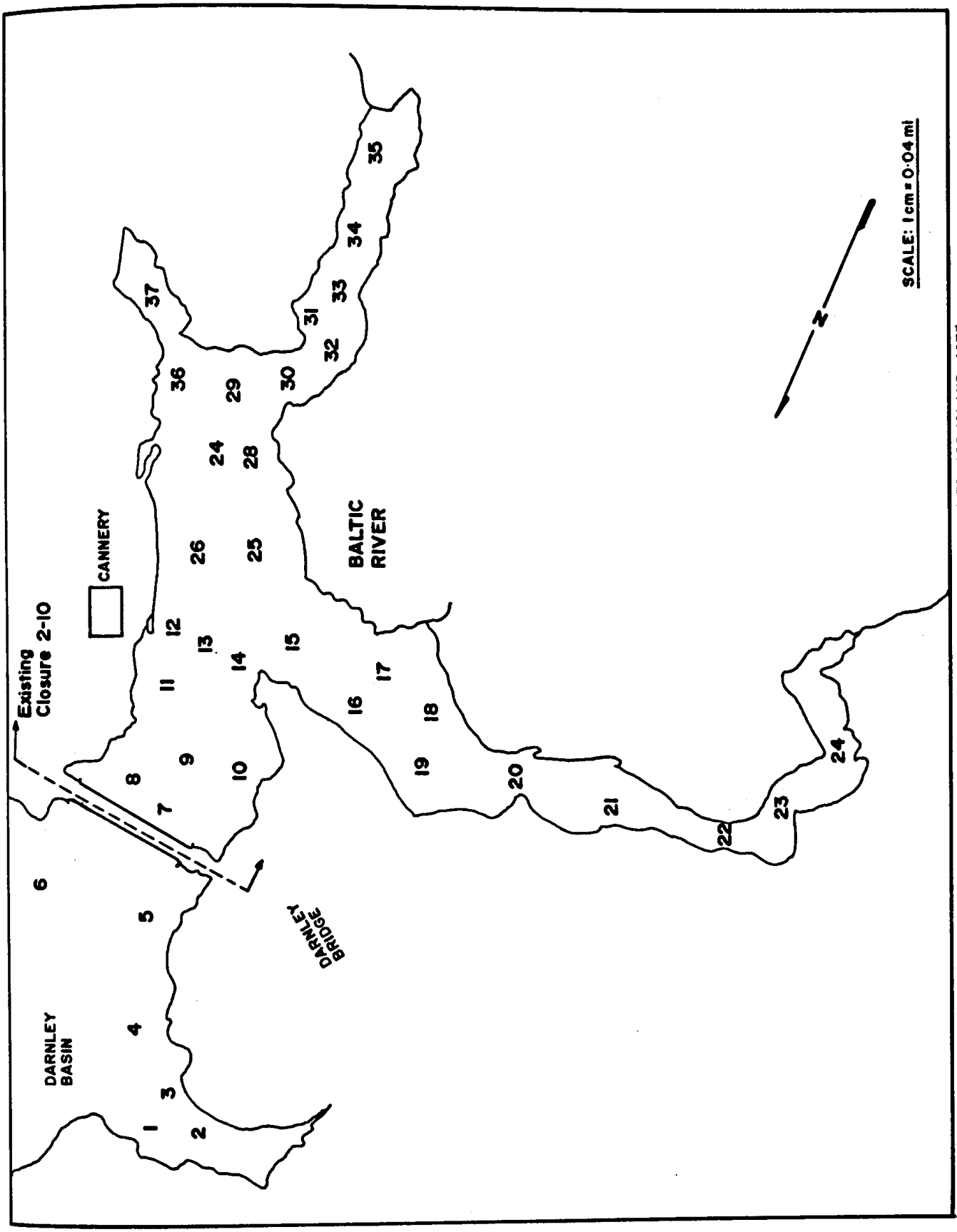

FIGURE 1 - SAMPLING STATIONS AT BALTIC RIVER, PRINCE EDWARD ISLAND, 1975.

