Environment Canada
Environmental Protection

Environnement Canada
Protection de l'environnement

# A Bacteriological Survey of Rustico Harbour, Prince Edward Island, 1973 Shellfish Area 3



Surveillance Report EPS 5-AR-74-9
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 3E4.

# A BACTERIOLOGICAL SURVEY OF RUSTICO HARBOUR, PRINCE EDWARD ISLAND, 1973 SHELLFISH AREA 3

by

H.R. VAN OTTERLOO, M. BAXTER AND J. MACHELL
MICROBIOLOGY SECTION
SURVEILLANCE AND ANALYSIS DIVISION
ENVIRONMENTAL PROTECTION SERVICE
ATLANTIC REGION

for the

WATER POLLUTION CONTROL DIRECTORATE
ENVIRONMENTAL PROTECTION SERVICE

REPORT EPS-5-AR-74-9
FEBRUARY, 1974.

## ABSTRACT

This report presents the results of a bacteriological water quality survey conducted in July and August, 1972, in North Rustico Harbour on the eastern shore of Prince Edward Island. This survey was conducted to review the classification of the area for the harvesting of shellfish.

The report includes a sanitary description of the area and the implications of the bacteriological results are discussed in terms of criteria for shellfish growing areas.

Gross fecal pollution was detected near the village of North Rustico and all of the North Shore of the Harbour is affected by these effluents. The survey was conducted under favourable environmental circumstances but an estimate is made of the area that would be definitely affected under more adverse conditions. This leads to the conclusion that the presently enforced closure line does not adequately include the waters near the western shores of the Harbour but in other sectors, the existing closure boundaries are adequate. A redefinition of the boundaries of this closure is recommended as illustrated in Figure 1.

# RÉSUMÉ

Ce rapport présente les résultats d'un relevé bactériologique qui a été mené au mois de juillet et d'août 1972, à Havre North Rustico sur la côte est de l'Ile du Prince-Edouard. Ce relevé a été entrepris pour passer la classification du secteur en revue en ce qui regarde la pêche coquillière.

Ce rapport contient aussi une dèscription sanitaire de la région et les implications des données bactériologiques sont discutées sous forme de critères pour les Secteurs de Pêche de Coquillages.

On a decouvert de la pollution fécale substantielle près du village de North Rustico et toute la rive nord de ce Havre est influencée par ces eaux d'égout.

Cette étude à été menée durant un temps favourable mais on a estimé la partie du secteur qui sera affectée pendant des conditions plus adverses. Ceci nous fait conclure que la présente ligne de fermeture n'est pas suffisante pour contenir les eaux près de la rive ouest du Havre. Les lignes de fermeture dans les autres secteurs sont suffisantes. Une nouvelle définition des lignes pour cette fermeture est recommandée et illustré en dessin 1.

# TABLE OF CONTENTS

# LIST OF FIGURES

# LIST OF TABLES

# 1 INTRODUCTION

From July 2 to August 1, 1973, the Environmental Protection Service conducted a bacteriological survey of Rustico Harbour (Shellfish Area P.E.I.-3), to investigate the present closure to shellfishing in a large section of the harbour. The closed area is defined in Schedule F of the Prince Edward Island Fisheries Regulations as follows (P.C. 1972-3025):

> "3-4 Those portions of Rustico, Queens County, including Division Nos. 435 and 436.

Previous bacteriological surveys of the area have been conducted in 1959 (1) by Reid and Rockwell and most recently in 1967 (2) by Cullen. The most recent sanitary survey was conducted by Cullen in 1966 (3). These surveys substantiated the requirement for the present closure in this area.

The current assessment is part of the continuous review of closure regulations governing shellfish growing areas which is carried out by the Environmental Protection Service in accordance with the procedures described in the National Shellfish Sanitation Program Manual of Operations (4).

