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# Shellfish Growing Water Sanitary Survey of Lasqueti Island, British Columbia, 1974

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Surveillance Report EPS 5-PR-74-8

Pacific Region  
October, 1974

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SHELLFISH GROWING WATER SANITARY SURVEY  
OF  
LASQUETI ISLAND

by

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and

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Pollution Abatement Branch  
Environmental Protection Service  
Pacific Region

Report EPS 5-PR-74-8  
October, 1974

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# **ABSTRACT**

A sanitary survey of the foreshore waters encompassing Lasqueti Island was conducted during the period February 26 to March 13, 1974, by personnel of the Environmental Protection Service, Pacific Region.

The purpose of the survey was to evaluate the bacteriological quality of the shellfish growing waters, to identify possible sources of bacterial contamination and to classify the area surveyed with respect to shellfish growing water standards.

A total of 109 sea water samples from 20 locations and 20 stream samples from 6 locations were collected and analysed for coliform and fecal coliform numbers using the 5-tube MPN method.

The results indicate that the shellfish growing waters of Lasqueti Island are of an acceptable quality.

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## RÉSUMÉ

Une étude sanitaire des eaux côtières entourant l'île Lasqueti a été effectuée entre le 26 février et le 13 mars 1974 par le personnel du Service de protection de l'environnement de la région du Pacifique.

Le but de cette étude était d'évaluer l'état bactériologique des eaux où vivent les crustacés, afin de déceler des sources potentielles de contamination bactériologique et de classer les zones concernées en fonction des normes applicables aux eaux à crustacés.

Au total, 109 prélèvements d'eau de mer provenant de 20 endroits, et 20 échantillons d'eau douce provenant de 6 endroits ont été analysés selon la méthode 5-tube MPN pour dénombrer les coliformes et les coliformes fécaux.

Les résultats ont démontré que la qualité des eaux à fruits de mer de l'île Lasqueti est acceptable.

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## 1. INTRODUCTION

It was the consensus of Environmental Protection Service, Fish Inspection Branch, Fisheries and Marine Service, and Marine Resources Branch, Department of Recreation and Conservation, that a sanitary survey of the shellfish growing water of Lasqueti Island be given a high priority. Accordingly, personnel of the Shellfish Water Quality Program (Environmental Protection Service, Pacific Region) carried out the survey from February 26 to March 13, 1974 during which time the most unfavourable weather and hydrographic conditions prevailed. The bacteriological quality of British Columbia shellfish growing waters is normally poorest in the wet winter months due to increased land wash, lower water temperatures, rougher seas and stronger wind conditions.

The shellfish resource of Lasqueti Island, Fisheries Statistical Area 16, is considerable. Commercial harvesting of oysters, native littleneck and manila clams occurs primarily in the regions of Tucker Bay, Scottie Bay and False Bay. Recreational harvesting (winter and summer) occurs on most foreshore areas of Lasqueti Island and on the islands in Sabine Channel. During the survey particular attention was given to Tucker Bay where oyster raft culture is practised. Due to the absence of power and accomodation on Lasqueti Island, the limited ferry service, and the dangerous sea conditions which prevail in the Strait of Georgia during the winter, a comprehensive sampling program could not be carried out. The number of water samples taken for bacteriological analyses was the minimum required to indicate the presence or absence of bacterial pollution, pursuant to the rationale presented in Table 10.

## 2. FIELD PROCEDURES AND METHODS

Sample stations were selected and a bacteriological water testing program developed to assess the shellfish growing water quality and the sources of fecal pollution.

