BACTERIOLOGICAL WATER QUALITY SURVEY

OF

NEW BRUNSWICK SHELLFISH AREA #7

By

A.S. Menon
Environmental Protection Service
Atlantic Region
Dartmouth, N.S.

MS REPORT NO. 81-9

ABSTRACT

A sanitary and bacteriological survey of the coastal waters in Northumberland Strait from Shediac to Shemogue, was conducted from May 22 to August 26, 1980. A total of 768 water samples were collected from 134 locations and analysed for fecal coliform densities.

Results of this study indicate that the bacteriological water quality in Shediac River and Harbour have improved significantly since the installation of the sewage collecting system in 1972. However, the waters in Shediac Harbour are still frequently subjected to gross fecal contamination from sewage overflow from the collection system during heavy run-off conditions.

With the exception of several localized areas along the shore which are subjected to intermittant pollution from fish plant and wharf activities, the waters in the Northumberland Strait consistently meet NSSP criteria for an approved shellfish harvesting area. Potential pollution sources observed in the sanitary survey, do not appear to contribute significant amounts of fecal materials to the open waters.

It is recommended that the existing closures in Shediac Harbour (7-2), Shediac Bay (7-3) and the Western Barachois (7-4) be remained closed to the harvesting of shellfish for direct marketing. It is also recommended a new closure be implemented on the Kouchibouguac River as in Figure 8. The Shediac River should be considered for reopening for direct shellfishery.

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1 INTRODUCTION

Sanitary and bacteriological water quality surveys of shellfish growing areas in the Maritimes are routinely carried out by the Environmental Protection Service. The objective of these surveys is to determine if direct harvesting of shellfish is acceptable. From a public health standpoint, the principle purpose is to detect the occurrence of disease-causing organisms that may be accumulated by shellfish if domestic sewage or animal wastes reach their environment. The public health safety of shellfish and shellfish harvesting waters in Canada is judged presently by bacteriological standards. These standards require the "Most probable numbers of fecal coliforms in water should not exceed a median of 14 per 100 ml and no more than 10% of samples should exceed 43 fecal coliforms per 100 ml in areas approved for harvesting". On the basis of these standards, shellfish growing areas are classified into three categories: closed, approved and conditionally approved.

It should be emphasized that bacteriological examination of shellfish growing waters is used only as adjunct to the sanitary survey to show the extent of fecal pollution affecting an area. Fecal contamination is often intermittent and may not be revealed by the bacteriological examination of a single water sample. The most a bacteriological report can prove is that, at the time of examination, bacteria indicating fecal pollution did or did not grow under laboratory conditions from a sample of water. Therefore, if a sanitary survey shows the waters in a shellfish growing area are obviously subject to fecal pollution, the shellfish area should be closed irrespective of the results of bacteriological analysis.

Bacteriological surveys of coastal waters in the Northumberland Strait from Shediac to Shemogue were conducted by the Environmental Protection Service, from May 22 to August 26, 1980. The purpose of this investigation was to reassess the present classification of these areas for the harvesting of shellfish for direct marketing.

There are presently four shellfish closures in the study area and they are described in the New Brunswick Fishery Regulation Schedule E as follows:

> 7-1 Shediac Bay and River, Westmorland County, and including Gallant's Brook, Kent County, westerly of a straight line drawn from Oyster Survey Monument No. 154A located on Poirier Point as shown on the plan showing oyster leases in Shediac Bay to Oyster Survey Monument No. 154B as shown on that plan, except that oysters may be taken from November 1st to November 30th, both days inclusive, in any year.
>
> 7-2 Shediac Bay and its tributary in Westmorland County lying between a straight line drawn due north astronomic a distance of 304.8 m from Survey Monument No. W7 as shown on the Shediac Bay Area plan and a straight line drawn due north astronomic a distance of 304.8 m from Survey Monument No. W7A as shown on that plan.
>
> 7-5 Western Barachois, Westmorland County, inside or south of a straight line drawn from Survey Monument No. W6 as shown on the Shediac Bay Area plan to Survey Monument No. W6A as shown on that plan.

The above closures were implemented as a result of a sanitary and bacteriological survey conducted in 1968 by Silliphant, which identified that these waters were polluted with treated and untreated sewage from the surrounding areas. In 1972 a twin cell aerated lagoon was built to service the town of Shediac and suburbs to include Shediac Cape on the west to Cape Bimet on the east. The final effluent of the lagoon is chlorinated before discharge to Shediac Bay near Cape Brule. The sewage collection system has twelve lift stations, nine of which have overlfow by-passes to the Scoudouc River which empties to Shediac Harbour.

2 MATERIALS AND METHODS

2.1 Bacteriological Sampling

All water samples for bacteriological analyses were collected in sterile wide-mouth polyethylene bottles at a depth of approximately 30 cm below the water surface from a boat. All water samples collected were held in an insulated cooler and transported to the mobile laboratory of the Environmental Protection Service located at Shediac. Bacteriological analyses were carried out within three hours of sample collection.

2.2 Bacteriological Procedures

Fecal coliform levels in water samples were determined by the multiple tube fermentation technique as described in the APHA Recommended Procedure for the Examination of Sea Water and Shellfish. The culture medium used was the A-1 medium, as described by Andrews and Presnell (1972)[2]. The medium and the method described below were

accepted by the NSSP as the method of choice for the enumeration of fecal coliforms in shellfish growing areas in 1978. An evaluation of the A-1 medium in the Atlantic Region has been done by Menon (1977)[3] and found to be comparable to the Standard LTB-EC method.

The "modified A-1" technique involves the inoculation of a series of dilutions of water sample into A-1 medium. Ten millilitre volumes of water sample were inoculated into five fermentation tubes containing 10 ml of double strength A-1 medium, and sample volumes of 1 and 0.1 ml were inoculated into five tubes each of single strength medium. The tubes were incubated at 35±0.5°C in an air incubator for 3±0.5 hours, and then transferred to a water bath at 44.5±0.2°C and incubated for a further 21±2 hours. All gassing tubes with growth were considered to be fecal coliform positive. The most probable number (MPN) of fecal coliforms for each sample were computed by using the MPN Table in Standard Methods [(i)].

3 RESULTS AND DISCUSSION

For discussion purposes, the survey area is divided into six sectors as shown in Figure 1. The pricipitation data recorded at Moncton during the survey period are presented in Appendix Table 1.

3.1 Sector 1 - Shediac River

This sector is represented by stations 1 to 26 (Figure 2). There are approximately fifty summer cottages located adjacent to the Shediac River. These cottages are equipped with septic tanks and tile fields.

Of 160 water samples collected in this sector, 151 (94%) had fecal coliform MPNs of 14 or less, while 3 (2%) exceeded a fecal coliform MPN value of 43 (Appendix Table 2). The overall fecal coliform median MPN value for the sector was less than 2.

Precipitation occuring on the days prior to the July 9 sampling date, did not have any significant effect on the bacteriological quality of the waters in the river, but precipitation occuring on the previous days did have significant effect on the fecal coliform counts within the presently closed sector on July 27, 1980. The median fecal coliform level for the nine stations (1-13) within the closed sector was 33, while that of the approved sector (stations 14-26) was 8 on this date.