The coliform MPN test is the principal bacteriological criterion used in this program although fecal coliform MPN tests provide additional information and are included in this report. With the coliform test, water is considered unacceptable for the harvesting of shellfish when the median of the MPN values exceeds 70 per 100 ml and/or more than ten percent of the results exceed 230 MPN per 100 ml. There is no universally accepted standard for the fecal coliform test but a median of 23 with a 90-percentile of 76 may be used in comparing the two tests.

# 2 METHODS

## 2.1 Sampling

Water samples were collected in sterile glass bottles using a rod sampling device to lower the bottles to a depth of about two feet. Samples were not iced but were kept in an insulated container and processed in a mobile laboratory less than six hours after collection.

## 2.2 Bacteriological Analyses

Coliform and fecal coliform tests were performed on all samples using "most probable number" (MPN) techniques. Three or more five-tube MPN series were inoculated with appropriate aliquots of sample (decimal dilutions). In the first stage of the procedure, Bacto Lauryl Tryptose Broth was the growth medium used and the tubes were inoculated at 35°C for about 48 hours, or if gas formation was detectable sooner, for 24 hours. Gas-positive cultures were transferred to Bacto Brilliant Green Bile Broth (BGB) and Bacto-EC medium. Gas formation in BGB after 24 or 48 hours of incubation at 35°C constituted the confirming stage of the coliform test. For the fecal coliform test, the EC tubes were examined after 24 hours of incubation at 44.5°C. The incubator in this case was a water bath equipped with a stirring device.

## 2.3 Additional Data

The tidal stage was estimated and recorded for each sampling run. In addition, records of daily precipitation at a nearby station of the Atmospheric Environment Service (Charlottetown) are included.

# 3 AREA DESCRIPTION

Rustico Harbour is a portion of Rustico Bay located

on the eastern shore of Prince Edward Island. The Bay is partially enclosed by a long bar (Rustico Island). There are two channels to the Gulf of St. Lawrence: one at the northern end of Rustico Island and one at its southern end. The Bay encloses the estuaries of the Hunter River in the north and the Wheatly River in the south (Figure 1).

Rustico Harbour lies in the extreme northern end of the Bay and near the northern tip of Rustico Island. Pollution sources include the domestic waste from the village of North Rustico (pop. 780) and wastes from two fish plants located along the northern shore of the Harbour. The industrial wastes are discharged untreated to the Harbour. The domestic waste from North Rustico is collected and discharged to a settling tank (3). However, this system is inadequate and the wastes often receive little, if any, treatment before discharge to the Harbour.

This coastline is an important tourist area. Rustico Island and all of the adjacent outer shoreline is part of Prince Edward Island National Park.

## 4. RESULTS

Samples for bacteriological analyses were collected at 32 stations (Figure 1) on four sampling days between July 24 and August 1, 1973. The results of coliform and fecal coliform tests performed on these samples are listed in Table I-A of the Appendix. The median of coliform data for each station is illustrated in Figure 1 while rainfall levels recorded during the survey at a nearby station of the Atmospheric Environment Service (Charlottetown) are presented in Figure 1-A. The time of sampling and tide is given in Appendix Table 1-B.

On all sampling days very high (>2400/100 ml) coliform and fecal coliform densities were detected at Stations 3 and 4 near the village of North Rustico. At other

