



Environment
Canada

Environmental
Protection
Service

Environnement
Canada

Service de la
Protection de
l'environnement

Atlantic Regional Library
JUL -3 1981
Environment Canada

A Bacteriological Survey of Buctouche Bay Shellfish Area 6 New Brunswick



TD
172
C3352
no76-1

Surveillance Report EPS-5-AR-76-1
Atlantic Region

ENVIRONMENTAL PROTECTION SERVICE REPORT SERIES

Surveillance reports present the results of monitoring programs carried out by the Environmental Protection Service. These reports will usually be published on a regular basis.

Other categories in the EPS series include such groups as Regulations, Codes and Protocols, Policy and Planning, Technical Appraisal, Technology Development, Surveillance, and Reprints of Published Papers.

Inquiries pertaining to Environmental Protection Service Reports should be directed to the Environmental Protection Service, Department of the Environment, Halifax, Nova Scotia, B3J 1M5.

A BACTERIOLOGICAL SURVEY OF BUCTOUCHE BAY
SHELLFISH AREA #6
NEW BRUNSWICK

by

M.D. BAXTER AND G. JULIEN

Microbiology Section
Environmental Services Branch
Environmental Protection Service
Atlantic Region

January, 1976

E.P.S.-5-AR-76-1

ABSTRACT

During the period August 22 to September 17, 1975, the Environmental Protection Service conducted a bacteriological and sanitary investigation in Buctouche Bay, New Brunswick. A total of 312 water samples were collected at 52 stations and analyzed for fecal coliform bacteria by the MPN method. The survey results indicate that three and four days following very high rainfall (2.54 inches/24 hrs.) water quality criteria for an approved shellfish harvesting area are exceeded at three of the sampling stations in the currently open sector near the mouth of the estuary and in the Little Buctouche River. It is concluded that the existing closure 6-2 on the Little Buctouche should remain in effect unchanged. The existing closure 6-4 on the Buctouche River also should be permanently expanded or increased conditionally for seven days after rainfall events exceeding 1.0 inch of precipitation in 24 hours.

Résumé

Pendant la période du 22 août au 17 septembre, 1975, le Service de Protection de l'Environnement a entrepris une étude bactériologique et sanitaire dans la Baie de Buctouche, au Nouveau Brunswick.

Un total de 312 échantillons d'eau ont été ramassés de 52 postes et analysés pour les colibacilles fécaux en utilisant la méthode NPP. Les résultats de l'étude indiquent qu'après trois et quatre jours suivant de très sévères chutes de pluies (2.54 pouces/25 h), le critérium pour l'approbation des Zones Coquillières selon la qualité de l'eau est surpassé à trois des postes d'échantillonnages dans la portion présentement approuvée près de l'embouchure de l'estuaire et dans la Petite Rivière de Buctouche. Il est conclut que la fermeture présentement établie (6-2) sur la Petite Rivière de Buctouche doit être agrandi. La fermeture présentement établie sur la rivière de Buctouche (6-4) doit être aussi agrandi d'une manière permanente où elle doit être agrandi conditionnellement pour une période de sept jours après de chutes de pluies de plus qu'un pouce par 24 heures.

TABLE OF CONTENTS

	PAGE
ABSTRACT	i
RESUME	ii
TABLE OF CONTENTS	iii
LIST OF FIGURES	iv
LIST OF TABLES	v
1 INTRODUCTION	1
2 MATERIALS AND METHODS	3
2.1 Sample Collection	3
2.2 Bacteriological Analyses	4
2.3 Additional Data	4
3 SANITARY CONDITIONS	4
4 CURRENTS, TIDES AND RAINFALL	6
4.1 Currents	6
4.2 Tides	6
4.3 Rainfall	6
5 BACTERIOLOGICAL RESULTS	6
6 DISCUSSION	9
7 CONCLUSIONS	10
8. RECOMMENDATIONS OF THE MARITIME STANDING COMMITTEE ON SHELLFISH	11
REFERENCES	13
ACKNOWLEDGEMENTS	14
APPENDIX	15

LIST OF FIGURES

FIGURE		PAGE
1	MAP OF THE SAMPLING STATION LOCATIONS BUCTOUCHE BAY, 1975	2
2	DISTRIBUTION OF MEDIAN FECAL COLIFORM LEVELS BUCTOUCHE BAY AUGUST 22 TO SEPTEMBER 17, 1975	8
3	DISTRIBUTION OF MAXIMUM FECAL COLIFORM COUNTS (MPN/100 ML) BUCTOUCHE BAY, AUGUST 22 TO SEPTEMBER 17, 1975	11
APPENDIX FIGURE		
A-1	MAP OF PRESENT SHELLFISH HARVESTING CLOSURES BUCTOUCHE BAY, NEW BRUNSWICK	15
A-2	HYDROGRAPHIC CHART OF BUCTOUCHE BAY, NEW BRUNSWICK	17
A-3	MAP OF THE OYSTER LEASES IN BUCTOUCHE BAY, NEW BRUNSWICK	18