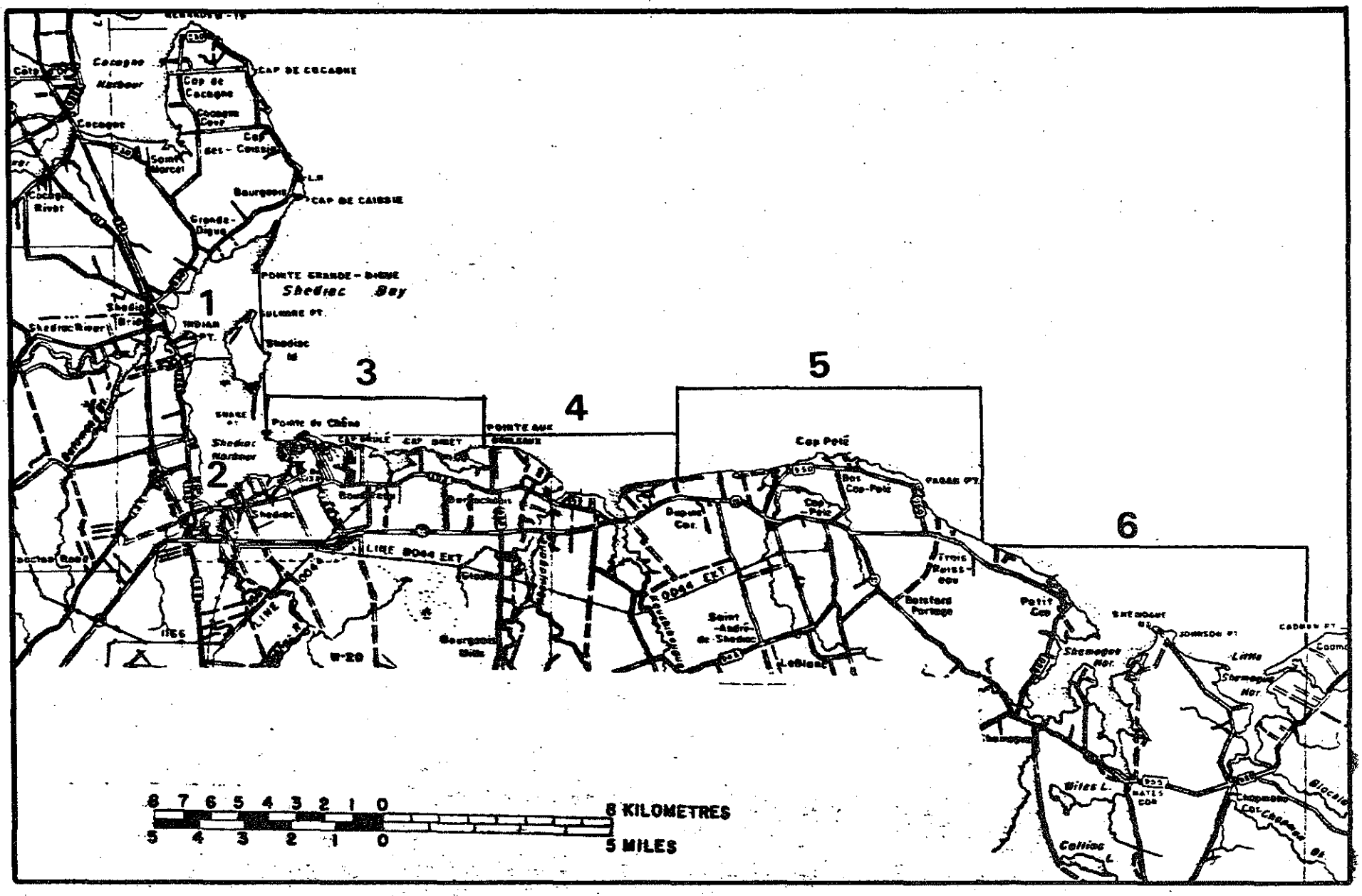

FIGURE 1. MAP OF SURVEY AREA SHOWING LOCATION OF SECTORS.

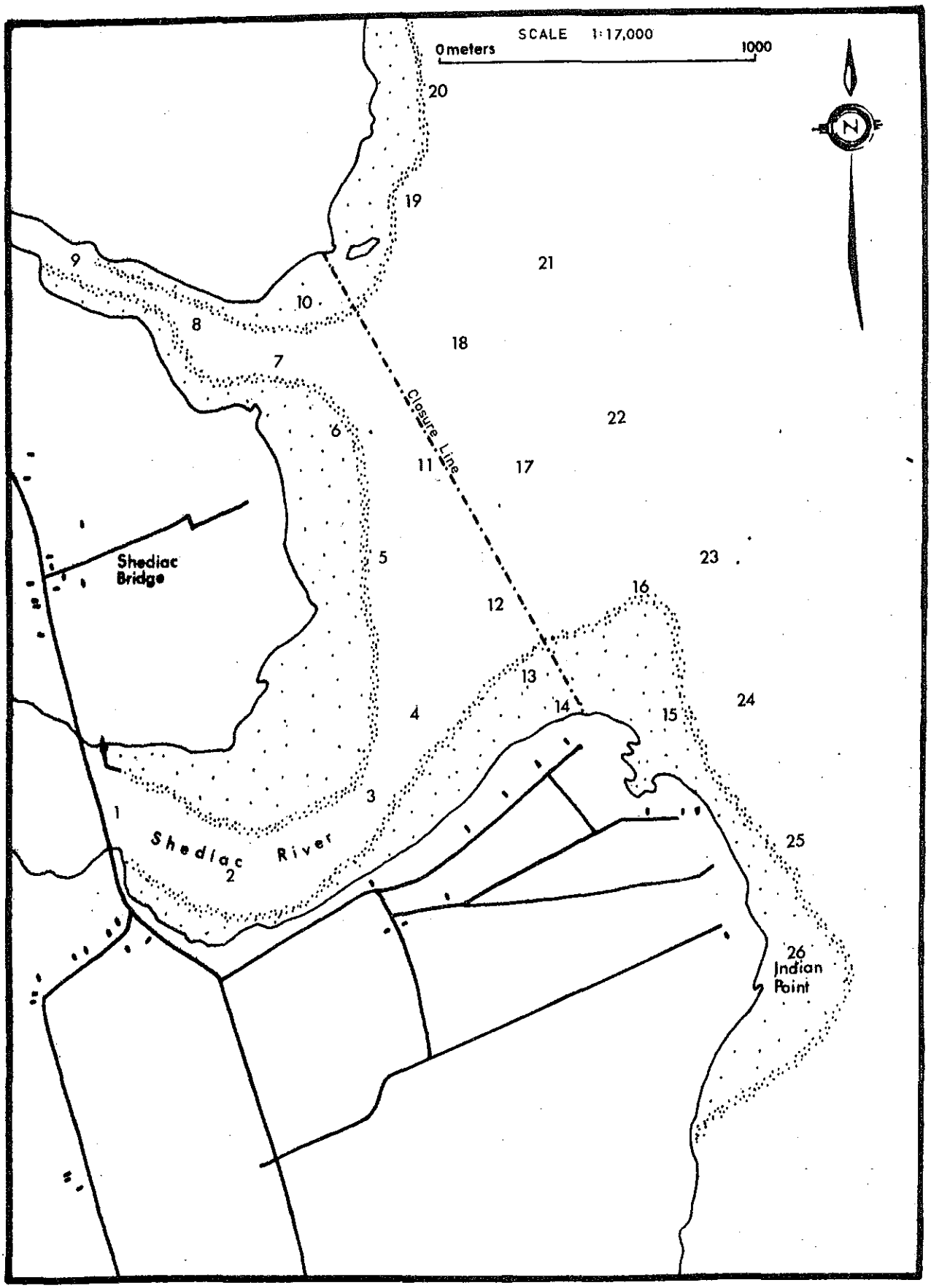

FIGURE 2. SAMPLING LOCATIONS AT SHEDIAC RIVER.