## 2.1 Bacteriological Sampling and Analysis

All samples for bacteriological analysis were collected in sterile 6 ounce wide-mouth bottles approximately 6 inches to one foot below the water surface. Samples were collected by boat or by wading and stored in coolers at temperatures not exceeding 10°C until processed. Analyses were carried out in the Environmental Protection Service mobile laboratory located for the duration of the study at Fanny Bay, Vancouver Island and were performed within 6 hours of sample collection. The total confirmed coliform MPN per 100 ml was determined using the multiple tube fermentation technique (at least 3 decimal dilutions of 5 tubes each) as described in Part 407A of the 13th edition of Standard Methods for the Examination of Water and Wastewater.<sup>(3)</sup>

The fecal coliform MPN per 100 ml was determined as described in Part 407C of Standard Methods. Incubation was for  $24 \pm 2$  hours in a circulating water bath maintained at  $44.5^{\circ}\text{C} \pm 0.2^{\circ}\text{C}$ .

Lauryl Tryptose Broth and Brilliant Green Bile Broth media were used for the confirmed coliform MPN determinations, and EC medium for the fecal coliform test.<sup>1</sup>

## 2.2 Physical Testing Equipment and Analyses

Temperature and salinity measurements were determined 6 inches to one foot below the water surface using a YSI Model 33 Salinity-Temperature-Conductivity Meter. Tide data is for the Point Atkinson reference port. Precipitation data was that recorded at the Canadian Forces Base, Comox. Wind direction was that recorded hourly by the Atmospheric Environment Service at Sisters Lighthouse located off the north-west corner of Lasqueti Island. Results are presented in Appendix II.