LIST OF TABLES

APPENDIX TABLE	PAGE
A-1 TEMPERATURE AND SALINITY DATA FOR BUCTOUCHE RIVER AUGUST-SEPTEMBER, 1975	16
A-2 TIDE STAGE AND TIME OF SAMPLING, BUCTOUCHE RIVER, 1975	19
A-3 FECAL COLIFORM DATA BUCTOUCHE BAY, 1975	20
A-4 PRECIPITATION DATA FOR THE BUCTOUCHE AREA DURING THE STUDY PERIOD, 1975	21

1. INTRODUCTION

A bacteriological survey of the water quality of Buctouche Bay and tidal tributaries was conducted during the months of August and September 1975. The study was carried out by the Mobile Laboratory Staff of Environmental Protection Service, Atlantic Region, located at Richibucto, N.B. The purpose of this study was to reassess the bacteriological quality of the overlaying shellfish growing waters, of Buctouche Bay and its tidal tributaries, and to determine the adequacy of the existing Shellfish Closures, N.B. 6-2, 6-4. A total of 312 water samples were collected from 52 sampling stations, and were tested for fecal coliform bacteria, by the approved standard method (Figure 1). Sampling schedules were so arranged as to obtain samples representing conditions at different tidal phases.

There are three shellfish closures in the survey area of this report, N.B. 6-4 extending across the estuary of the Buctouche River at Priest Point, (Appendix Figure A-1), and continuing in a straight line across the estuary of the Black River to Indian Point. Closures N.B. 6-2 and 6-3 are located at the Highway Bridge (route #11) and further upstream respectively on the Little Buctouche River (Appendix Figure A-1).