3.2 Sector 2 - Shediac Harbour

This sector covers the portion of Shediac Bay from Shediac Cape to the wharf at Pointe-du-Chene. Majority of the houses in the study area are serviced by the sewage collecting lagoon system. There are nine lift stations which have overflow bypasses to the Scoudouc River which flows into Shediac Harbour. There is a Yacht Club located in the harbour which serviced over forty sail and power crafts during the summer months. The Irving's storage tanks are located at Pointe-du-Chene with pipe connected to the wharf.

A total of 186 water samples were collected from Shediac Harbour and analysed for fecal coliform densities. The location of these sampling stations are presented in Figure 3 and the results of fecal coliform analysis are tabulated in Appendix Table 3.

Of the 150 water samples collected within the closed sector of Shediac Bay (station 27 to 48), 130 (86%) had a fecal coliform level of 14 or less, while 15 (10%) exceeded a fecal coliform level of 43. The waters in the approved sector have a median fecal coliform level of less than 2 with 3% of the sample greater than 43.

The waters in Shediac Harbour are subjected to gross fecal contamination as a result of lift stations bypassing raw sewage to Scoudouc River due to infiltration problems during wet weather. The high fecal coliform counts obtained on July 17, 1980 after 23.2 mm of rainfall on the previous day, was an indication of what might be expected in the harbour during a rain storm episode.

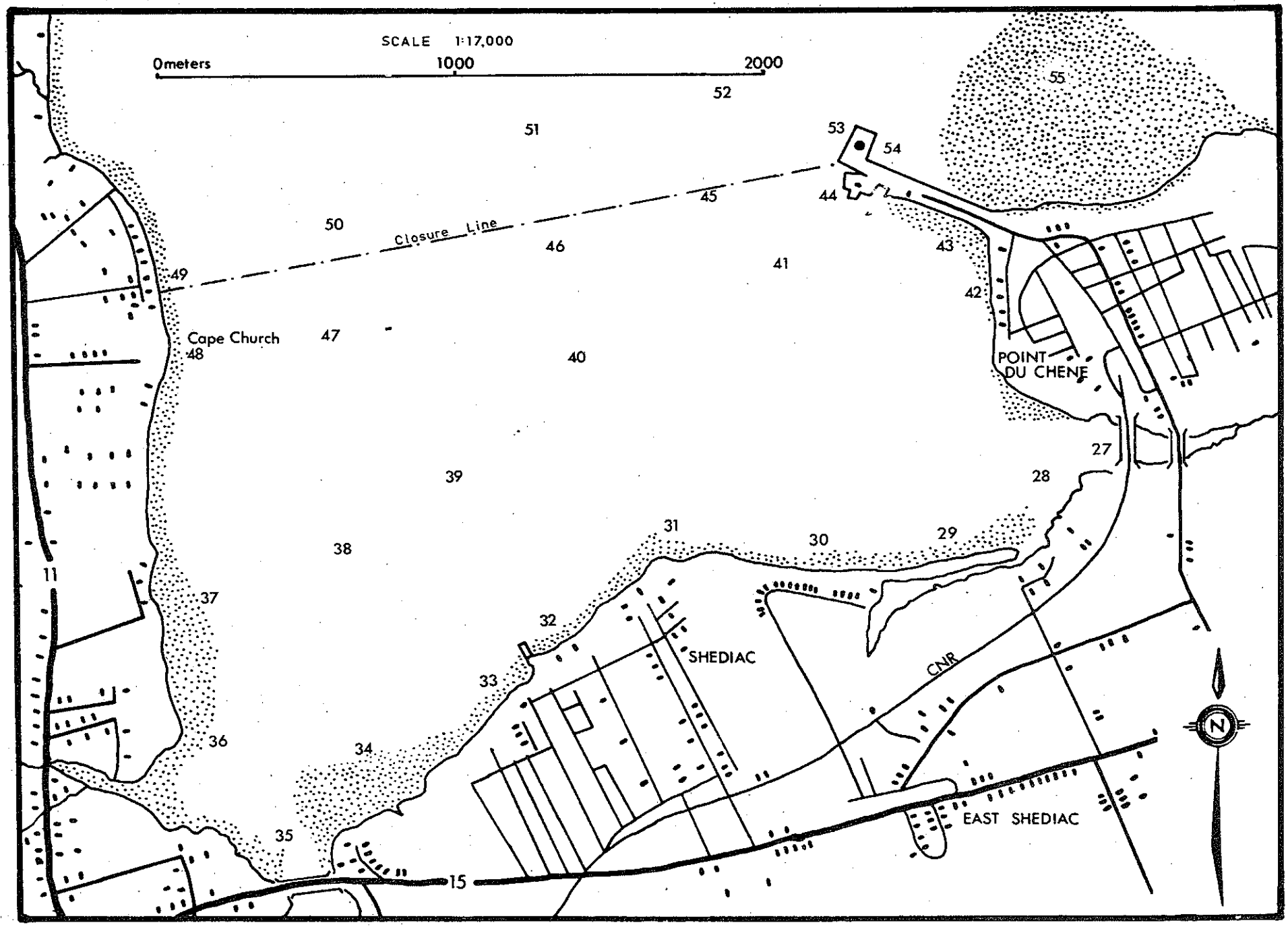

FIGURE 3. SAMPLING LOCATIONS AT SHEDIAC HARBOUR.

3.3 Sector 3 - Shediac Bay

This sector covers the shoreline of Shediac Bay from the whart at Pointe-du-Chene to Petit Barachois and is represented by stations 54 to 70 (Figure 4). The topography of this sector is generally low and flat containing marshy areas and natural lagoons. Majority of the permanent residents in the study area, are serviced by the sewage collecting lagoon located east of Cape Brule. The population of the area increases to more than double in the summer months as tourists take up residence in Pointe-du-Chene, the Bluff and Cape Brule. Trailer parks and tenting grounds are utilized to their maximum capacity during this period.

The Paturel Fish Plant belonging to the National Sea Products Limited, located on the shore of Cape Bimet, discharges its processing wastes into the beach near Station 58. The plant sanitary wastes are handled by septic tanks and tile fields behind the plant.