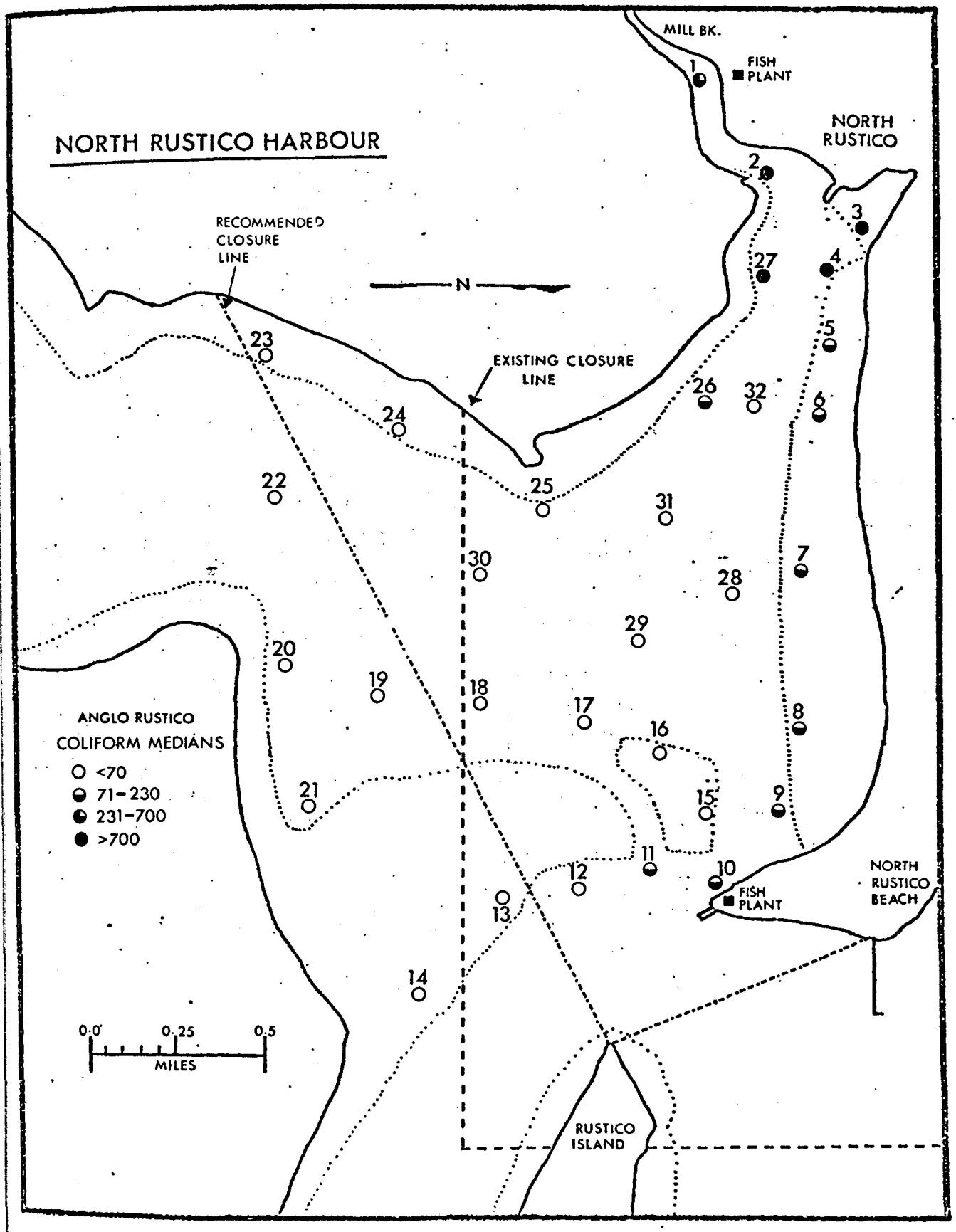


FIGURE 1. SAMPLING STATIONS, NORTH RUSTICO HARBOUR, PRINCE EDWARD ISLAND, 1977

stations along the northern shore (Stations 1 to 11) coliform medians were also greater than 70 per 100 ml, indicating that there was a consistently high level of fecal contamination in this area. Further south, coliform medians were less than 70 at almost all stations but many individual MPN's were greater than 70 per 100 ml.

In general, the results on July 30 (low tide) and in particular on August 1 (low falling tide) were higher than on other sampling days. On the first of August, coliform densities greater than 70 per 100 ml were found at several stations near or outside the present closure line (Stations 19, 24, 25 and 30) and at Station 24, just outside the closure line near the western shore of North Rustico Harbour, the coliform as well as the fecal coliform MPN was 170 per 100 ml.

A small amount of rain fell during the survey period; 0.1 inch was recorded on July 30 and 0.2 inches on August 1.