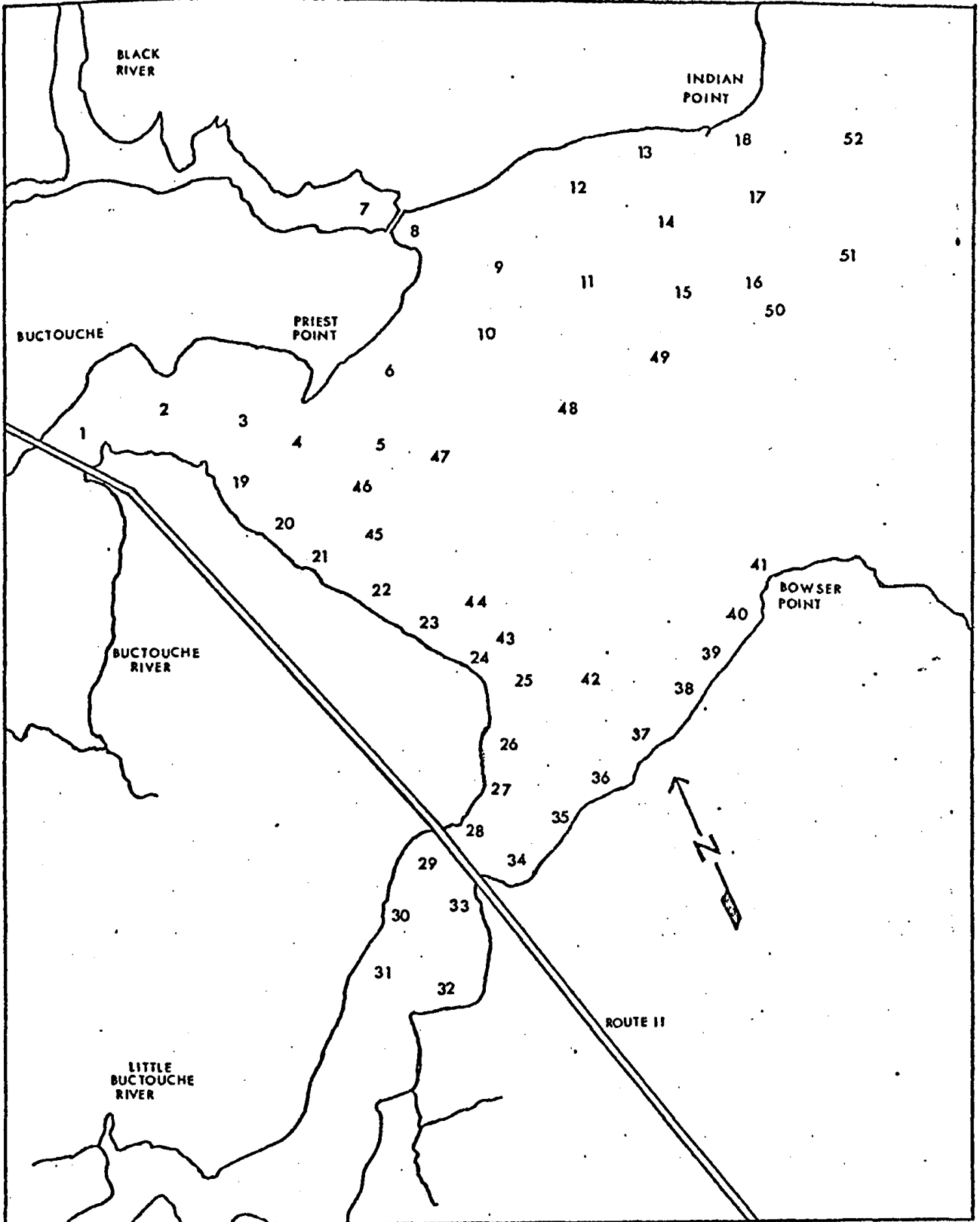


FIGURE 1 MAP OF THE SAMPLING STATION LOCATIONS BUCTOUCHE BAY, 1975

Sanitary surveys of shellfish growing water, including bacteriological water quality surveys are routinely carried out by E.P.S. The objective of these surveys is to determine if direct harvesting of shellfish is acceptable. The principal concern is the potential occurrence of disease-causing organisms that may be accumulated by shellfish if domestic sewage or wastes of domestic and wild animals reach their environment.

To assess the degree of fecal pollution in water the fecal coliform "Most Probable Number" (MPN) test is currently used in the Canadian Shellfish Sanitation Program. Water is considered acceptable if the median of the test results at a sampling station does not exceed an MPN fecal coliform count of 14 per 100 ml of sample and no more than 10% of the samples exceed 43 MPN/100 ml. Before areas are designated contaminated or approved, however, all factors that have a bearing on potential contamination levels are considered in addition to the bacteriological results.

2 MATERIALS AND METHODS

2.1 Sample Collection

All water samples were collected in sterile glass bottles (100 ml) using a rod sampling device lowered below the surface approximately 1 meter. All samples were stored in insulated coolers and transported to the Mobile Laboratory. The elapsed time for sampling, transportation, and test inoculation, did not exceed 2 hours.

2.2 Bacteriological Analysis

The Fecal Coliform test was performed on all samples using the most probable number (MPN) technique (A.P.H.A. 1970). Three 5-tube MPN series were inoculated with the appropriate aliquots of sample (decimal dilution). In the first stage of procedure, Bacto-lauryl-tryptose broth was used as presumptive growth medium and incubated at 35°C for 48 hours ± 2 hrs., or at 24 hours if growth was indicated by gas formation. Gas positive cultures at 24 hours or 48 hours were then transferred to Bacto-EC Medium and incubated in a water bath at 44.5°C. Gas production after 24 hours constituted the confirming stage for the Fecal Coliform test.

2.3 Additional Data

Water temperature and salinity was measured in situ using a Y.S.I. Model 33 salinometer (Appendix Table A-1). Rainfall and wind records for the Buctouche Bay area were obtained from the Provincial Department of Forestry and the Atmospheric Environment Service, Environment Canada.

3 SANITARY CONDITIONS

Buctouche Bay receives the drainage from three rivers; the Buctouche River, the Little Buctouche River and the Black River. Sources of Domestic wastes include the communities of Buctouche, St. Jean Baptiste, St. Francois de Kent, St. Marie de Kent and St. Anthony. Livestock and pasturage on the water shed of the Buctouche Estuary is also another important source of fecal wastes affecting the Bay.

The village of Buctouche (pop. approx. 2900) is serviced by a collection system and a single cell lagoon located at the northern end of the railway bridge. This system serves approximately 40% of the village and discharges 120,000 g.p.d. of unchlorinated waste to the Buctouche River estuary (Donnelly 1975). Other waste sources in the village include; the direct discharge of sanitary waste from a religious institution at Priest Point and Kent Homes Ltd. (150 employees) whose sanitary wastes drain to the shore via an open ditch and storm drain.

In St. Francois de Kent the Buctouche Bay Hotel/Motel sewage system drains to the mouth of the Little Buctouche River. St. Anthony is located upstream of St. Francois de Kent on the Little Buctouche River. This village has a population of approximately 756 and is served by a single cell lagoon and the effluent is discharged unchlorinated to the river.

There are numerous farms and homes located along the Buctouche River Estuary. Some homes are served by septic tanks and tile fields but many are not. Due to the steepness of the land bordering the road and the estuary most of these wastes and the animal wastes from livestock and pasturage eventually enter the estuary. This is clearly a problem particularly during periods of runoff.

The community of St. Marie de Kent is located at the head of the estuary approximately 6 miles from the Bay. A portion of this community is served by a small treatment plant whose unchlorinated effluent enters the estuary.

4 CURRENT, TIDES AND RAINFALL

4.1 Currents

As is indicated by (Appendix Figure A-2) a hydrographic chart, the narrow channel current passes through the survey area of Buctouche Bay in a west to east direction, ranging in depth at low water soundings from 24 ft. at the Irving Oil Wharf to less than 10 ft. at Oyster Shoal. Deep sea merchant marine vessels traverse the channel at flood tides during the ice free seasons. Tidal currents and river flow is usually restricted from December 15 through April 30 of each year due to the ice cover in the bay and rivers.

4.2 Tides

The Mean tide for Buctouche Bay as reported by Canadian Hydrographic Service, was less than 3 ft. during August and September, 1975. The tidal flood waters extend upstream in the Buctouche River approximately six miles to a mile beyond the highway bridge at St. Marie de Kent. Tidal flood waters extend upstream in the Little Buctouche River approximately two miles from the highway bridge on route #11.