1 All test media used was Bacto brand from Difco Laboratories, Detroit, Michigan.

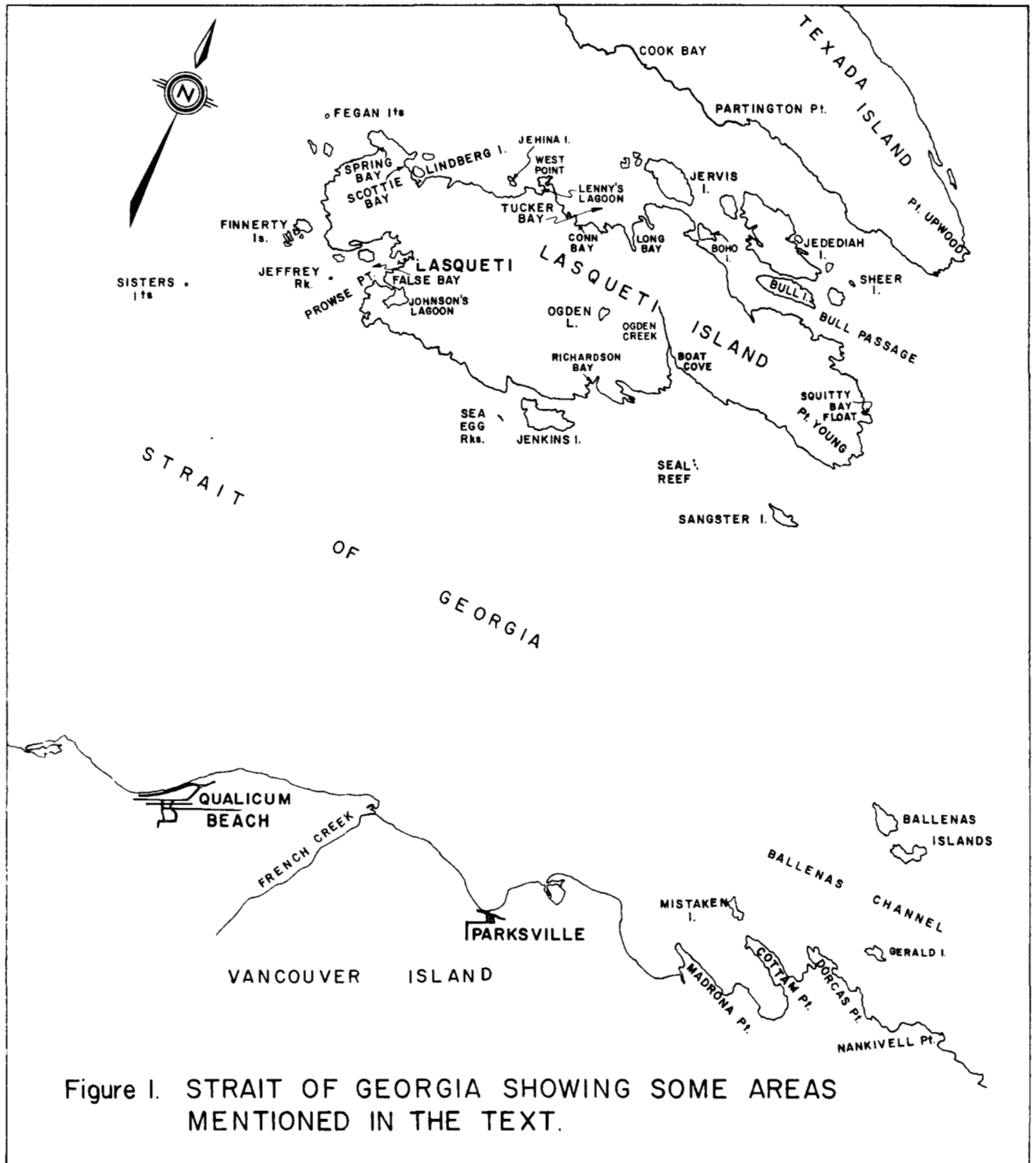


Figure 1. STRAIT OF GEORGIA SHOWING SOME AREAS MENTIONED IN THE TEXT.

### 3. DISCUSSION OF RESULTS

The geographical location of the study area is shown in Figure 1. Sample station locations are shown in Figure 2. The sample station locations are described in Tables 5 and 6 of Appendix I. Total and fecal coliform results for shellfish growing waters and freshwater streams are summarized in Tables 1 to 4. Daily bacteriological results and a description of daily sampling conditions at individual sample stations are presented in Table 7 and 8 of Appendix II. As a point of interest and future reference, fecal coliform data is summarized (Table 9 of Appendix II) in terms of the two recently proposed fecal coliform growing water standards presently under consideration by the National Shellfish Sanitation Program (U.S. Food and Drug Administration).

In order that an area be considered bacteriologically safe for the harvesting of shellfish, the total confirmed coliform median MPN of the water must not exceed 70 per 100 ml, and not more than 10 percent of the samples ordinarily exceed an MPN of 230 per 100 ml for a 5-tube decimal dilution test, in those portions of the areas most probably exposed to fecal contamination during the most unfavourable hydrographic and pollution conditions. The foregoing limits need not be applied if it can be shown by detailed study that the coliforms are not of direct fecal origin and do not indicate a public health hazard <sup>(1)</sup>.

On the basis of these bacteriological standards, all of the sample stations fall within the acceptable water quality limits (Table 1). The high water quality is a reflection of the island's low permanent population of about 150 persons scattered throughout the island. Lasqueti Island is serviced only by a small passenger ferry. Located in the middle of the Strait of Georgia, Lasqueti Island experiences considerable tidal flushing, and during the winter, strong prevailing SE, SW and NW winds result in considerable mixing and dilution. The above parameters combine to adequately reduce the bacterial densities resulting from contaminated freshwater inputs.

