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A Bacteriological Assessment of the Johnson and Hillsborough Rivers, (Shellfish Area, No. 7 Queens Co., P.E.I.)

Surveillance Report EPS 5-WP-72-17
Atlantic Region

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A BACTERIOLOGICAL ASSESSMENT OF THE JOHNSON AND HILLSBOROUGH RIVERS (SHELLFISH AREA #7 QUEENS CO., P.E.I.)

by

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for

Shellfish Bacteriological Surveillance
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ABSTRACT

During the month of June and July, 1972, the waters of Johnson River and Hillsborough River were bacteriologically assessed to determine the adequacy of the existing shellfish closures as referenced in the Prince Edward Island, Fishery Regulations, Schedule "F" Items #7-2 and #7-3, P.C. 1972-520, March 21, 1972.

As indicated by the density of coliform bacteria and the observations and information obtained by the physical sanitary survey, the existing shellfish closures #7-2 and #7-3 are considered to be adequate pending the completion of a municipal sewage treatment system for the city of Charlottetown (Pop. 18,000).

The operation of this sewage treatment system is expected to have a favourable effect in the sector under closure #7-2.

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1. INTRODUCTION

In compliance with a proposal adopted by the Inter-departmental Shellfish Committee Meeting in Ottawa in March, 1972, a bacteriological survey was carried out on a sector of the Hillsborough River and a sector of the Johnson River, Queens Co., P.E.I. by the Mobile Laboratory of Environmental Protection Service, Atlantic Region, during June and July, 1972.

As a public health protection, the existing closures #7-2 and #7-3 were implemented following a study by the Moncton office of Public Health Engineering Division, National Health and Welfare, in 1964 and 1969. This was recommended due to untreated sewage discharging from the city of Charlottetown collector system into the Hillsborough River and dispersing into the shellfish growing waters.

The Fish Inspection Laboratory at Charlottetown have reported these sectors are within highly productive shellfish zones and reduction of the closure area would be of significant economic benefit to the local fishing industry.

In the interest of public health, and regard for the concern expressed by Fisheries Service at Charlottetown, this survey was carried out to determine if bacterial pollution emanating from sewage outfalls at Charlottetown was extending into range of the shellfish closure lines.

A total of 125 water samples were collected from the 25 designated sampling stations and tested for coliform and fecal coliform bacteria by the approved standard methods (See Figure 1).

The sanitary investigation of the watershed and surrounding area was conducted during the sampling period and conditions relevant to the bacterial quality of the shellfish growing waters were noted for consideration in this report.

Sampling times were scheduled to correspond to various tidal phases, water temperature, rainfall, and salinity concentrations and recorded at the time of sampling to relate with bacteriological and other data of this report (See Tables 1, 2, 3 and 4).

2. METHODS

All samples were tested for coliform bacteria by the methods outlined in A.P.H.A. "Recommended Procedures for the Bacteriological Examination of Sea Water and Shellfish", Fourth Edition 1970. Coliform and fecal coliform densities were determined on all water samples by multiple dilution tubes (MPN) methods using Bacto-Lauryl Tryptose Broth with three or five tubes in each of at least three consecutive decimal dilutions with incubation at 35.5°C for 24 and 48 hours, and confirmation of all positive cultures was completed in (a) Bacto-Brilliant Green Bile Broth with incubation at 35.5°C for 24 and 48 hours, and in (b) Bacto-E.C. medium with incubation for 24 hours at 44.5°C in a recirculating water bath.

Salinity determinations were made by the Knudsen Method from composite samples. Salinities were expressed as parts per thousand (PPT).

Water samples were collected from the 25 sampling stations by a rod sampling device and placed in sterile 8-ounce glass bottles. Collected samples were transported to the Mobile Laboratory and submitted to bacteriological analysis within one hour of collection.

3. RESULTS

The 25 designated water sampling stations cover the study area of both closure lines, #7-2 and #7-3 and are shown in Figure 1. Coliform and fecal coliform MPN counts for the 125 water samples collected at these stations are recorded in Table 5.

Sampling stations #1 to #3 inclusive, reflect the water quality in the Johnson River and at the closure line #7-3 in the river estuary. The MPN coliform counts from these sampling stations range from a 130 median value at station #1 to a <2 median value at sampling station #3. These values are in close comparison with results obtained during studies carried out in 1964 and 1969.