4.3 Rainfall

The time span of the survey was 26 days from August 22 through September 17. Total rainfall during this period was 4.76 inches, 0.55 inches in August and 4.21 inches in the September sampling periods. Three days prior to the September 15 sampling, 2.83 inches in 24 hours was recorded for the area.

5 BACTERIOLOGICAL RESULTS

A total of 312 water samples were collected at 52 sampling stations in the Buctouche Bay study area and analyzed for fecal coliform bacteria.

Six samples were collected from each of the 52 stations and the schedule of sampling so arranged as to obtain representative conditions at different tidal phases (Appendix Table A-2). The results of Fecal Coliform analyses on these samples are given in Appendix Table A-3. The distribution of median Fecal Coliform levels for the Buctouche Bay during the study period area are given in Figure 2.

Median Fecal Coliform levels of 14 were exceeded at only three stations (2, 5 and 46). Station 2 is located inside the present boundaries of closure 6-4). Stations 5 and 46 are outside the present closure (6-4) in or on the edge of the channel leading out of the Buctouche River (Figure 1).

Maximum Fecal Coliform counts at most stations occurred on September 15, 56-68 hours after 2.56 inches of rain which fell on September 12. There was additional light rainfall on September 13 and 14 of 0.16 and 0.11 inches respectively (Appendix Table A-4).

On September 15, Fecal Coliform levels in excess of 43 MPN/100 ml occurred in two sectors. Counts ranged from 49 to 95 MPN/100 ml at stations within closure 6-4 and outside the limit of the present closure at the mouth of the estuary (Figure 3). Maximum Fecal Coliform levels (49-95 MPN/100 ml) also occurred at several stations within the present Little Buctouche River closure (6-2) and outside the upstream margin of this closure. The elevated Fecal Coliform levels observed on September 15 reflect low falling tide conditions (Appendix Table A-2). On September 16, densities remained elevated within closure 6-3 and in the mouth of the river outside the present closure during morning on the low rising tide. On

September 17, counts in this area were lower at most stations, but several stations (5,46,47 and 48) outside the present closure remained slightly elevated.

Fecal Coliform levels in the Little Buctouche River area had returned to pre-rainfall values (<2) by the morning of September 16. Generally, the presently approved growing area with the exception of the two previously discussed sectors meet approved growing area water quality criteria.

6 DISCUSSION

During the particularly dry conditions which prevailed in August, water quality was acceptable in most of the area surveyed. Sanitary conditions, however, in the present Buctouche River closure (6-4) and Little Buctouche River closures (6-2, 6-3) remain unsatisfactory and represent a public health hazard to these sectors at all times. Fecal Coliform levels in the area are very much dependent upon rainfall conditions as partially exhibited by the data of September 15 and shown in previous reports (Baxter 1970). The data of the present survey shows that up to three days after periods of very high rainfall (2.56 inches) approved growing area water quality standards are exceeded outside the present Buctouche River closure (6-4) and outside the landward limit of closure 6-2 on the Little Buctouche River. Three days after a significant rainfall event the Fecal Coliform levels in these sectors are not exceptionally high, but clearly indicative of fecal contamination. It must be assumed that immediately following (within 24 hours) such a rainfall

event, fecal coliform levels are considerably higher. As oysters are currently grown and harvested from the area immediately adjacent to the present closure (6-4), it is concluded that a potential public health risk exists in this sector for several days after extremely high rainfall (Appendix Figure A-3).

7 CONCLUSIONS

It is concluded that the boundaries of closure 6-2 on the Little Buctouche River should be expanded to include the area shown on Figure 3. The existing closure 6-4 on the mouth of the Buctouche River should be expanded to include the area inside a line drawn from the shore east of Priest Point to a point on the western shore as shown on Figure 3; or the sector lying outside the present closure margin and within the line as described previously should be closed to shellfish harvesting seven days following rainfall events exceeding 1.0 inch in a 24 hour period as measured at Buctouche. With the genuine cooperation of the Buctouche Bay Oyster Cooperative, we see no reason why the latter alternative should not be considered.

8 RECOMMENDATIONS OF THE MARITIME STANDING COMMITTEE
ON SHELLFISH

The existing closure N.B. 6-4, Buctouche River should be rescinded and replaced by a closure west of a line as shown on Figure 3 of this report.

It is also recommended that additional survey work be carried out on the Buctouche Bay to more adequately define the possible need for a conditional closure mechanism in the area following periods of heavy rainfall. This study should be conducted during the fall harvesting season.