Bacteriological water quality in the coastal waters along the Bay was generally very good with the exception of some sporadic high fecal coliform counts observed at stations 54, 61, 62 and 64 during the survey period (Appendix Table 4). The high fecal coliform count (540 MPN) observed at station 64 on August 26, 1980, was probably due to the waste discharged from the Patural Fish Plant. Fecal coliform counts recorded at the final effluent of the Paturel Fish Plant , ranged from 220 to greater than 2400. The high fecal coliform counts recorded at stations 61 and 62 were within the existing closure of Western Barachois (7-5). The Western Barachois receives sewage from the town sewage collecting lagoon and a dairy farm.

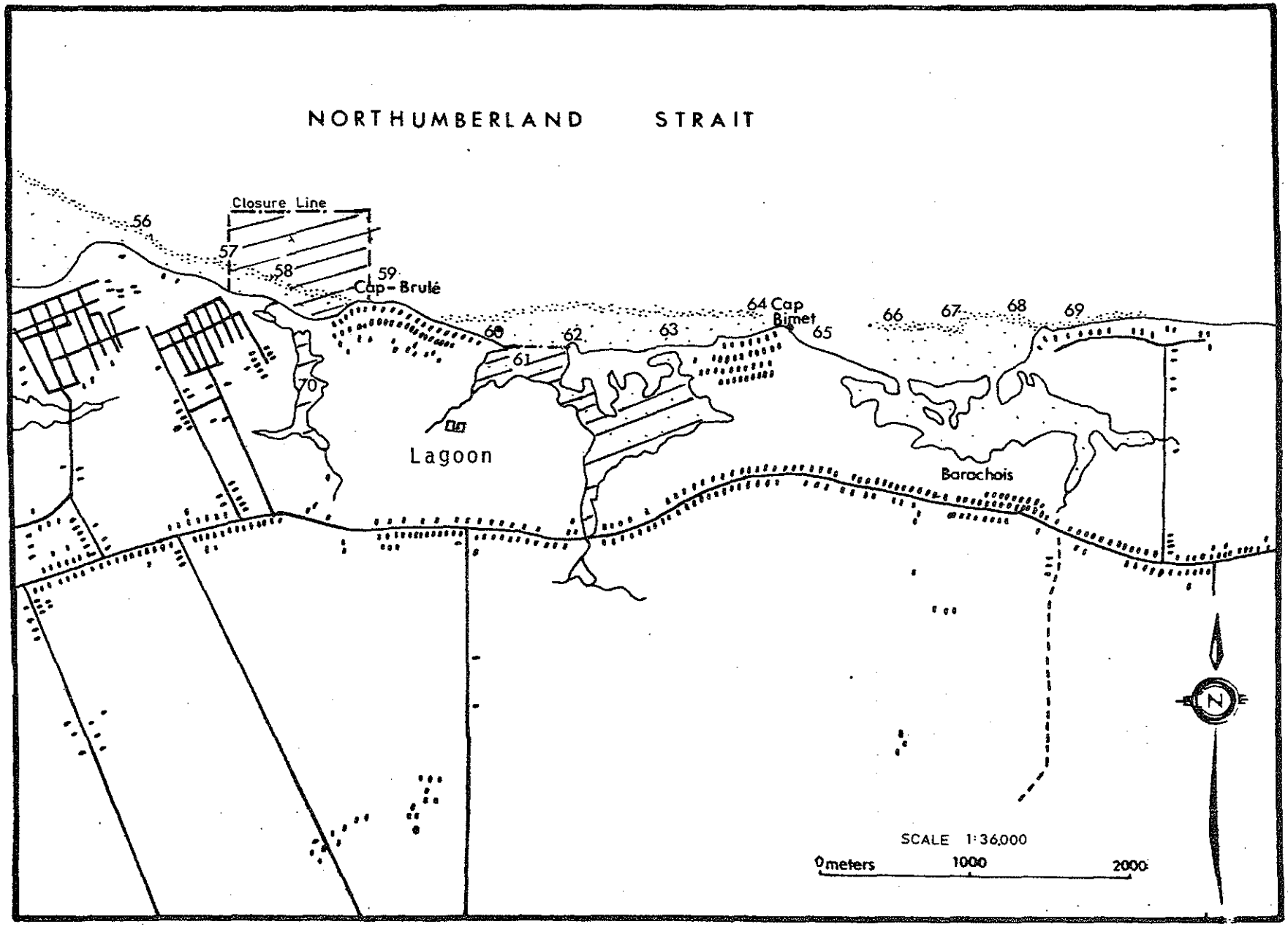

FIGURE 4. SAMPLING LOCATIONS AT SHEDIAC BAY.

A consistent high fecal coliform count (>2400 MPN) were found in the lagoon (station 70) next to the Ocean Surf Trailer Park. A large number of cattle were observed grazing around the lagoon during the survey period. The lagoon is presently under shellfish closure (7-4).

3.4 Sector 4 - Robichaud

This sector covers the shoreline of Northumberland Strait from Pointe aux Bouleaux to Dupius Corner, and is represented by stations 71 to 89 (Figure 5). At present this sector is considered an approved area for the harvesting of shellfish for direct marketing.

The sanitary investigation of this coastline identified two fish plants, and a number of bloater houses scattered along the shore as potential sources of pollution to the waters of Northumberland Strait. Grab samples collected from Edmond Gagnon Limited and Landry & Landry Fish Plants contained fecal coliform in excess of 2400 MPN per 100 ml. The effluent from the Edmond Gagnon Fish Plant is discharged to the coastal waters beside Robichaud wharf near stations 77 and 78. The Landry & Landry Fish Plant discharges it's wastes into the mouth of the Kouchibouguac River (stations 79 and 80).

Of the 95 water samples collected in this sector, 83 (87.4%) had fecal coliform equal or less than 14, while 8 (8.4%) samples exceeded a MPN of 43 (Appendix Table 5). Majority of the high fecal coliform counts found in this sector, were confined between stations 77 to 81. It appears that effluents discharged from the two fish plants located on the shore are responsible for the high fecal coliform counts observed in these waters.