## 5 DISCUSSIONS AND CONCLUSIONS

The data of this survey indicate that the village of North Rustico is the major source of fecal pollution to North Rustico Harbour. Miller Brook and the area within approximately half a mile of North Rustico are grossly polluted and all of the northern shoreline of North Rustico Harbour appears to be seriously and continuously contaminated by effluents contributed mainly by the sewage treatment facilities of North Rustico.

Further from land, in a southeasterly direction, the degree of contamination and the extent of the contaminated area is very much affected by environmental conditions. With the exception of a high fecal coliform count (170/100 ml) on August 1 at Station 29, we have not found excessive

coliform (>230/100 ml) or fecal coliform (>76/100 ml) counts outside the presently closed area (Figure 1). Even at many stations within this closed area, the water quality during the survey was acceptable in terms of criteria for shellfish growing areas.

It should be noted, however, that this survey was conducted under circumstances that would tend to reduce the extent of the contaminated area. Most important, the amount of rainfall affecting the area during the survey was minimal.

Nevertheless, rainfall appeared to be a contributing factor in the increase in bacterial densities at many stations on the first of August, although this phenomenon may also be related to the tide at the time of sampling (low falling).

It is likely that, following a greater amount of rainfall, the contaminated area at low tide would extend over most if not all of the area that is recommended for closure. Outside the closure line, the degree of fecal contamination under these circumstances probably would be minimal in all areas except the waters near the western shores. Cause for concern in this respect are the bacteriological data obtained on the first of August at several stations near this shore (Stations 24, 25, 29 and 30). No undue emphasis should be placed on the single high (170/100 ml) fecal coliform count at Station 24 on that day but it is noted that at other stations in this area (Stations 23, 25, 30 and 31) the bacterial densities were fairly high also. Coliform MPN's at these stations were greater than 70/100 ml and fecal coliform MPN's exceeded 23/100 ml.

It is also noted that a trailer park on the western shore constitutes a potential source of fecal contamination to these waters and it is advisable to include this area in a redefined closure as indicated in Figure 1.

## 6 RECOMMENDATIONS

1. The existing closure (3-4), Rustico Harbour should be redefined to prohibit the harvesting of shellfish in the area adjacent to North Rustico as designated in Figure 1 of this report.

2. The new closure lines should be marked by the installation of numbered monuments.

## REFERENCES

1. Reid, J.E. and L.J. Rockwell, 1959. Bacteriological Surveys, Shellfish Producing Areas, 1959, Rustico Bay and Harbour, P.E.I. 8. M.S. Report 59-5, Department of National Health and Welfare.

2. Cullen, D.H. 1967. Bacteriological Survey, Hunter River and Rustico Harbour, Shellfish Area P.E.I. 8, Rustico. M.S. Report, Division of Public Health Engineering, Department of National Health and Welfare.

3. Cullen, D.H. 1967. Sanitary Survey, Shellfish Area P.E.I. 8, Rustico, Prince Edward Island. Division of Public Health Engineering, Department of National Health and Welfare.

4. U.S. Department of Health, Education and Welfare, National Shellfish Sanitation Program Manual of Operations, Part I, Sanitation of Shellfish Growing Areas. Public Health Service Publication No. 33, 1965 Revision, Washington.

ACKNOWLEDGEMENTS

Essential to the completion of these surveys was the technical assistance provided by Mr. B. Cushing. The assistance of Dr. R.H. Cook in reviewing the manuscript is also acknowledged.