REFERENCES

1. American Public Health Association, Recommended Procedures for the Examination of Sea Water and Shellfish. Fourth Edition, American Public Health Association, New York, 106 pp. (1970).
2. Baxter, M.D. Sanitary and Bacteriological Survey, New Brunswick Shellfish Area #6. Buctouche River Section, Division of Public Health Engineering, Manuscript Report AR-70-1-1, 9 pp. (1970).
3. Baxter, M.D. A Bacteriological Assessment of the Buctouche River Estuary, Kent County (Shellfish Area, N.B. No.6) Environmental Protection Service Surveillance Report EPS 5-WP-72-24, 11 pp. (1972).
4. Donnelly, J.P. A Sanitary Engineering Survey of Kent County From Kouchibouguac National Park. South to Shediac in Westmorland County. Environmental Protection Service Unpublished Report 33 pp. (1976).
5. Silliphant, D.R. Sanitary and Bacteriological Survey New Brunswick Shellfish Area #6, Little Buctouche River Section, Division of Public Health Engineering Report Aug. 9 pp. (1968).

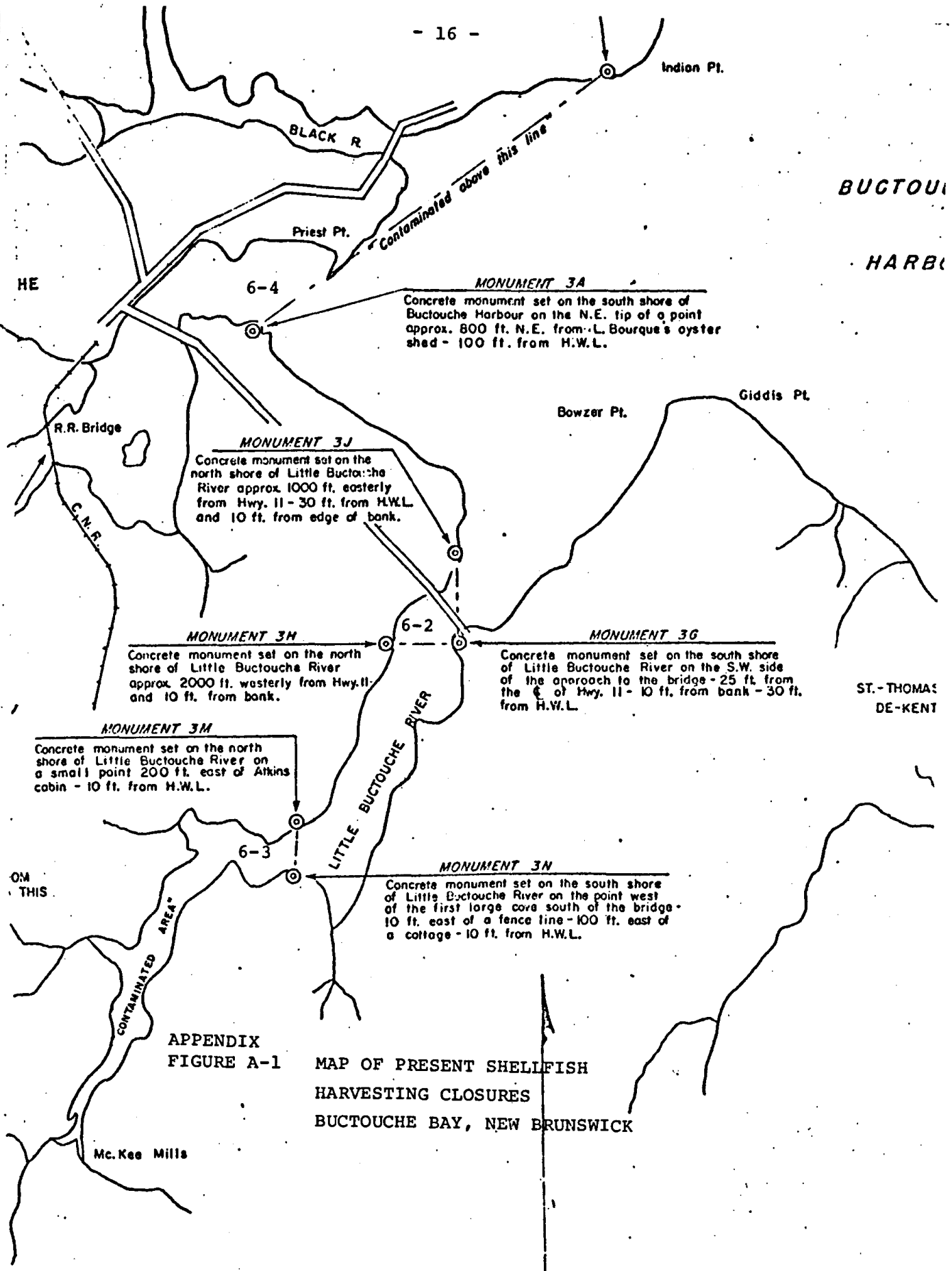
ACKNOWLEDGEMENTS

The authors gratefully acknowledge the assistance of Mr. M. Gauvin who participated in the survey activities, and Mr. K. Coffin who assisted in the preparation of this report, also to Mr. Leopold Allain, Supervisor, Buctouche Bay Oyster Co-op for providing boat service and manpower in the collection of samples, and the cooperation extended by personnel of Fisheries and Marine Services, Resource Development Branch.

Advice and active support was provided by Mr. J. Machell and Mr. A. Menon.