FIGURE 2. LASQUETI ISLAND  
SAMPLE STATION LOCATIONS

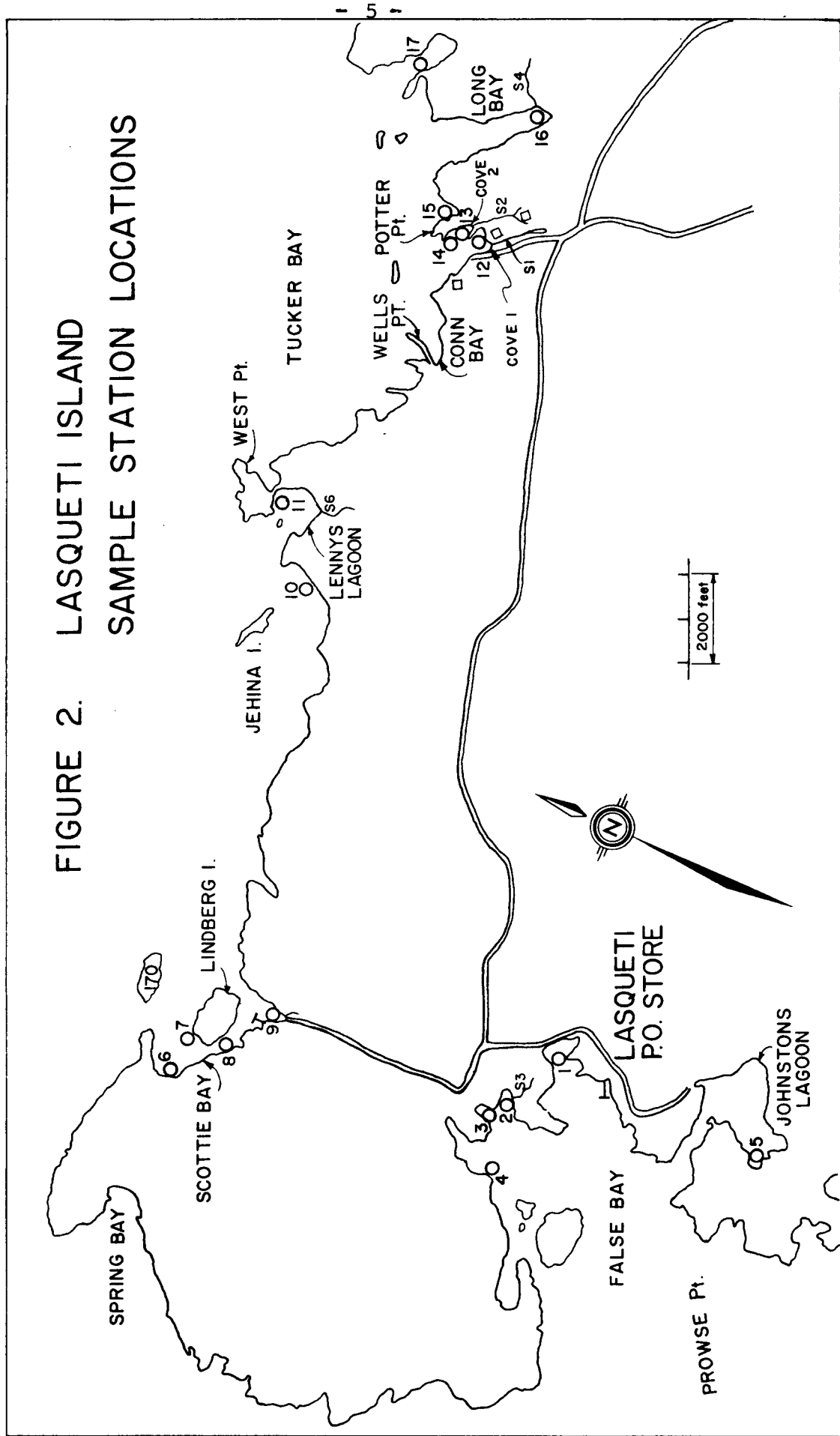


TABLE 1: SUMMARY OF TOTAL CONFIRMED COLIFORM MPN DATA FOR SHELLFISH GROWING WATER SAMPLES.