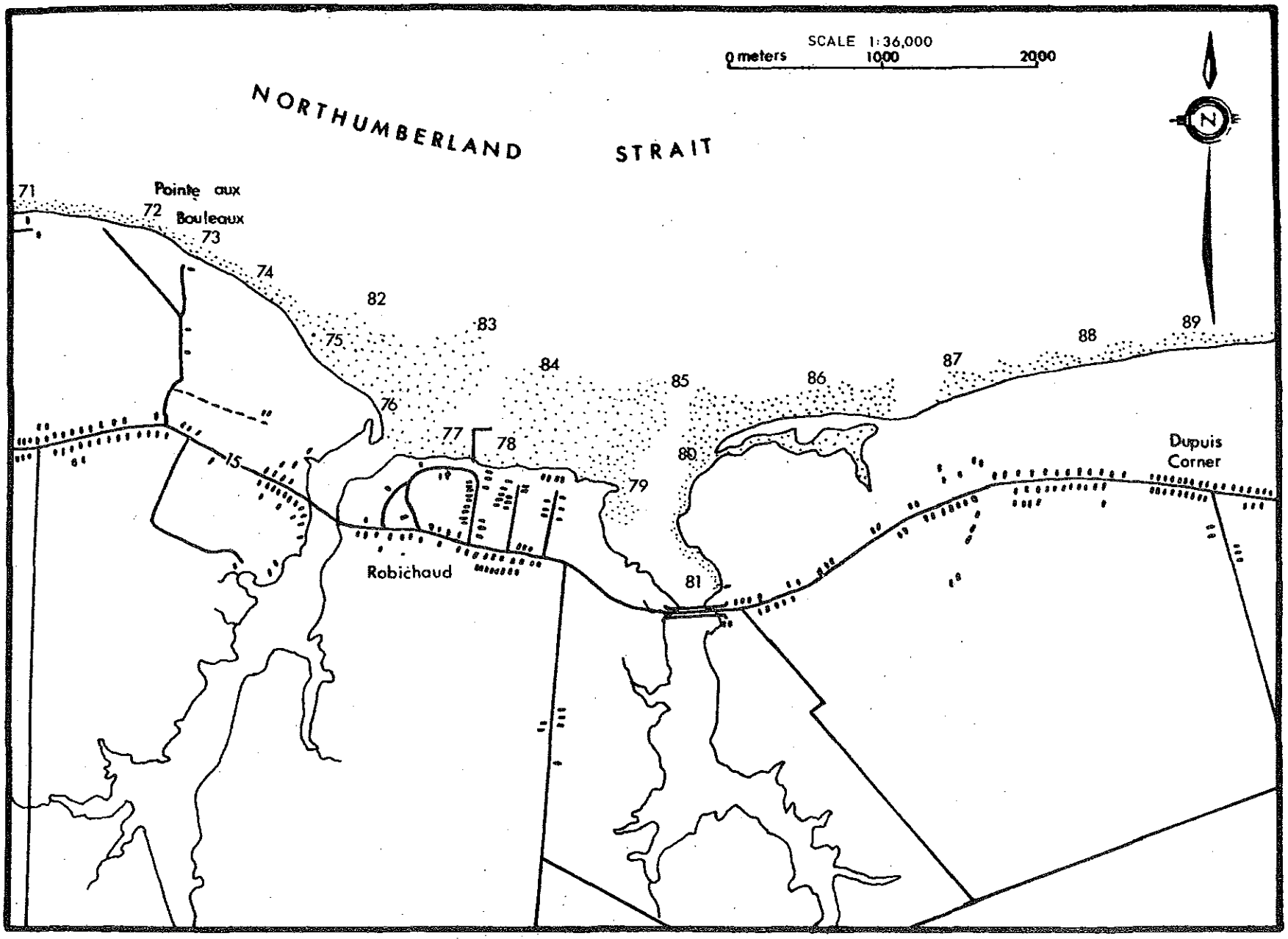

FIGURE 5. SAMPLING LOCATIONS AT ROBICHAUD.

3.5 Sector 5 - Cape Pelé

This sector covers the shoreline of the Northumberland Strait from Dupuis Corner to the wharf at Petit-Cap and is represented by stations 90 to 104 (Figure 6). There are several canneries and a number of bloater houses scattered along the coast of this sector. The effluent from the Cormier & LeBlanc Limited discharges into the Northumberland Strait at the Cape Pelé Wharf (station 100). The storm drainage system of the town of Cape Pelé often discharges into the Friel Brook which empties into the Northumberland Strait.

Results of the 125 water samples collected from this sector, showed that 123 (98%) of the samples had fecal coliform MPNs of 14 or less while only one sample exceeded an MPN value of 43 (Appendix Table 6). The only high fecal coliform count of 170 was recorded on July 14, 1980 at station 94 which is located at Friel Brook. This pollution source did not appear to affect the water quality in Northumberland Strait as the fecal coliform densities recorded at station 95 were less than 2.

3.6 Sector 6 - Shemogue

This sector covers the waters of Shemogue Harbour and Little Shemogue Harbour, and is represented by stations 115 to 134 (Figure 7). The topography of this sector is generally flat with the coastal area being composed of sand-bars, while further inland the region is predominately wooded. Majority of the homes and farms in this region are well back from the shoreline and does not appear to contribute any major pollution problem to the waters of Northumberland Strait.

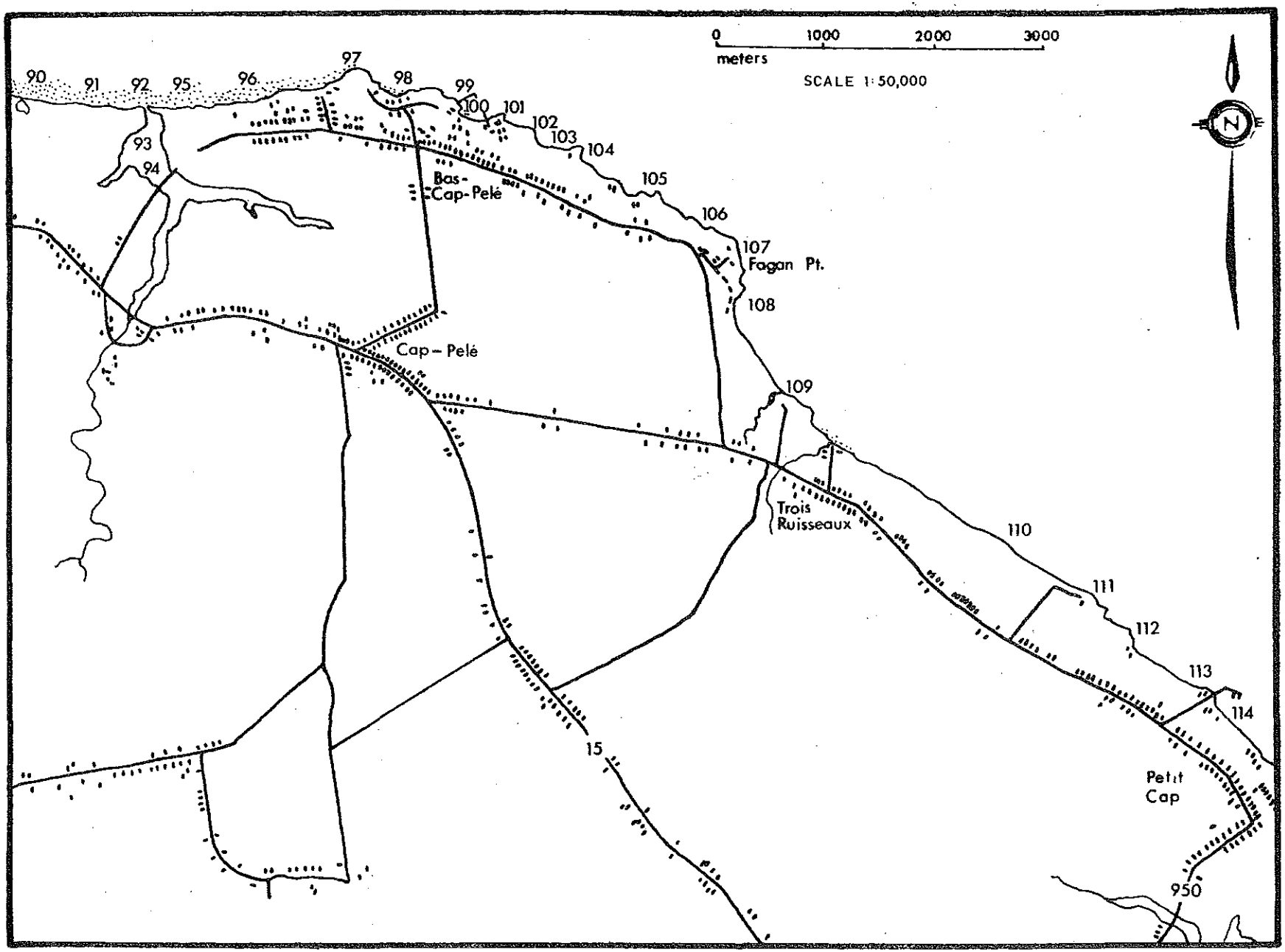

FIGURE 6. SAMPLING LOCATIONS AT CAPE PELÉ.