Particular appreciation is extended to Dr. R. H. Cook, and Mr. J. Machell for the reviewing of this manuscript.

APPENDIX



APPENDIX
FIGURE A-1

MAP OF PRESENT SHELLFISH
HARVESTING CLOSURES
BUCTOUCHE BAY, NEW BRUNSWICK

TABLE A-1

TEMPERATURE AND SALINITY DATA FOR BUCTOUCHE RIVER, AUGUST-SEPTEMBER, 1975

STATION	DATE	TEMPERATURE °C	SALINITY ‰
1	Aug. 22	17	25.4
	Sept. 15	15	25.9
	Sept. 16, a.m.	14.5	19.1
	Sept. 16, p.m.	15.0	23.3
	Sept. 17, a.m.	14.5	23.0
	Sept. 17, p.m.	14.5	23.0
3	Aug. 22	17	26.7
6	Aug. 22	17	27.7
8	Sept. 15	15	22.0
	Sept. 16, a.m.	14.9	23.0
	Sept. 16, p.m.	15.5	23.3
	Sept. 17, a.m.	14.5	23.0
	Sept. 17, p.m.	14.5	23.0
31	Sept. 15	15	23.3
	Sept. 16, a.m.	14.5	23.3
	Sept. 16, p.m.	15.5	23.3
	Sept. 17, a.m.	15.5	23.0
	Sept. 17, p.m.	14.5	23.3
42	Aug. 22	17	26.7
	Sept. 15	15	24.0
	Sept. 16, a.m.	14.5	25.9
	Sept. 16, p.m.	15.5	23.4
	Sept. 17, a.m.	15.5	24.6
	Sept. 17, p.m.	14.5	24.3
46	Aug. 22	17	27.7
	Sept. 15	15	24.6
	Sept. 16, a.m.	14.5	25.9
	Sept. 16, p.m.	15.5	23.3
	Sept. 17, a.m.	15.5	24.6
	Sept. 17, p.m.	14.5	25.9
50	Aug. 22	17	29.3
	Sept. 15	15	27.3
	Sept. 16, a.m.	14.5	25.9
	Sept. 16, p.m.	15.5	23.4
	Sept. 17, a.m.	15.5	24.6
	Sept. 17, p.m.	14.5	25.6

Final information from the Department of Public Works to 1909

Sloped soundings from British Admiralty surveys

P.W. A. : Lat. 46° 28' 00" N., Long. 64° 42' 35" W.

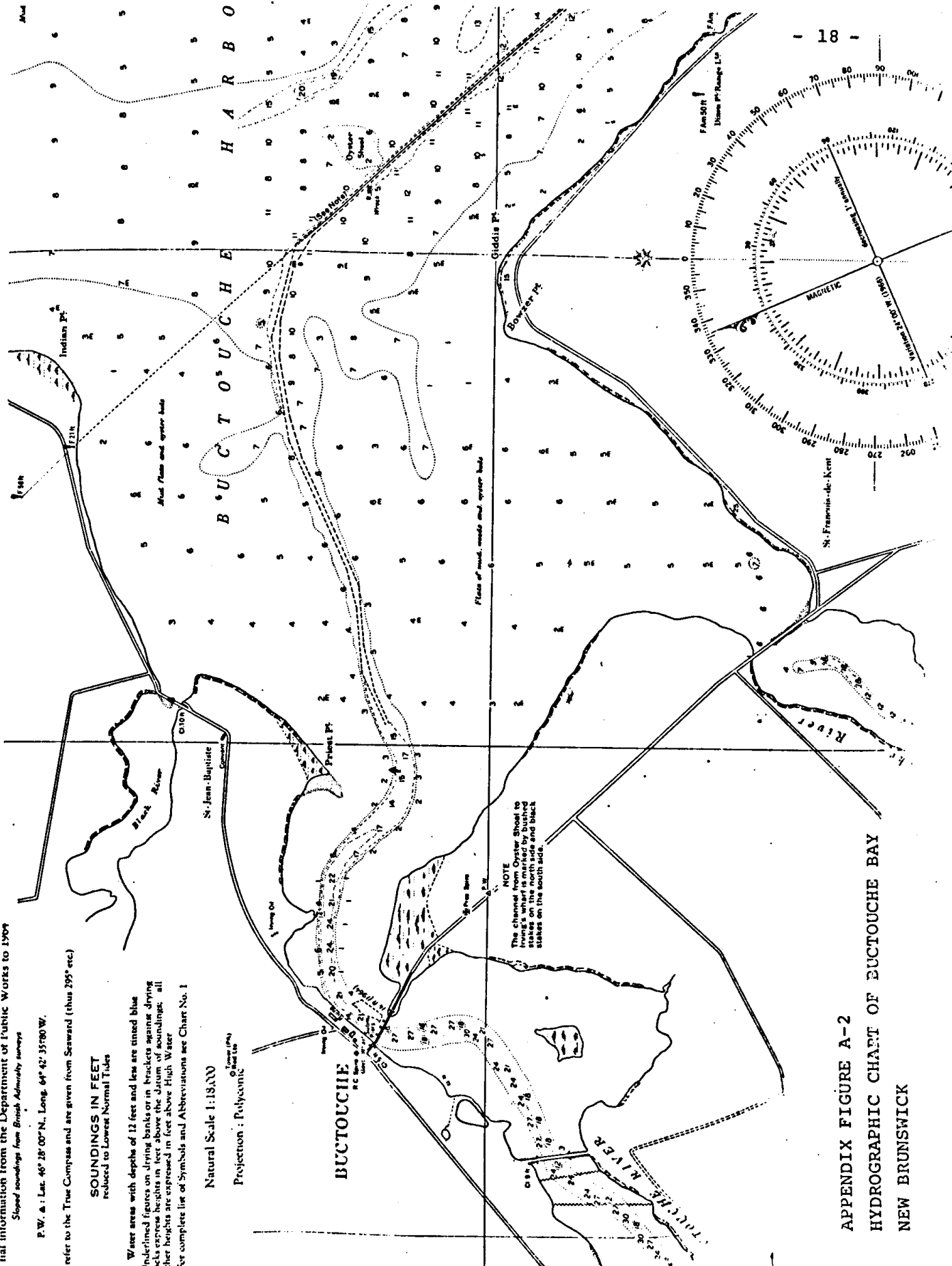
refer to the True Compass and are given from Seaward (thus 295° etc.)