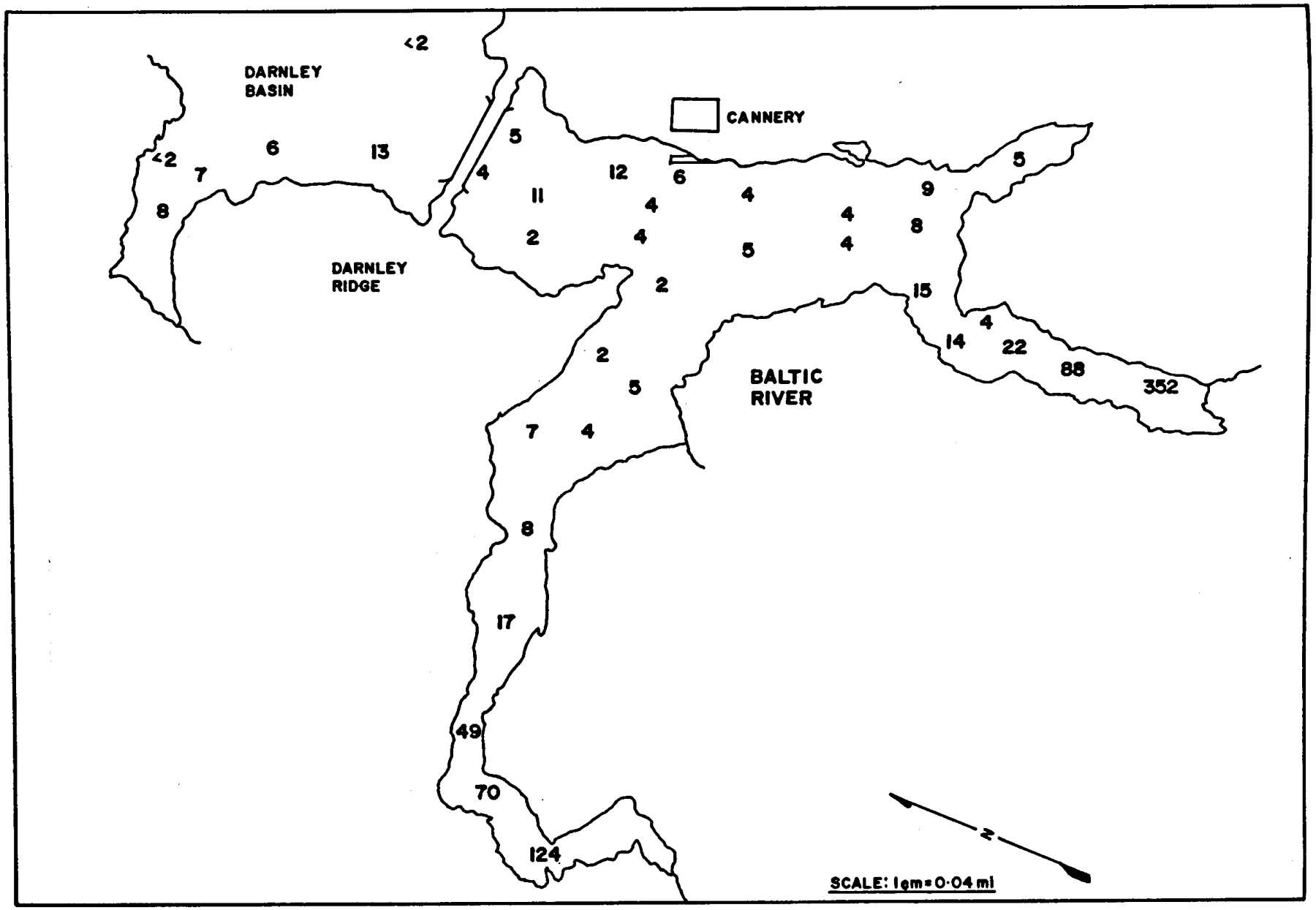

FIGURE 2· MEDIAN FECAL COLIFORM, BALTIC RIVER, PRINCE EDWARD ISLAND-1975