Sampling stations #4 to #25 inclusive, were selected to be representative of the water quality of the Hillsborough River, above and below the closure line #7-2. Stations #'s 4, 5, 6, 7, 8, 9 and 12, above and east of the closure line, range in median value

from a MPN of 8 to <2. One sample collected July 16th, at station S4, proved to be unusually high. The cause of this singular high MPN value from the large number of samples analyzed is impossible to identify. Experience has shown that in any large number of samples from a survey area, occasional high values do occur and this condition is taken into consideration when making final assessment.

The Department of the Environment, Atmospheric Environment Service, reported a total of 0.07 inches of rainfall during the survey period in June, and 0.42 inches during the July sampling period for the study area (See Table 3). This level of rainfall during the survey periods would not be expected to influence the bacteriological data that was collected.

Salinity determinations from composites of the daily samples show a range differential of 1.4 PPT. Considering the dilution due to flow from the many tributaries to the Hillsborough River, and periods of rainfall, these values appear to be normal. The values are comparable to salinity data of previous reports (See Table 4).

Sampling time, related to tidal time phase, was so arranged to provide the maximum information in dilution and dispersement by tidal currents. No significant variation in the data due to tidal phase was detected throughout the sampling period.

The physical sanitary investigation showed that the only

significant source of pollution to the study area was the municipal outfalls discharging into Charlottetown Harbour. This includes the discharge of untreated industrial and domestic waste from the city collector system into the harbour waters.

4. DISCUSSION

Since Shellfish closures #7-2 and #7-3 were implemented on the Hillsborough and the Johnson Rivers in 1964, continuing surveillance of the adequacy of these closures has been maintained by the Moncton, New Brunswick office of Public Health Engineering Division, National Health and Welfare.

The increasing volume of industrial and domestic waste discharging into Charlottetown Harbour has been a cause for concern in these closures, since the Hillsborough River is known to be a very productive shellfish source.

The present practice of disposing of untreated industrial and domestic wastes into Charlottetown Harbour will be discontinued in the near future. The completion of a sewage collector and treatment system for the greater Charlottetown area is expected to improve the harbour water quality to acceptable standards for recreational waters. This condition will subsequently have a favourable effect on the water quality of the Hillsborough River.

The information of this report will support the adequacy of these closures, and suggests the need for continuing surveillance

and an assessment study following any significant change in physical conditions of the surrounding area or any change in water quality in the river course.

5. CONCLUSIONS

It may be concluded that:

(a) the increasing volume of untreated domestic and industrial waste discharging into Charlottetown Harbour poses a significant potential health hazard through intrusion of these wastes into shellfish producing waters,

(b) the bacteriological data of this survey evaluated together with other related information such as dilution, climatological data and noted physical conditions within the surrounding watershed, support the adequacy of the closures, #7-2 and #7-3.

6. RECOMMENDATIONS

It is recommended that:

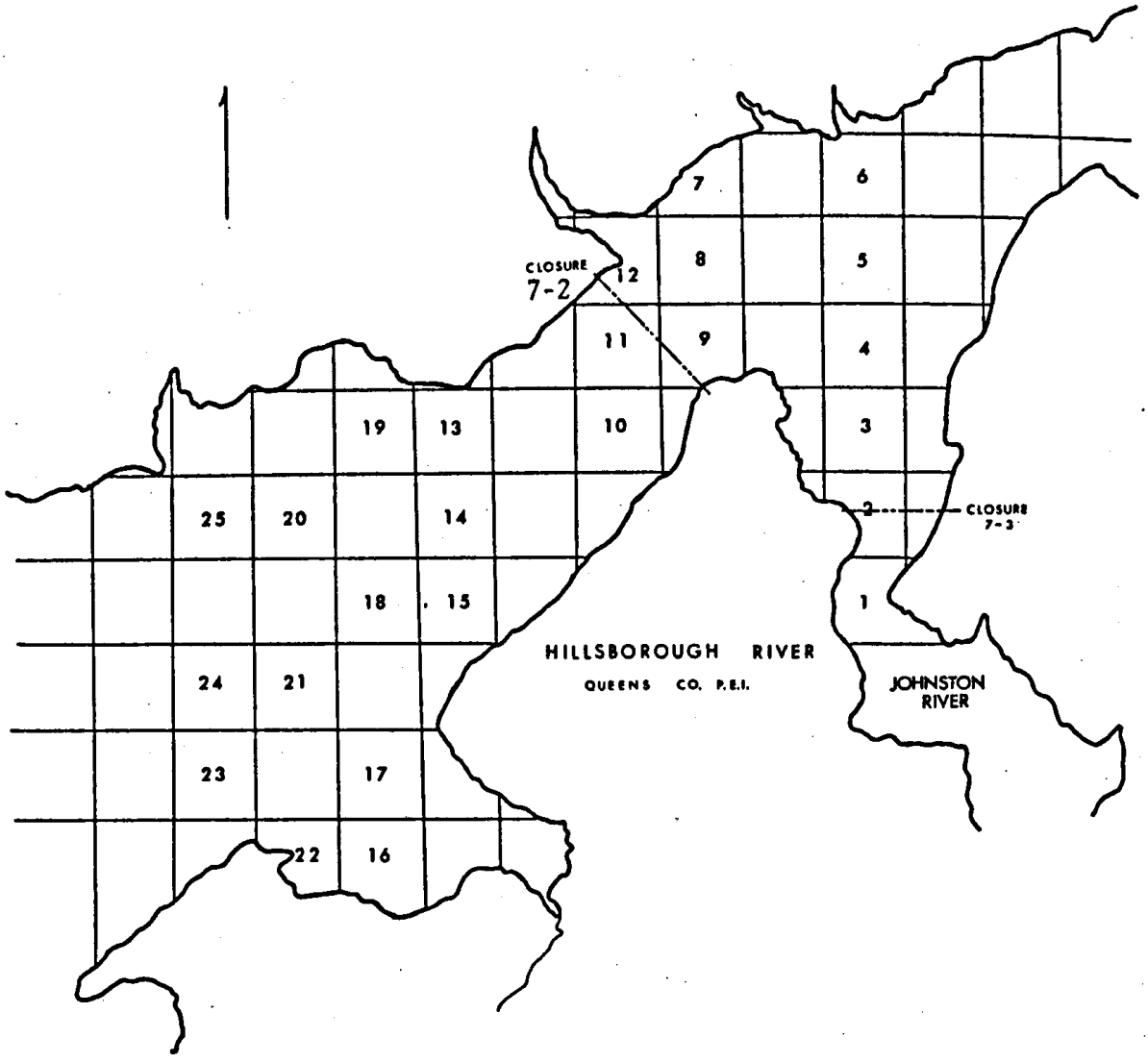
(a) the existing shellfish closures #7-2 and #7-3 as defined in the Prince Edward Island, Fishery Regulations, P.C. 1972-520, March 21, 1972 are adequate and to remain in effect. The existing closure areas are defined as follows:

#7-3, that portion of Johnston's River, tributary to Hillsborough River, Queens Co., above or southerly of a straight line drawn across the river South 85° 00' East astronomic from point to point at the Narrows.

#7-2, Charlottetown Harbour, Yorke or North River and Hillsborough Bay, Queens Co., inside a line drawn from Oyster Survey Monument No. 3 located on Squaw Point, as shown on the plan showing Oyster Leases in Alexandra Bay, to Oyster Monument No. 4, located on Crown Point as shown on that plan; thence to Oyster Survey Monument No. 2 located near Bacon Point on the northwest shore of the Bay as shown on that plan; including also the waters of Eliot (West) River below or easterly of a straight line drawn across the river from Oyster Survey Monument No. 4, as shown on the plan showing Oyster Leases in Eliot River, to Oyster Survey Monument No. 5, as shown on that plan; and the waters of Hillsborough (East) River below or southwesterly of a straight line drawn across the river from Oyster Survey Monument No. 19, as shown on the plan showing Oyster Leases in Hillsborough River, to Oyster Survey Monument No. 20, as shown on that plan.

(b) that a reassessment study of shellfish closures #7-2 and #7-3 be carried out following the completion and operation of a municipal sewage collector and treatment system for the city of Charlottetown.

FIGURE 1.