SOUNDINGS IN FEET
reduced to Lowest Normal Tides

Water areas with depths of 12 feet and less are tinted blue
Inclined figures on drying banks or in brackets against drying
sols express heights in feet above the datum of soundings; all
other heights are expressed in feet above High Water
For complete list of Symbols and Abbreviations see Chart No. 1

Natural Scale 1:18,000

Projection : Polyconic



APPENDIX FIGURE A-2
HYDROGRAPHIC CHART OF EUCTOUCHE BAY
NEW BRUNSWICK

APPENDIX FIGURE A-3 MAP OF THE OYSTER LEASED IN BUCTOUCHE BAY, NEW BRUNSWICK

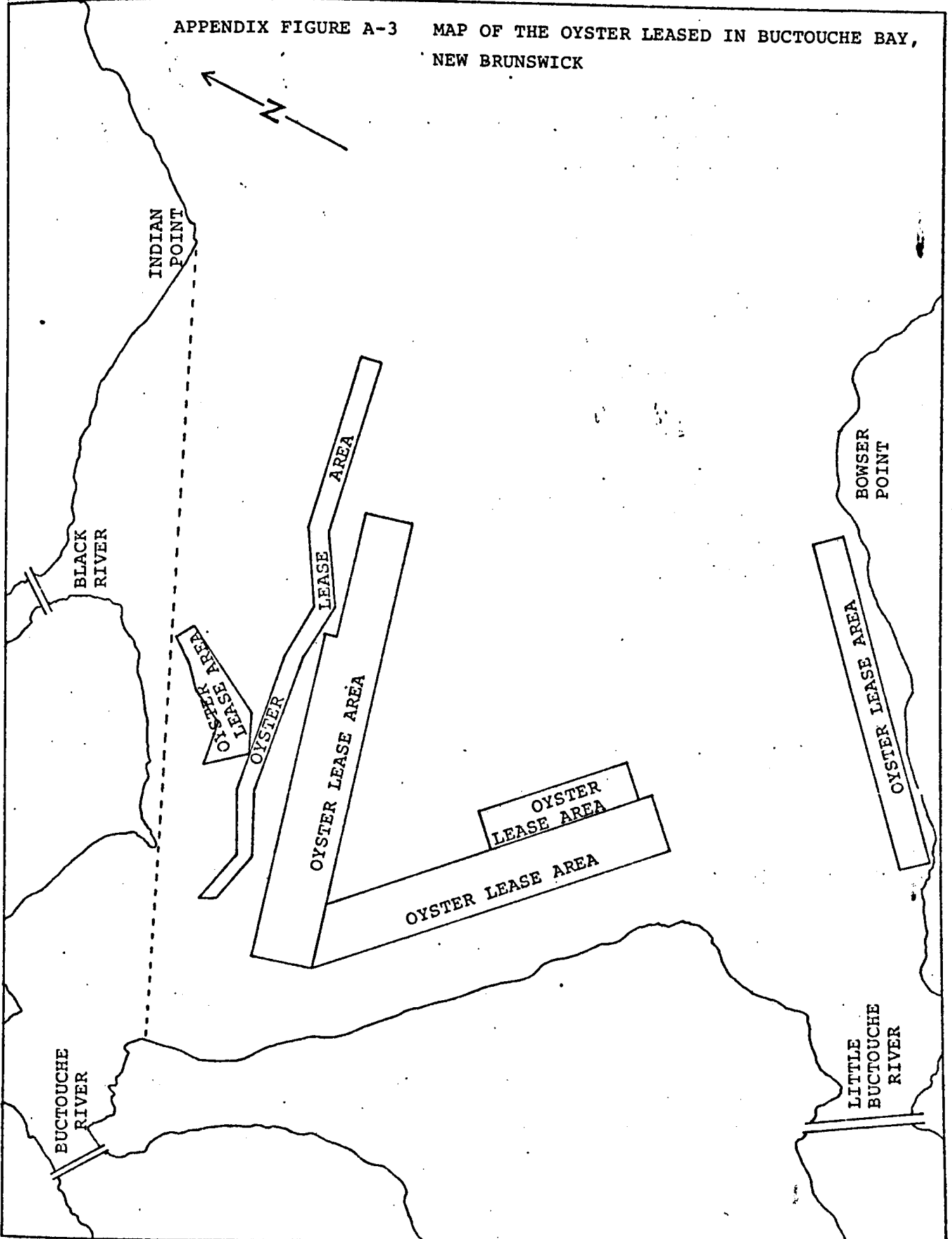


TABLE A-2

TIDE STAGE AND TIME OF SAMPLING, BUCTOUCHE RIVER, 1975

DATE	TIME OF SAMPLING (HRS.)	TIDE
Aug. 22	0830-0930	High Falling
Sept. 15	0915-1015	Low Falling
Sept. 16, a.m.	0900-1030	High Rising
Sept. 16, p.m.	1330-1500	Low Rising
Sept. 17, a.m.	0900-1000	High Falling
Sept. 17, p.m.	1400-1500	Low Falling

TABLE A-3 FECAL COLIFORM DATA, BUCTOCHE BAY

STATION NO.	MPN's PER 100 ml						MEDIAN
	AUG. 22	SEPT. 15	SEPT. 16	SEPT. 16	SEPT. 17	SEPT. 17	
1	<2	70	46	13	7	8	11
2	5	95	33	26	<2	17	27
3	<2	49	21	17	5	7	12
4	<2	79	95	5	2	7	6
5	2	49	22	7	2	46	15
6	2	13	13	7	2	5	6
7	2	-	5	-	<2	<2	<2
8	<2	33	5	4	<2	11	5
9	26	13	13	2	6	<2	10
10	<2	5	33	13	<2	<2	<4
11	<2	5	7	2	2	<2	2
12	<2	9	5	2	2	<2	2
13	2	2	4	<2	2	<2	2
14	2	5	6	4	<2	<2	3
15	<2	14	<2	4	<2	<2	<2
16	<2	13	5	<2	<2	<2	<2