Sample Station	Number of Samples	MPN Range	Median MPN per 100 ml	% over 230 MPN per 100 ml
1	6	< 1.8 - 7.8	~ 1.9	0.0
2	6	1.8 - 26	8.8	0.0
3	6	2.0 - 23	4.5	0.0
4	6	< 1.8 - 7.8	~ 1.9	0.0
5	6	< 1.8 - 7.8	~ 1.9	0.0
6	6	< 1.8 - 2.0	< 1.8	0.0
7	4	< 1.8 - 2.0	-	-
8	6	< 1.8 - 2.0	< 1.8	0.0
9	6	< 1.8 - 23	5.4	0.0
10	6	< 1.8 - 2.0	< 1.8	0.0
11	5	< 1.8 - 6.8	2.0	0.0
12	6	< 1.8 - 14	3.8	0.0
13	10	< 1.8 - 170	< 1.8	0.0
14	6	< 1.8 - 2.0	< 1.8	0.0
15	6	< 1.8 - <1.8	< 1.8	0.0
16	9	< 1.8 - 220	< 1.8	0.0
17	6	< 1.8 - 79	< 1.8	0.0
18	1	< 1.8	-	-
19	1	< 1.8	-	-
20	1	6.8	-	-

TABLE 2: SUMMARY OF FECAL COLIFORM MPN DATA FOR SHELLFISH GROWING WATER SAMPLES.

Sample Station	Number of Samples	MPN Range	Median MPN per 100 ml
1	6	< 1.8 - 7.8	< 1.8
2	6	< 1.8 -< 1.8	< 1.8
3	6	< 1.8 - 4.5	< 1.8
4	6	< 1.8 - 2.0	< 1.8
5	6	< 1.8 - 7.8	~ 1.9
6	6	< 1.8 -< 1.8	< 1.8
7	4	< 1.8 - 2.0	-
8	6	< 1.8 - 2.0	< 1.8
9	6	< 1.8 - 7.8	3.0
10	6	< 1.8 -< 1.8	< 1.8
11	5	< 1.8 - 4.0	~ 1.9
12	6	< 1.8 - 11	< 1.8
13	10	< 1.8 - 70	< 1.8
14	6	< 1.8 - 2.0	< 1.8
15	6	< 1.8 -< 1.8	< 1.8
16	9	< 1.8 - 220	< 1.8
17	6	< 1.8 - 49	< 1.8
18	1	< 1.8	-
19	1	< 1.8	-
20	1	< 1.8	-



Although there was some evidence of fecal contamination in the freshwater inputs, the total contribution to the receiving waters was not sufficient to significantly reduce the water quality (Tables 3 and 4).

#### 4. SANITARY SURVEY

##### 4.1 False Bay

The largest concentration of homes occurs in the vicinity of False Bay. The homes are sufficiently scattered and the septic tank - absorption field sewage systems appeared to be operating adequately, thus reducing any likely contamination from that source. In addition, the existing 400 foot closure surrounding the government wharf and ferry dock is felt to be adequate for health protection in this area. Approximately ten cattle pasture in the immediate vicinity of sample station 5 but dilution and tidal flushing appears to be sufficient to reduce any possible bacterial contamination from that source. The tidal foreshore in the vicinity of sample station 5 is extremely muddy, and no clams and few oysters were observed at this location.

##### 4.2 Scottie Bay

A small shipyard with wharf facilities is located in the south-west corner of Scottie Bay. A small pond on which approximately one dozen geese are raised drains into the vicinity of sample station 9. The Schedule J 400 foot general wharf closure includes both the shipyard and the area into which the pond drains and is felt to be adequate for this area.

##### 4.3 Lenny's Lagoon

Pit privies are utilized by the few residents in this area and it is unlikely that the lagoon waters will be contaminated from this source.

TABLE 3: SUMMARY OF TOTAL CONFIRMED COLIFORM MPN DATA  
FOR FRESHWATER SAMPLES.

Sample Station	Number of Samples	MPN Range
S1	6	2.0 - 49
S2	5	1.3 - 240
S3	4	33 - 220
S4	3	4.5 - 79
S5	1	14
S6	1	7.8

TABLE 4: SUMMARY OF FECAL COLIFORM MPN DATA FOR  
FRESHWATER SAMPLES.