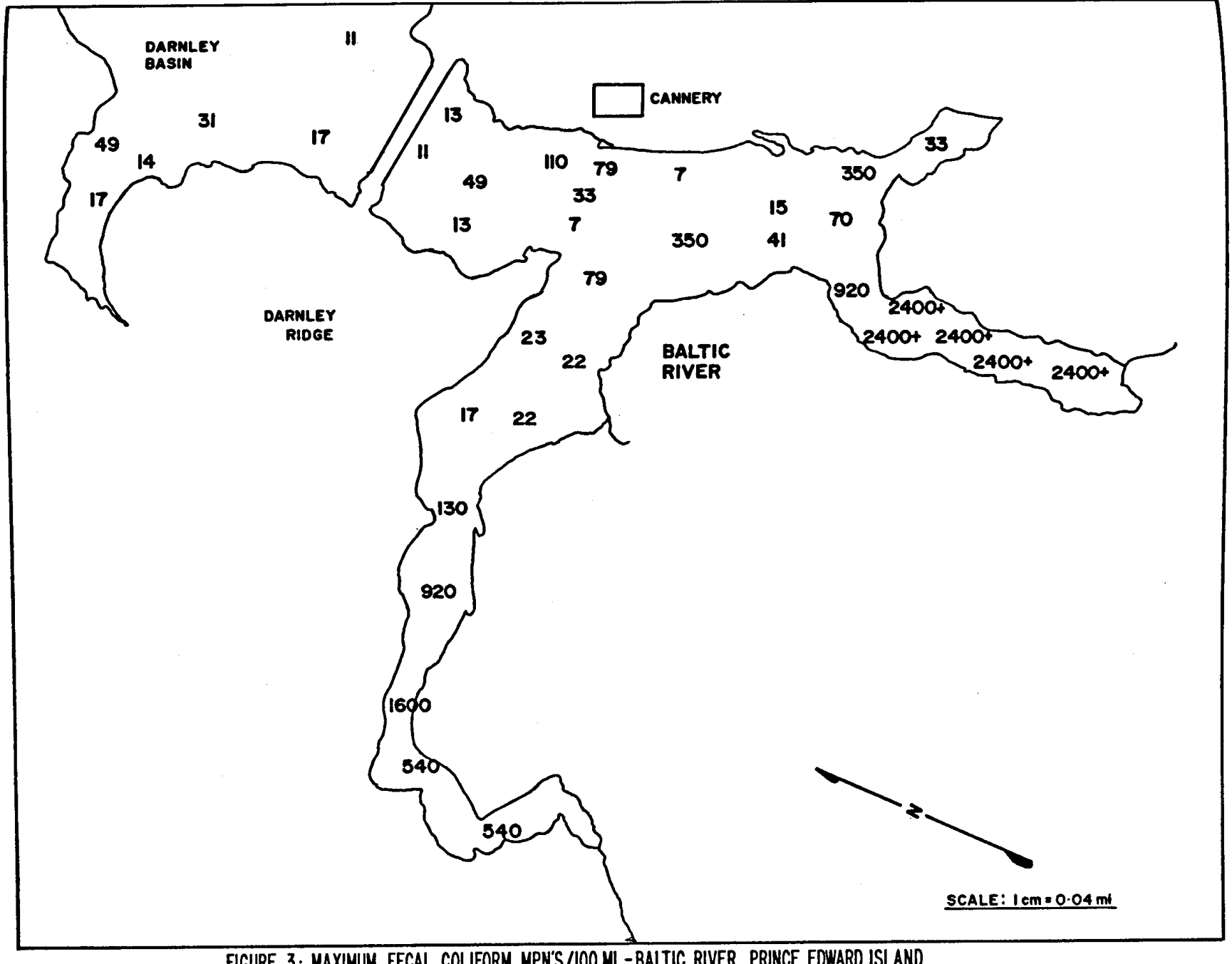

FIGURE 3· MAXIMUM FECAL COLIFORM MPN'S/100 ML - BALTIC RIVER, PRINCE EDWARD ISLAND.