17	<2	<2	2	2	<2	<2	<2
18	<2	<2	2	2	<2	<2	<2
19	2	21	5	17	<2	8	7
20	<2	46	2	2	2	4	2
21	<2	22	<2	5	<2	7	<4
22	<2	7	<2	7	<2	13	<5
23	<2	11	<2	13	<2	2	<2
24	<2	49	<2	2	2	2	2
25	<2	<2	2	4	5	5	3
26	5	4	<2	<2	8	2	3
27	<2	12	<2	2	<2	<2	<2
28	<2	95	<2	2	2	<2	<2
29	<2	79	<2	2	<2	<2	<2
30	<2	17	<2	2	2	5	2
31	<2	79	<2	2	2	<2	<2
32	<2	49	<2	-	<2	<2	<2
33	<2	34	<2	4	<2	<2	<2
34	<2	27	<2	4	<2	<2	<2
35	<2	22	2	<2	<2	<2	<2
36	<2	21	2	<2	<2	<2	<2
37	<2	64	2	<2	<2	<2	<2
38	<2	31	5	<2	2	2	2
39	<2	17	<2	<2	5	2	<2
40	<2	7	2	<2	11	2	2
41	<2	21	<2	<2	<2	<2	<2
42	<2	22	2	<2	17	<2	2
43	<2	33	<2	5	13	5	5
44	<2	33	<2	14	13	7	10
45	<2	49	17	13	13	2	13
46	<2	49	22	22	33	<2	22
47	<2	31	13	11	70	2	12
48	<2	33	8	5	33	<2	7
49	<2	33	5	<2	<2	<2	<2
50	<2	13	8	5	2	<2	4
51	<2	11	8	<2	8	<2	<5
52	<2	5	17	<2	<2	<2	<2

TABLE A-4

PRECIPITATION DATA FOR THE BUCTOUCHE AREA
DURING THE STUDY PERIOD

DATE	PRECIPITATION (INCHES)	SAMPLING DATES
Aug. 1		
2	.17	
3	.31	
4		
5		
6		
7		
8		
9		
10		
11		
12	.09	
13		
14	.03	
15	.10	
16		
17		
18		
19		
20		
21		
22	.43	*
23		
24		
25		
26		
27	.12	
28		
29		
30		
31		
Sept. 1		
2	.26	
3	.27	
4	.21	
5		
6		
7		
8		
9	.65	
10		
11		
12	2.56	
13	.16	
14	.11	
15		*
16	T	*
17		*

Environment Canada - Environnement Canada

A BACTERIOLOGICAL SURVEY OF BUCTOUCHE BAY SHELLFISH AREA #6, NEW BRUNSWICK
BAXTER, M. D

TD 172 C3352 NO. 76-1
NSDE

7012156E