Sample Station	Number of Samples	MPN Range
S1	6	2.0 - 23
S2	5	13 - 240
S3	4	4.5 - 110
S4	3	4.5 - 79
S5	1	4.5
S6	1	7.8

#### 4.4 Tucker Bay

Oyster raft culture is presently being practised in Tucker Bay. A single raft of oyster clusters is in present use and is situated approximately 1000 feet from freshwater inputs S1 and S2 (Figure 2). Sample station 14 was located at the raft (Figure 2). Holding trays for growing undersized individual oysters are held on the foreshore of Cove #1 at sample station 12 (Figure 2). Individual oysters of the same size class are then transferred to trays suspended from the rafts. Wild oysters are also found in this area. Cove #1 completely drains at a low tide of 4.0 feet and a large part of Cove #2 is exposed at low tide. The area in which the raft is located appears to be well flushed during a tidal change.

A single dwelling is located at the head of Cove #1 and a barn is located approximately 500 feet south of the house. A variable number of sheep (domestic turned wild) have access to the foreshore and cleared pasture area surrounding the house up to the barn. The sheep population in this area was approximately eight during the survey and feces were in evidence on the pasture. Three milking cows pasture in the vicinity of the barn. The drainage of surface water in the vicinity of the culture operation is directed into two creeks (S1 and S2) which drain into Coves #1 and #2 respectively (Figure 2). Creek S1 drains an irrigation pond and then runs through bush to the foreshore. The sheep and cows pasture in this area but not to the degree found around the barn. Creek S2 collects surface water from the barn area and then runs through bush to the foreshore. Fecal coliform MPN data indicates some contamination occurs in these creeks (Table 4). During heavy rainfall, surface water collects and drains the area southeast of the house, which is extensively used by the sheep. During the winter considerable surface water collects and drains down to the foreshore.

Rhodamine dye was used to test the septic tank - absorption field system serving the house. Dye was observed within

five minutes from the tank overflow indicating tile field blockage. Effluent from the septic tank overflow drains into the top soil of an embankment. No dye appeared along the foreshore or in the water.

Dilution and tidal flushing appears to be sufficient to reduce the bacterial levels found in creeks S1 and S2 to acceptable shellfish growing water levels.

#### 4.5      Long Bay

A single house is located at the head of the bay and the septic tank - absorption field is a sufficient distance from the foreshore not to be considered a significant health hazard. Sample station 16 was located at the mouth of freshwater creek S4. The high fecal counts found in this stream would appear to result from the wild sheep and deer population as no other pollution sources exist. Dilution and tidal flushing adequately reduces the bacterial levels found in creek S4 to acceptable shellfish growing water levels.

At sample station 17, the lone house located in the vicinity utilizes a pit privy and is not considered to be a health hazard. Wild sheep appear to be the only possible source of fecal contamination in this area.

#### 4.6      Squitty Bay

The existing Schedule J 400 foot general wharf closure is felt to be adequate for this area.

#### 4.7      Boat Cove

A single dwelling is located at the head of Boat Cove but the septic tank - absorption field system is sufficiently distant from the foreshore and Ogden Creek not to be considered a health hazard. Wild sheep and deer would appear to be the only possible source of fecal contamination to Ogden Creek.

#### 4.8 Richardson Bay

Wild sheep would appear to be the only possible source of fecal contamination to the creek draining into Richardson Bay. A single summer dwelling is located at the head of the bay and doesn't present a health hazard.

#### 4.9 Boho Island

Three summer cabins are located on the south-east end of the island. The cabin toilet facilities are connected to one main sewage pipe which discharges below a small wharf. This sewage disposal system when in use represents a health hazard and requires rectification.