# APPENDIX I

# TABLES

TABLE 1-A COLIFORM AND FECAL COLIFORM DATA, RUSTICO, PRINCE EDWARD ISLAND, 1973

| STATION NUMBER | COLIFORM MPNS per 100 ml | | | | | FECAL COLIFORM MPNS per 100 ml | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Jul 24 | Jul 25 | Jul 30 | Aug 1 | Median | Jul 24 | Jul 25 | Jul 30 | Aug 1 | Median |
| 1 | 920 | 79 | 540 | 540 | 540 | 280 | 11 | 220 | 540 | 250 |
| 2 | 920 | 540 | >2400 | 920 | 920 | 540 | 130 | >2400 | 920 | 730 |
| 3 | >2400 | >2400 | >2400 | >2400 | >2400 | >2400 | >2400 | >2400 | 920 | >2400 |
| 4 | >2400 | 920 | >2400 | >2400 | >2400 | 350 | 49 | >2400 | >2400 | >975 |
| 5 | 1600 | 49 | 33 | 350 | 200 | 220 | 33 | 5 | 49 | 41 |
| 6 | 79 | 33 | 920 | 170 | 125 | 33 | 13 | 170 | 49 | 41 |
| 7 | 920 | 33 | 79 | 240 | 160 | 220 | 12 | 33 | 79 | 56 |
| 8 | 240 | 17 | 170 | 79 | 125 | 49 | 17 | 110 | 79 | 64 |
| 9 | 49 | 46 | 130 | 350 | 90 | 49 | 31 | 79 | 130 | 64 |
| 10 | 26 | 17 | 130 | 920 | 78 | 4 | 13 | 33 | 220 | 23 |
| 11 | 240 | 26 | 240 | 22 | 133 | 27 | 17 | 49 | 8 | 22 |
| 12 | 13 | 8 | 7 | 33 | 11 | 8 | 5 | 7 | 11 | 8 |
| 13 | 17 | 49 | 33 | 21 | 27 | 11 | 49 | 33 | 14 | 2 24 |
| 14 | 34 | 13 | - | - | 24 | 21 | 13 | - | - | 17 |
| 15 | 26 | 31 | 350 | 49 | 40 | 7 | 13 | 110 | 49 | 31 |
| 16 | 22 | 13 | 33 | 46 | 28 | 14 | 13 | 11 | 13 | 13 |
| 17 | 5 | 5 | 49 | 49 | 27 | 5 | 5 | 49 | 22 | 14 |
| 18 | <2 | 2 | 17 | 49 | 10 | <2 | 2 | 17 | 7 | 5 |
| 19 | 2 | <2 | 11 | 130 | 7 | <2 | <2 | 5 | 11 | <3 |
| 20 | 2 | 2 | 17 | 33 | 10 | 2 | 2 | 7 | 17 | 5 |
| 21 | <2 | <2 | 8 | 13 | <7 | <2 | <2 | 5 | 8 | <3 |
| 22 | 5 | 5 | 8 | 23 | 7 | 5 | 5 | 8 | 8 | 7 |
| 23 | 5 | 2 | 13 | 49 | 9 | 2 | <2 | 2 | 33 | 2 |
| 24 | 2 | 8 | 2 | 170 | 5 | <2 | 2 | 2 | 170 | 2 |
| 25 | 49 | 2 | 5 | 110 | 27 | 11 | 2 | 5 | 49 | 8 |
| 26 | 130 | 17 | 14 | 280 | 74 | 17 | 7 | 6 | 140 | 12 |
| 27 | 920 | >2400 | >2400 | 540 | >1260 | 540 | 540 | >2400 | 540 | 540 |
| 28 | 8 | 7 | 7 | 95 | 52 | 2 | 7 | 64 | 17 | 12 |
| 29 | 5 | 11 | 79 | 23 | 17 | 5 | 5 | 33 | 13 | 9 |
| 30 | 2 | <2 | 33 | 140 | 16 | <2 | <2 | 17 | 49 | <9 |
| 31 | 2 | 5 | 11 | 70 | 8 | <2 | <2 | 7 | 49 | <4 |
| 32 | 17 | 11 | 14 | 920 | 16 | 7 | 11 | 8 | 70 | 10 |

TABLE 1-B SAMPLING DATES AND TIDE AT THE TIME OF SAMPLING, RUSTICO HARBOUR, 1973.

| DATE | TIME | TIDE |
|---|---|---|
| July 24 | 1500 - 1600 | High rising |
| July 25 | 1300 - 1400 | High rising |
| July 30 | 1430 - 1530 | Dead low |
| August 1 | 1330 - 1430 | Low falling |