An earlier bacteriological study of Baltic River by Reid and Tennant[3] indicate that the area is very sensitive to rainfall induced fecal pollution. Examination of the present survey data also indicate that fecal coliform levels in most of the stations increase considerably on June 20 and July 16 following a rainfall of 0.16 and 0.65 inch respectively.

4.2 Malpeque Cove

A total of 32 water samples were collected from 7 stations in Malpeque Cove (Figure 4). Fecal coliform MPNs obtained from these samples are recorded in Table 1 of the Appendix. Median and maximum fecal coliform values for each station are presented in Figure 5 and 6, respectively.

Bacteriological water quality in most stations at Malpeque Cove was generally very good with the exception of July 16, when significant high numbers of fecal coliforms were found in three stations; 38, 39 and 40 at the north western sector of the cove after a heavy rainfall of 0.65 inch fell on a preceeding day. The median fecal coliform densities for most stations were below the acceptable limit of 14 for approved shellfish growing waters, except station 38 which had a median fecal coliform value of 31.

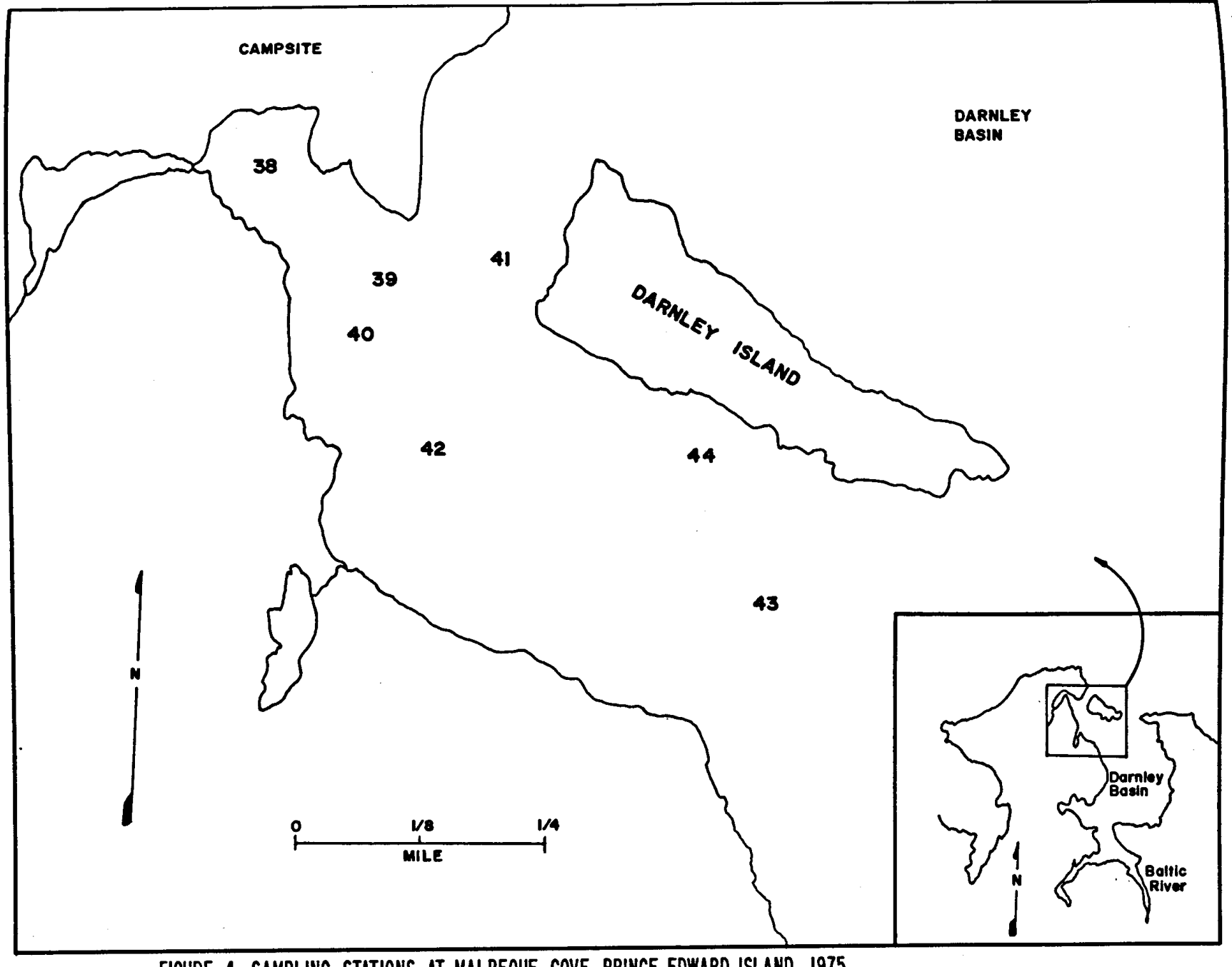

FIGURE 4 · SAMPLING STATIONS AT MALPEQUE COVE, PRINCE EDWARD ISLAND, 1975

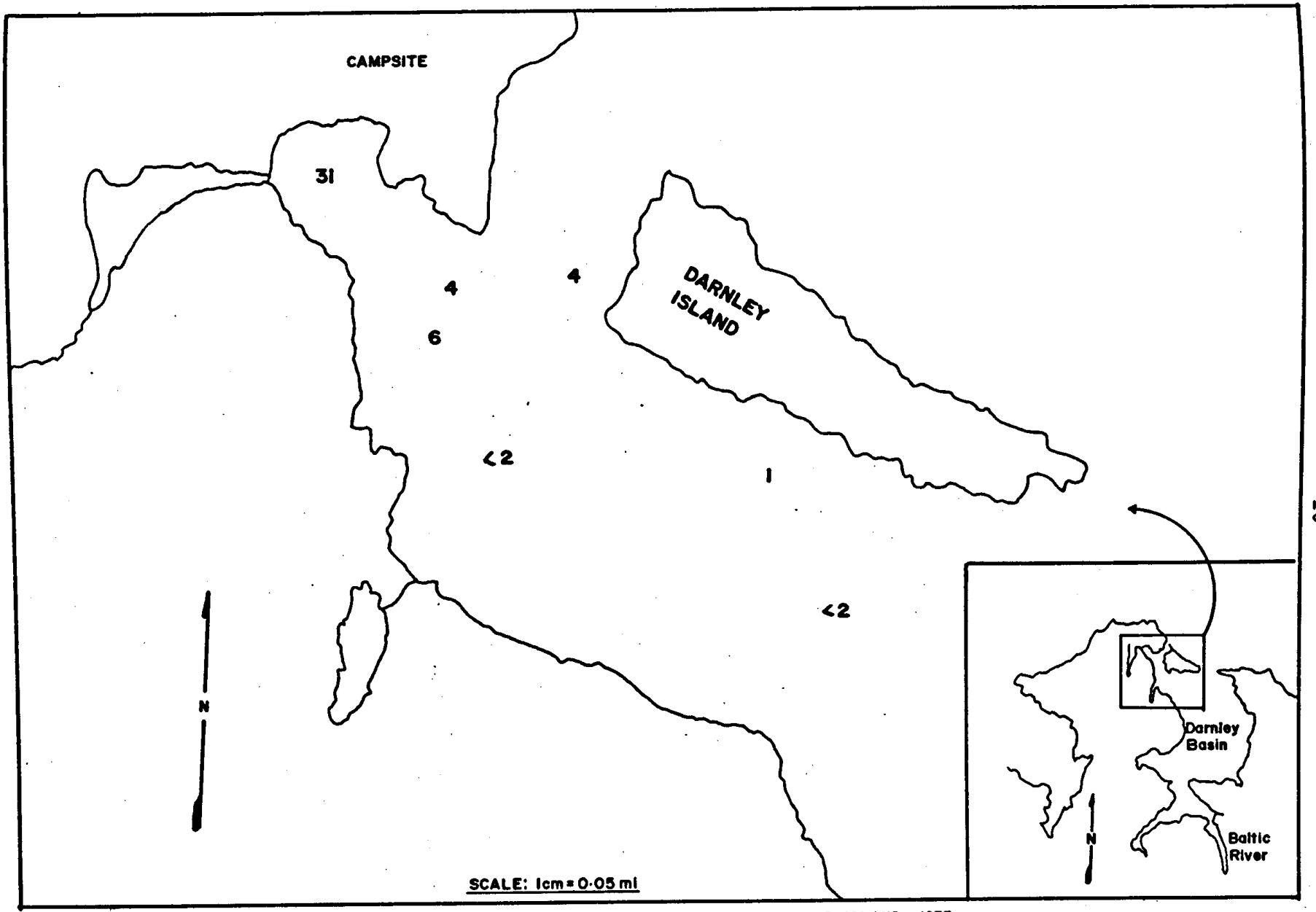

FIGURE 5· MEDIAN FECAL COLIFORM; MALPEQUE COVE, PRINCE EDWARD ISLAND, 1975

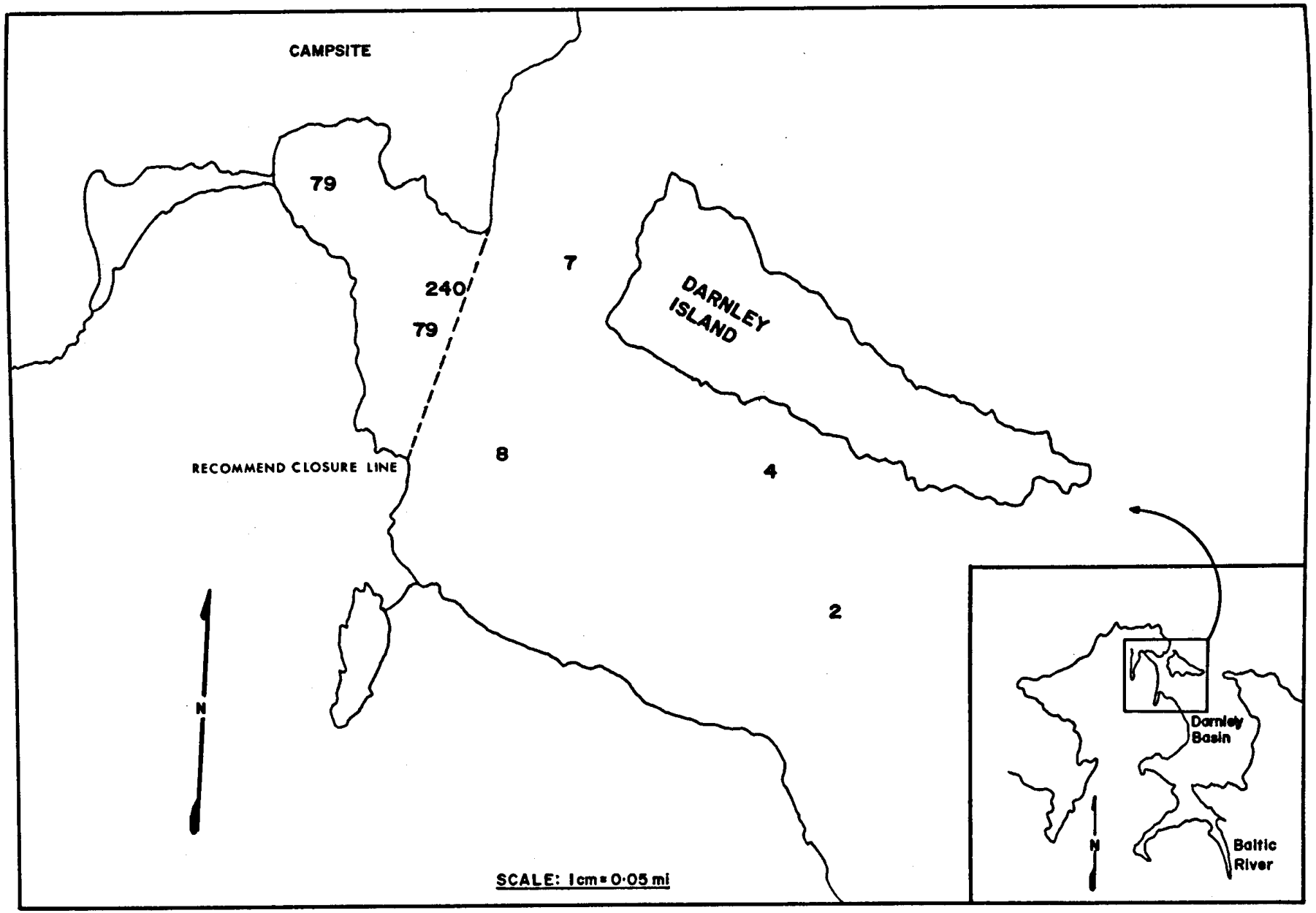

FIGURE 6 · MAXIMUM FECAL COLIFORM MPN'S/100 ML; MALPEQUE COVE, PRINCE EDWARD ISLAND, 1975

5 CONCLUSIONS

Fecal coliform densities were very high in water samples collected in the upstream sectors of the south and each branches of Baltic River, as well as in the river adjacent to the North Shore Packing Company. It is apparent that the piggery and the cannery in the area contributed a substantial amount of fecal pollution to the river.