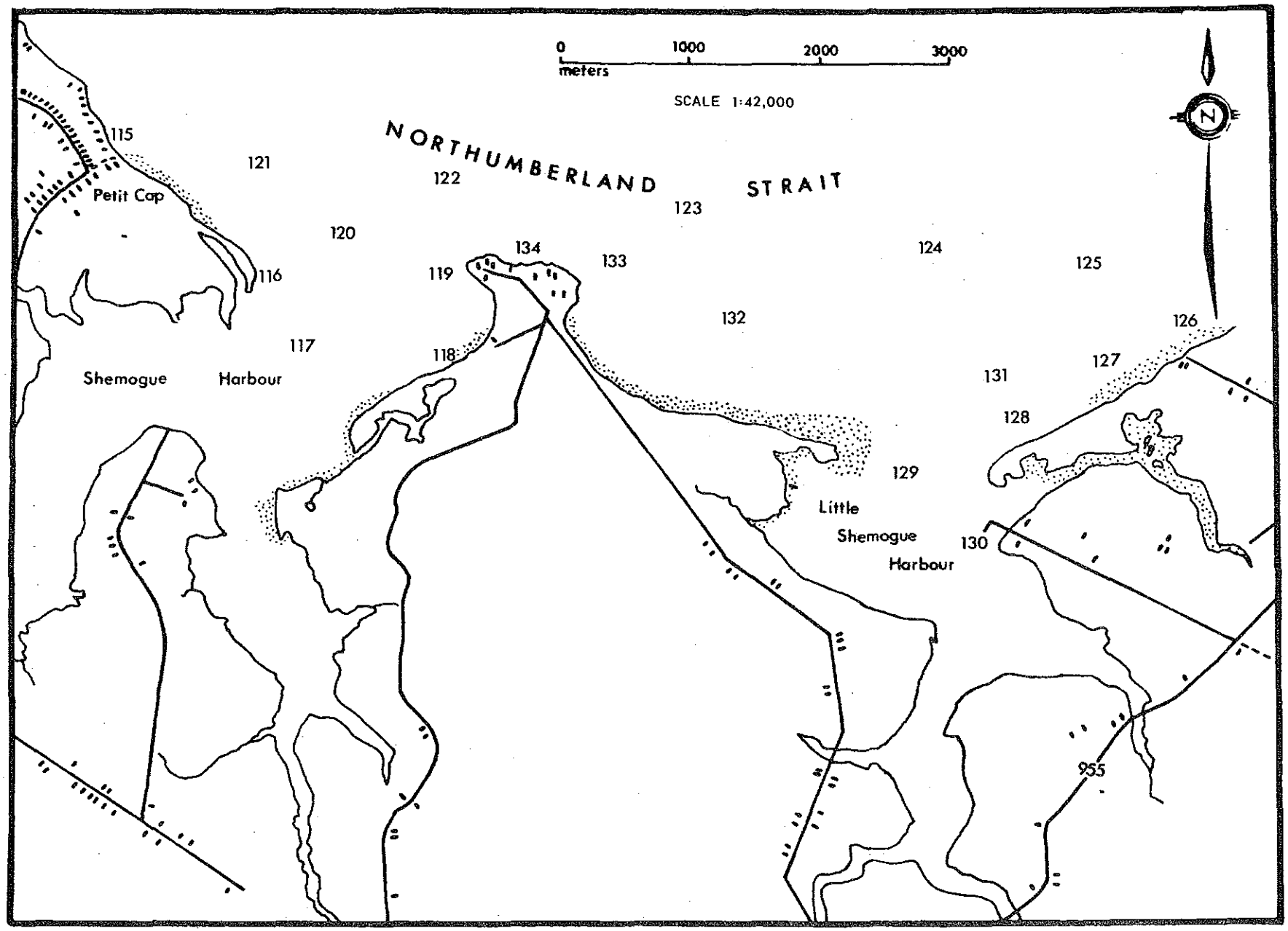

FIGURE 7. SAMPLING LOCATIONS AT

A sanitary survey of the area by the New Brunswick Department of Environment identified that a piggery and a cattle farm are discharging animal wastes into Chapman's Brook which runs into Little Shemogue Harbour.

Fecal coliform results obtained from this sector during the survey period (Appendix Table 7), indicate that the bacteriological water quality for the two harbours were excellent. Of the 89 water samples collected from this sector, 86 (97%) samples had fecal coliform MPNs of 2 or less, and no sample had MPN value in excess of 14. It is apparent that agricultural activities in the watershed has no major detrimental effect on the water quality in the harbour.

With reference to the precipitation which fell in the region prior to July 20, 1980 sampling, no increase in fecal coliform counts was observed.

4 CONCLUSION AND RECOMMENDATIONS

4.1 Sector 1

The bacteriological water quality of the Shediac River and estuary has improved significantly since the last study in 1968. Some of the pollution sources identified in the earlier study have been rectified. However, due to the proximity of the cottages to the river, some contamination might reach the river during periods of wet weather as indicated by the data collected on July 27, 1980.

It is recommended that the Shediac River and estuary below the bridge be considered for an approved shellfish area providing that shellstock analyses are carried out during the harvesting season by the Department of Fisheries and Oceans.

4.2 Sector 2

The bacteriological water quality of Shediac Harbour has improved since the installtion of the sewage collecting lagoon. Sanitary observations reveal that the sewage collecting system is experiencing serious infiltration problems during wet weather condition. The waters in Shediac Harbour is subjected to gross fecal contamination from sewage overflow from the lift stations and poses an immediate threat to shellfish harvested in the Bay.

It is recommended that the Shediac Harbour area be remained closed for the harvesting of shellfish for direct marketing.

4.3 Sector 3

Unacceptable bacteriological water quality found in this sector, were the two natural lagoons which is presently under shellfish closure and the two wharfs at Pointe-du-Chene and Cape Bimet. The pollution along the two wharfs are well protected within the mandatory 400 feet standing wharf closure.

It is recommended that the two existing closures (7-4 and 7-5) in the Shediac Bay be remained closed to direct shellfishery.

4.4 Sector 4

Fecal coliform levels in this sector consistently meet established NSSP water quality criteria, with the exception of the waters between the Robichaud wharf and Kouchibouguac River which received effluents from the Edmond Gagnon and Landry & Landry Fish plants.

It is recommended a new closure be implemented in the section of Northumberland Strait between the Robichaud wharf and Kouchibouguac River as shown in Figure 8.