# APPENDIX II

FIGURE

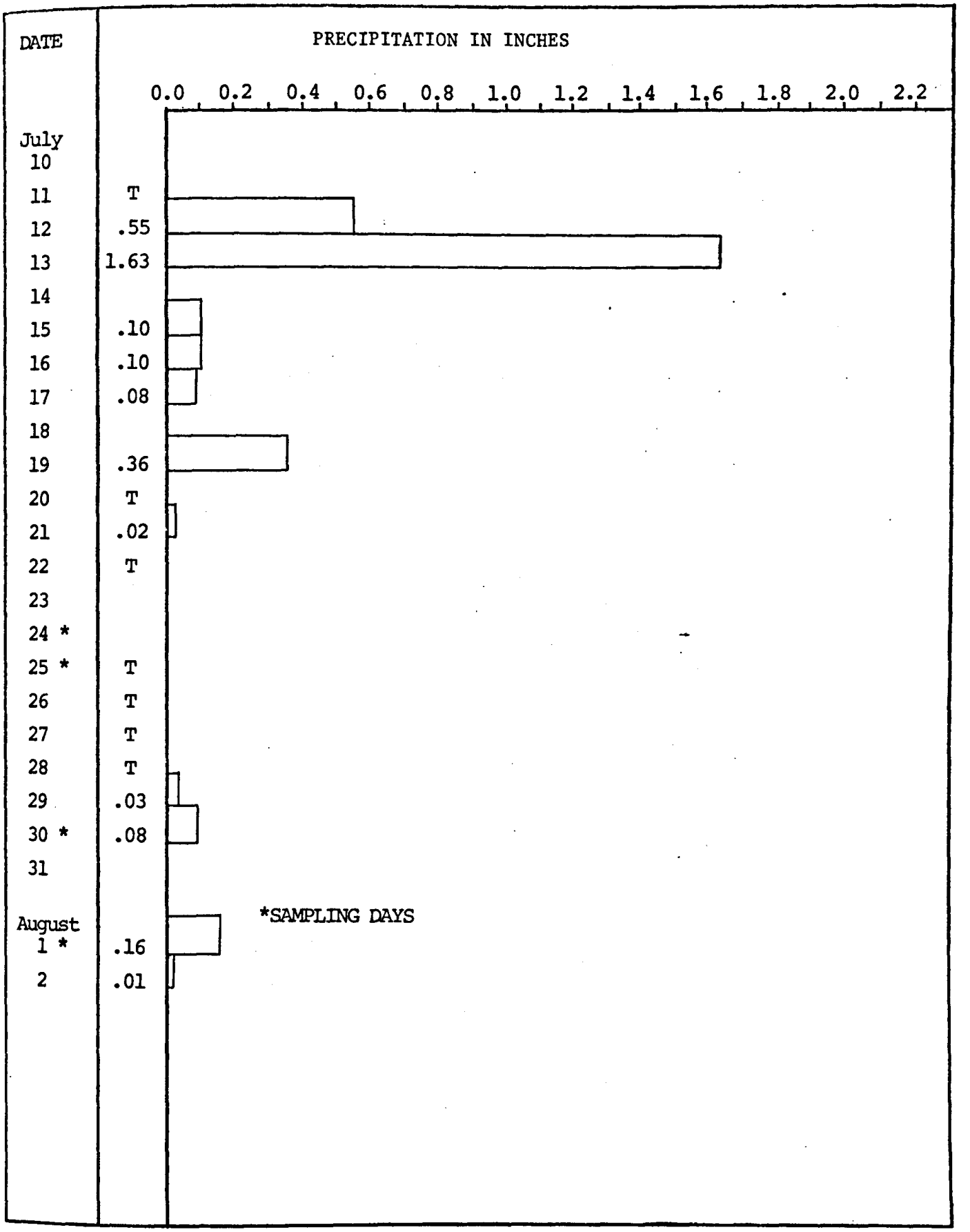


FIGURE 1-A DAILY PRECIPITATION DATA FOR THE SURVEY PERIOD; CHARLOTTETOWN, P. E. I.