Heavy rainfall on July 15 caused a significant increase in fecal coliform densities over a large part of Baltic River and sector of Malpeque Cove near the campsite. It is apparent that the study area is very sensitive to runoff pollution during periods of accelerated landwash and unsatisfactory bacteriological condition could persist for a period of time. It is, therefore, recommended that the existing closure (2-10) at the Baltic River upstream from the Darnley Bridge be retained. At present there are plans to remove the existing package plant serving the Malpeque Cove campsite and relocate a treatment system further west near Royalty Point. Until these plans are implemented, there is a need to establish an additional closure in Malpeque Cove near the campsite as indicated in Figure 6. When the treatment plant is removed, the need for this latter closure should be reassessed.

6 RECOMMENDATIONS OF THE MARITIME STANDING COMMITTEE ON SHELLFISH

The existing closure 2-10, Darnley Basin, should remain in effect unchanged.

Malpeque Cove should remain an approved growing area at present, but subject to confirmation by the Province of Prince Edward Island that the existing sewage outfall for the campground is removed prior to June 1, 1976.

REFERENCES

1. American Public Health Association, Recommended Procedures for the Examination of Sea Water and Shellfish, Fourth Edition, American Public Health Association, New York, 105 pp. (1970).

2. Anon, Determination of Chlorinity by the Knudsen Method, G.M. Manufacturing Company, New York (1962).

3. Reid, J.E. and A.D. Tennant, Bacteriological Surveys, 1962, Baltic River, P.E.I. 6, Darnley. Dept. National Health and Welfare, Laboratory of Hygiene, Manuscript Report No. 62-4 (1962).