4.5 Sector 5

The bacteriological water quality of this sector is excellent and meet the NSSP water quality criteria for an approved shellfish harvesting area. The potential pollution source identified in the sanitary survey did not appear to pose any serious threat to the open waters.

It is recommended that this sector remain open for the harvesting of shellfish for direct marketing.

4.6 Sector 6

The batceriological water quality in Shemogue Harbour and Little Shemogue Harbour is excellent and meets the NSSP water quality criteria for an approved shellfish area. The agricultural pollution source identified in the watershed did not appear to affect the water quality in the harbour.

It is recommended that this sector remain an approved shellfish harvesting area.

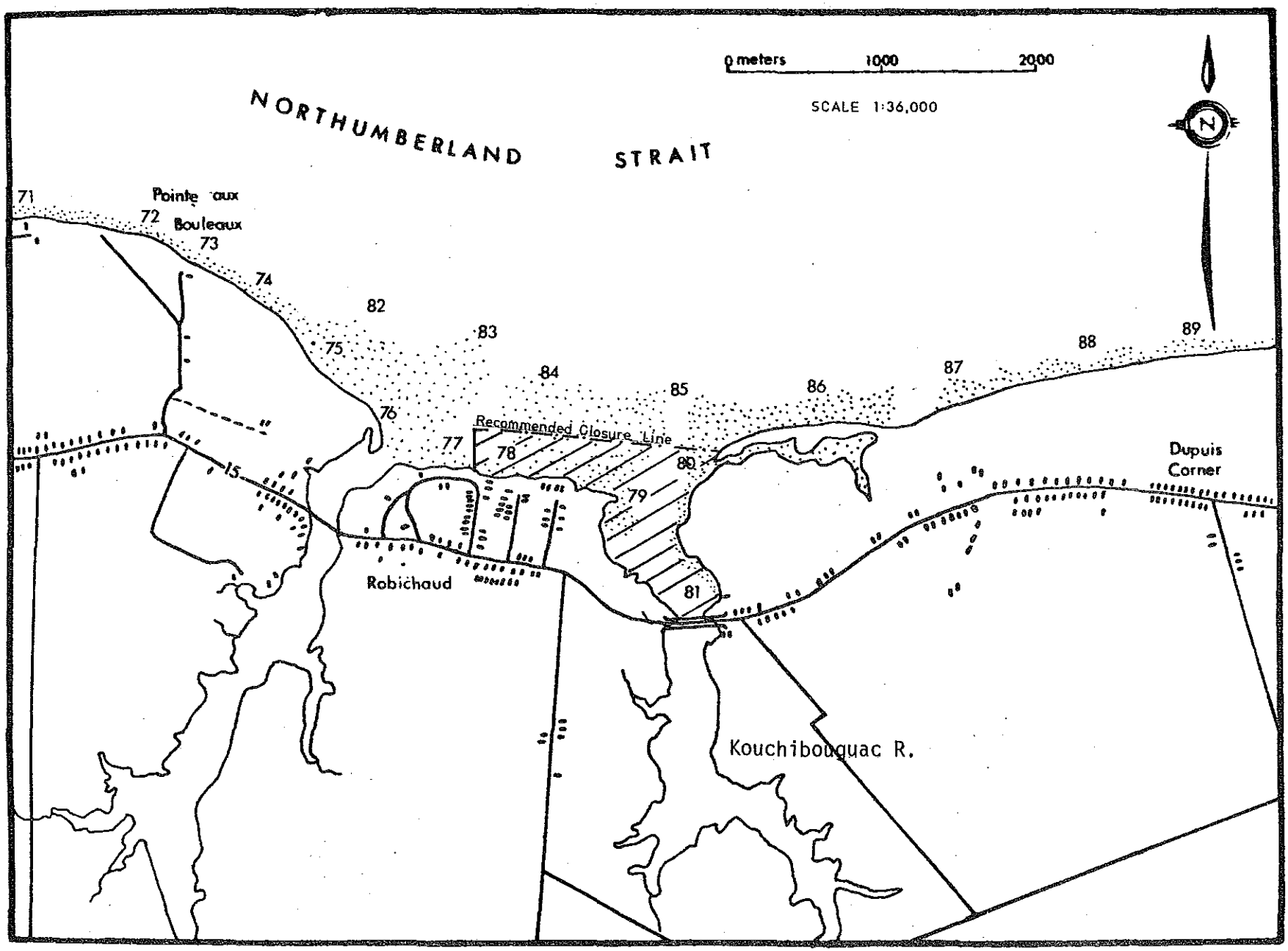

FIGURE 8. RECOMMENDED SHELLFISH CLOSURES AT ROBICHAUD.

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ACKNOWLEDGEMENTS

The author gratefully acknowledges the assistance provided through the Summer Youth Job Program headed by Mr. Michael Gauvin.

Acknowledgement is also extended to summer students-Messrs. B. Leger, D. LeBlanc, L. Doiron, D. Brooke Campbell, P. Brine and A. MacMillan for their excellent technical assistance in field sampling and laboratory analysis.

APPENDIX TABLES

TABLE 1 - PRECIPITATION DATA (mm) - MONCTON, NEW BRUNSWICK

DATE 1980	JUNE	JULY	AUGUST
1	0.2	3.0	
2	1.2	3.2	
3			2.4
4	Trace		
5	1.4	0.4	
6		9.6	4.4
7		6.1	7.2
8	23.7	5.8	Trace
9	1.0	13.6	13.6
10	4.2		
11			
12	0.3	12.7	35.2
13		0.8	6.0
14		Trace	0.2
15	11.8		2.1
16	16.2	0.8	11.9
17	1.0	23.2	
18		10.4	
19			
20		14.5	
21	5.1	0.4	
22		0.4	
23	Trace	2.8	
24	3.6	5.4	
25			2.0
26	4.8	2.1	0.8
27	9.2	0.4	
28			11.2
29		1.6	
30	16.0	1.0	
31		Trace	2.8
TOTAL	99.9	118.2	99.8

TABLE 2 - FECAL COLIFORM MPNs/100 ml, SHEDIAC RIVER

STATION	May 22	June 5	June 19	July 9	July 27	July 31	Aug 5	MEDIAN
1	2	<2	13	8	23	<2	5	5
2	<2	2	2	2	23	<2	2	2
3	<2	<2	2	5	17	<2	5	2
4	<2	-	5	23	33	<2	7	6
5	<2	-	2	<2	49	<2	2	<2
6	<2	-	<2	2	33	<2	2	<2
7	<2	-	2	<2	-	<2	<2	<2
8	<2	-	-	<2	-	<2	-	<2
9	-	-	-	<2	-	-	-	<2
10	2	<2	<2	<2	70	<2	8	<2
11	<2	<2	7	2	46	<2	<2	<2
12	<2	<2	4	<2	9	4	4	4
13	<2	<2	5	2	-	2	<2	<2
14	<2	<2	2	7	-	4	-	2
15	<2	<2	2	<2	-	<2	<2	<2
16	<2	<2	2	<2	-	<2	<2	<2
17	<2	<2	2	<2	13	<2	<2	<2
18	<2	2	4	<2	13	<2	<2	<2
19	4	<2	2	<2	-	<2	<2	<2
20	<2	<2	<2	<2	-	<2	5	<2
21	<2	<2	<2	<2	8	<2	<2	<2
22	<2	<2	<2	<2	23	<2	<2	<2
23	<2	<2	<2	<2	7	<2	<2	<2
24	<2	<2	<2	<2	2	<2	<2	<2
25	<2	<2	<2	<2	<2	<2	<2	<2
26	<2	<2	<2	2	<2	<2	<2	<2