DEPT. OF THE ENVIRONMENT
ENVIRONMENTAL PROTECTION SERVICE
ATLANTIC REGION

The Johnson and Hillsborough Rivers
Shellfish Area P.E.I. #7
Survey Sampling Stations 1972

SCALE:	DATE:	DWG. NO.
DRAWN:	CHECKED:	APPROVED:

TABLE 1. TIDAL PHASE AND SAMPLING TIME FOR THE HILLSBOROUGH RIVER DURING THE STUDY PERIOD OF JUNE, 1972

DATE 1972	TIDAL PHASE HIGH TIDE (hrs)	LOW TIDE (hrs)	SAMPLING TIME (hrs)
June 27	1105	1825	0930 - 1030
June 29	0150	0620	0900 - 1000
July 6	0615	1315	1400 - 1500
July 10	1015	1725	1230 - 1330
July 18	0335	1105	1200 - 1300

TABLE 2 CLIMATOLOGICAL DATA FOR THE

HILLSBOROUGH AND JOHNSON RIVER BACTERIOLOGICAL SURVEY

(P.E.I. SHELLFISH AREA #7)

DATE	SAMPLING TIME	WATER TEMP. °C	AIR TEMP °C	WIND VELOCITY DIRCTION
June 27	09:30-10:30 hrs.	20	21	5 M.P.H. S.E.
June 29	09:00-10:00 hrs.	19	20	10 M.P.H. W.
July 6	14:00-15:00 hrs.	18	22	10 M.P.H. S.E.
July 10	12:30-13:30 hrs.	19	21	10 M.P.H. S.W.
July 18	12:00-13:00 hrs.	18	19	10 M.P.H. N.W.

TABLE 3 RAINFALL DATA FOR HILLSBOROUGH RIVER

DURING THE SURVEY PERIOD OF JUNE, 1972

Date 1972	Precipitation in inches
June 26	.05
June 27	.01
June 28	.02
June 29	.04
July 1	.17
July 3	.02
July 4	.02
July 10	.04
July 13	.17
	Total 0.54

TABLE 4 SALINITY DATA OF COMPOSITED SAMPLING FOR THE JOHNSON RIVER AND HILLSBOROUGH RIVER SURVEY DURING JUNE, 1972

DATE 1972	SALINITY PARTS PER THOUSAND
June 26	22.8
June 29	22.5
July 6	19.3
July 10	21.1
July 18	20.4

TABLE 5 COLIFORM & FECAL COLIFORM MPN DATA FOR HILLSBOROUGH AND JOHNSON RIVER SURVEY, 1972, SHELLFISH AREA, P.E.I. # 7

Station No.	Coli-form	F.C.	Coli-form	F.C.	Coli-form	F.C.	Coli-form	F.C.	Coli-form	F.C.	Median Coli-form	Median F.C.
	June 27		June 29		July 6		July 10		July 18			
1	240	23	170	23	79	23	95	46	130	79	130	23
2	79	8	23	<2	23	<2	5	<2	23	13	23	<2
3	8	<2	<2	<2	<2	<2	5	5	<2	<2	<2	<2
4	5	<2	<2	<2	1600	450	<2	<2	13	5	5	<2
5	5	5	95	23	23	8+	<2	<2	8	5	8	5
6	8	8	5	5	8	8	<2	<2	<2	<2	5	5
7	8	<2	23	8	5	5	<2	<2	8	5	8	5
8	5	<2	49	5	5	<2	<2	<2	5	5	5	<2
9	<2	<2	<2	<2	<2	<2	23	13	8	8	<2	<2
10	<2	<2	<2	<2	<2	<2	23	5	3	<2	<2	<2
11	8	3	8	<2	<2	<2	5	<2	<2	<2	5	<2
12	5	5	23	5	<2	<2	<2	<2	5	<2	5	<2
13	13	13	11	5	<2	< 2	5	<2	<2	<2	5	<2
14	5	5	<2	<2	<2	< 2	<2	<2	<2	<2	<2	<2
15	23	13	8	5	<2	< 2	8	5	8	<2	8	5
16	<2	<2	5	<2	<2	< 2	5	<2	5	<2	5	<2

TABLE 5 (CONT'D)

Station No.	Coli-form	F.C.	Coli-form	F.C.	Coli-form	F.C.	Coli-form	F.C.	Coli-form	F.C.	Median Coli-form	Median F.C.
	June 27		June 29		July 6		July 10		July 18			
17	5	5	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
18	95	95	49	23	23	23	<2	<2	49	23	49	23
19	5	<2	8	5	<2	<2	8	8	<2	<2	5	<2
20	95	95	23	13	1600+	1600+	23	23	<2	<2	23	23
21	8	5	<2	<2	<2	<2	79	79	<2	<2	<2	<2
22	5	5	8	<2	<2	<2	8	5	<2	<2	5	<2
23	1600	450	240	95	23	23	95	49	8	5	95	49
24	13	5	13	8	8	5	95	49	8	5	13	5
25	8	5	5	<2	<2	<2	23	23	13	8	8	5