TABLE 1. FECAL COLIFORM DATA, BALTIC RIVER AND MALPEQUE COVE, P.E.I., 1975

STATION \ DATE / TIDE	MAY 21 L.R.	MAY 26 L.F.	JUNE 11 H.F.	JUNE 20 L.F.	JULY 16 L.R.	AUG 11 H.F.	MEDIAN
1	<2	-	<2	<2	49	8	<2
2	<2	-	8	8	17	17	8
3	<2	-	<2	7	14	7	7
4	<2	-	<2	31	23	6	6
5	<2	-	<2	13	17	13	13
6	<2	<2	<2	11	< 2	8	<2
7	<2	<2	<2	11	11	8	<5
8	5	2	<2	5	13	9	5
9	<2	17	<2	8	49	5	7
10	<2	<2	<2	4	13	5	<3
11	49	110	2	2	17	7	12
12	2	4	79	5	7	11	6
13	2	2	2	5	8	33	4
14	<2	<2	5	7	2	5	4
15	<2	2	2	2	79	2	2
16	4	<2	<2	5	23	<2	<3
17	8	<2	<2	13	22	2	5
18	5	<2	<2	2	22	5	4
19	8	<2	<2	17	13	6	7
20	7	<2	<2	8	130	22	8
21	33	-	8	11	920	17	17
22	17	-	23	1600	350	49	49
23	49	-	27	540	350	70	70
24	7	-	79	540	-	170	125
25	<2	-	2	350	13	5	5
26	<2	7	2	7	7	2	5
27	<2	5	<2	15	5	2	4
28	<2	5	-	41	-	2	4
29	<2	5	5	11	70	5	5
30	<2	2	22	1600	920	8	15
31	7	2	11	<2	>2400	2	5
32	<2	8	23	>2400	130	14	19
33	4	5	27	>2400	>2400	17	22
34	2	5	920	>2400	>2400	170	545
35	<2	17	540	>2400	>2400	170	545
36	<2	11	5	350	110	7	9
37	2	-	33	-	-	5	5
38	-	<2	11	31	79	33	31
39	-	<2	2	4	240	33	4
40	-	<2	<2	6	79	6	6
41	-	<2	-	-	4	7	4
42	-	<2	<2	8	4	<2	<2
43	-	<2	<2	2	-	<2	<2
44	-	-	<2	4	<2	2	<2

L.R. LOW RISING TIDE
L.F. LOW FALLING TIDE
H.F. HIGH FALLING TIDE

TABLE 2 - RAINFALL DATA PRECEEDING SAMPLING DAYS, NEW LONDON, P.E.I., 1975

DATE	RAINFALL	DATE	RAINFALL	DATE	RAINFALL
MAY	INCHES	JUNE	INCHES	JULY	INCHES
14	-	4	-	9	-
15	-	5	-	10	-
16	0.15	6	0.70	11	T
17	-	7	0.28	12	0.23
18	-	8	0.54	13	-
19	T	9	0.18	14	-
20	0.24	10	-	15	0.65
21*	-	11*	-	16*	-
22	0.22	12	-		
23	T	13	-	AUG.	
24	-	14	-	5	-
25	-	15	-	6	-
26*	-	16	-	7	-
		17	-	8	-
		18	0.66	9	-
		19	-	10	-
		20*	-	11*	-

* SAMPLING DAYS

TABLE 3 - SALINITY AND WATER TEMPERATURE DATA AT SELECTED STATIONS

STATION	SALINITIES (PPT) AND TEMPERATURE (°C)							
	MAY 21		MAY 26		JUNE 11		JUNE 20	
	PPT	°C	PPT	°C	PPT	°C	PPT	°C
6	23.7	12.5	20.6	12.2	25.1	11.8	20.0	18.0
9	23.2	14.0	19.0	12.0	20.1	12.0	20.6	18.0
10	-	-	20.9	12.5	-	-	20.2	17.9
13	-	-	18.3	13.0	19.0	12.2	20.0	18.0
17	-	-	20.5	12.2	19.1	12.8	19.1	18.0
20	12.0	14.0	-	-	19.0	13.5	19.9	18.1
22	-	-	-	-	18.0	14.0	10.8	18.0
30	20.0	14.0	15.2	12.8	14.5	12.8	15.0	17.0
34	23.0	15.0	7.0	11.4	8.5	12.0	3.8	16.0
36	24.5	12.0	11.5	12.0	17.0	13.0	22.5	17.5