TABLE 3 - FECAL COLIFORM MPNs/100 ml, SHEDIAC HARBOUR

STATION	DATE, 1980							MEDIAN
	May 22	June 5	June 19	July 9	July 17	July 27	Aug 26	
27	<2	2	-	-	-	-	<2	<2
28	<2	<2	<2	22	920	2	<2	<2
29	<2	<2	<2	11	240	<2	<2	<2
30	<2	<2	<2	13	240	<2	<2	<2
31	<2	<2	6	<2	49	2	<2	<2
32	<2	<2	<2	7	240	7	2	2
33	<2	2	7	<2	27	8	<2	2
34	<2	<2	8	49	17	49	8	8
35	<2	5	13	22	>2400	46	13	13
36	<2	5	5	23	>2400	49	2	5
37	4	2	2	2	<2	33	<2	2
38	<2	2	2	17	79	8	2	2
39	<2	<2	<2	5	<2	2	<2	<2
40	2	<2	<2	2	5	2	<2	<2
41	<2	<2	<2	8	2	2	<2	<2
42	<2	<2	<2	11	<2	<2	<2	<2
43	<2	<2	<2	27	<2	2	<2	<2
44	<2	<2	<2	79	<2	<2	2	<2
45	<2	<2	<2	4	8	<2	<2	<2
46	<2	<2	<2	2	<2	<2	<2	<2
47	2	<2	<2	<2	<2	<2	<2	<2
48	<2	<2	<2	2	>2400	<2	<2	<2
49	<2	<2	<2	<2	>2400	<2	<2	<2

Cont....

TABLE 3A - FECAL COLIFORM MPNs/100 ml, SHEDIAC BAY ("C")

STATION	DATE, 1980							MEDIAN
	May 22	June 5	June 19	July 9	July 17	July 27	Aug 26	
50	<2	2	<2	33	<2	<2	<2	<2
51	2	<2	<2	7	<2	<2	<2	<2
52	<2	<2	<2	2	<2	<2	<2	<2
53	<2	<2	<2	1600	<2	<2	2	<2

TABLE 4 - FECAL COLIFORM MPNs/100 ml, SHEDIAC BAY

STATION	DATE, 1980							MEDIAN
	May 26	June 11	June 30	July 10	July 21	July 31	Aug 26	
54	<2	<2	240	<2	2	<2	4	<2
55	<2	-	<2	-	-	<2	-	<2
56	2	<2	<2	<2	2	<2	<2	<2
57	2	<2	<2	<2	<2	<2	<2	<2
58	2	<2	<2	<2	<2	<2	<2	<2
59	<2	<2	<2	<2	<2	<2	<2	<2
60	<2	<2	<2	<2	8	<2	<2	<2
61	2	280	<2	13	<2	<2	<2	<2
62	2	350	<2	<2	2	<2	<2	<2
63	2	49	<2	<2	2	<2	<2	<2
64	2	11	5	<2	<2	<2	540	2
65	<2	<2	5	5	<2	<2	23	<2
66	<2	<2	5	<2	<2	<2	5	<2
67	<2	<2	<2	7	<2	<2	17	<2
68	<2	<2	<2	17	<2	<2	<2	<2
69	<2	2	<2	<2	<2	<2	<2	<2
70	-	-	-	>2400	>2400	>2400	>2400	>2400

TABLE 5 - FECAL COLIFORM MPNs/100 ml, ROBICHAUD

STATION	DATE, 1980						MEDIAN
	June 30	July 10	July 17	July 21	July 29		
71	<2	<2	2	<2	2		<2
72	<2	<2	33	<2	<2		<2
73	<2	<2	<2	<2	<2		<2
74	<2	<2	<2	<2	<2		<2
75	<2	<2	<2	<2	<2		<2
76	<2	<2	2	<2	5		<2
77	<2	120	26	22	12		22
78	<2	7	240	49	11		11
79	<2	2	130	17	350		17
80	<2	4	79	2	49		4
81	<2	2	<2	11	350		2
82	<2	2	<2	<2	<2		<2
83	<2	<2	<2	<2	<2		<2
84	<2	<2	<2	<2	<2		<2
85	<2	<2	<2	11	4		<2
86	2	2	<2	11	<2		2
87	2	5	<2	5	<2		2
88	<2	<2	<2	4	<2		<2
89	<2	13	<2	2	<2		<2

TABLE 6 - FECAL FECAL COLIFORM MPNs/100 ml, CAPE PELÉ

STATION	DATE, 1980					MEDIAN
	May 27	June 11	July 2	July 14	July 20	
90	2	<2	<2	2	<2	<2
91	4	<2	<2	<2	<2	<2
92	<2	<2	<2	2	<2	<2
93	<2	<2	2	8	13	2
94	5	2	2	170	13	5
95	<2	<2	<2	<2	<2	<2
96	<2	2	12	5	<2	2
97	<2	<2	7	<2	<2	<2
98	<2	<2	5	8	<2	<2
99	<2	<2	4	<2	<2	<2
100	2	5	13	5	12	5
101	5	<2	12	33	2	5
102	2	<2	2	<2	9	2
103	<2	<2	<2	5	8	<2
104	<2	<2	5	2	2	2
105	<2	<2	4	<2	2	<2
106	<2	<2	<2	<2	<2	<2
107	12	2	-	<2	2	<2
108	9	<2	-	<2	<2	<2
109	2	<2	<2	<2	<2	<2
110	<2	<2	<2	<2	<2	<2
111	<2	<2	<2	<2	<2	<2
112	<2	<2	<2	<2	<2	<2
113	<2	<2	2	<2	<2	<2
114	<2	<2	2	4	<2	<2

TABLE 7 - FECAL COLIFORM MPNs/100 ml,

STATION	July 2	July 14	July 18	July 20	Aug 4		MEDIAN
115	<2	<2	<2	<2	<2		<2
116	5	<2	<2	<2	<2		<2
117	4	<2	<2	<2	<2		<2
118	-	<2	<2	<2	<2		<2
119	2	<2	<2	<2	<2		<2
120	<2	<2	<2	<2	<2		<2
121	<2	<2	<2	<2	<2		<2
122	<2	<2	<2	<2	<2		<2
123	<2	<2	<2	<2	<2		<2
124	2	<2	<2	<2	<2		<2
125	2	<2	<2	<2	<2		<2
126	<2	<2	<2	<2	<2		<2
127	<2	<2	2	<2	<2		<2
128	-	<2	<2	<2	<2		<2
129	2	<2	<2	<2	<2		<2
130	4	<2	<2	<2	<2		<2
131	-	<2	<2	<2	<2		<2
132	-	<2	<2	<2	<2		<2
133	-	<2	<2	<2	<2		<2
134	-	<2	<2	<2	<2		<2