#### 5. CONCLUSIONS

- (1) The coliform levels obtained for the foreshore waters encompassing Lasqueti Island comply with the shellfish growing water quality bacteriological standards.
- (2) Lasqueti Island has a small, scattered, resident population, and there is good tidal flushing, dilution and mixing, which sufficiently reduces any fecal contamination resulting from freshwater sources.
- (3) Wild sheep and possibly deer appear to be the main source of fecal contamination to freshwater streams discharging to the foreshore waters.
- (4) The natural drainage system in the oyster raft culture area of Tucker Bay collects surface water from a sheep and cattle grazing area and directs it via creeks S1 and S2 to the foreshore area.
- (5) Unnamed creeks S1 and S2, Tucker Bay, are not of shellfish processing water quality.

- (6) The existing Schedule J 400 foot general wharf closures for False Bay and Scottie Bay are felt to be adequate.

6. RECOMMENDATIONS

- (1) As a precautionary measure, sheep and cattle should be pastured away from the foreshore fronting the oyster raft culture area of Tucker Bay, and away from the watershed areas of Creeks S1 and S2.
- (2) The non-functioning septic - absorption field system serving the house located at the Tucker Bay raft culture operation should be corrected as soon as possible.
- (3) During the summer, recreational boats anchor in that portion of Tucker Bay used by the raft culture operation. To eliminate bacterial contamination resulting from boat toilet discharges, signs should be posted restricting anchorage within 400 feet of the oyster rafts.

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National Shellfish Sanitation Program Manual  
of Operations, Part 1, 13.
2. Shellfish Growing Area Survey Procedures. (1973)  
U.S. Department of Health, Education and Welfare,  
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3. Standard Methods for the Examination of Water and Wastewater. (1971) 13th ed. (Amer. Public Health Assoc., New York.)

#### ACKNOWLEDGEMENTS

B. Kay, Bacteriologist, and M. Gaertner, Bacteriological Technician, conducted the bacteriological analyses in the Environmental Protection Service mobile laboratory located at Fanny Bay, Vancouver Island. Mr. Kay compiled the bacteriological data.

G. Derksen, Field Technician, and D. Low, Engineering Technician conducted the sanitary survey and carried out the sampling program.

We are indebted to Marine Resources Branch, Department of Recreation and Conservation, Victoria, for the use of the M.W. Marten and to the boat operator, Mr. D.M. McCaw whose expert seamanship was greatly appreciated by the survey team during several stormy crossings between Vancouver Island and Lasqueti Island.

APPENDIX I

SAMPLE STATION LOCATIONS DESCRIPTION

TABLE 5	MARINE SAMPLE STATION LOCATIONS
TABLE 6	FRESHWATER SAMPLE STATION LOCATIONS



TABLE 5: MARINE SAMPLE STATION LOCATIONS.

Sample Station	Latitude	Longitude	Location
1	49°29'40".0N	124°20'48".0W	False Bay
2	49°29'51".5N	124°21'03".0W	False Bay
3	49°29'54".5N	124°21'08".0W	False Bay
4	49°30'00".0N	124°21'21".0W	False Bay
5	49°28'56".0N	124°21'20".75W	Johnston's Lagoon
6	49°31'07".0N	124°20'47".0W	Scottie Bay
7	49°31'04".0N	124°20'39".0W	Scottie Bay
8	49°30'54".0N	124°20'39".0W	Scottie Bay
9	49°30'45".0N	124°20'30".0W	Scottie Bay
10	49°30'38".0N	124°18'04".0W	Lasqueti Island foreshore opposite south end of Jehina Island
11	49°30'41".0N	124°17'30".0W	Lenny's Lagoon
12	49°29'56".75N	124°16'10".0W	Tucker Bay - Cove #1
13	49°29'59".5N	124°16'06".5W	Tucker Bay - Cove #2
14	49°30'03".25N	124°16'11".5W	Tucker Bay
15	49°30'03".5N	124°15'58".0W	Tucker Bay - Cove east of Potter Point
16	49°29'43".25N	124°15'26".0W	Long Bay
17	49°30'14".0N	124°15'07".0W	Tucker Bay - Cove at extreme east side
18	49°29'53".0N	124°13'30".0W	Boho Island
19	49°27'11".0N	124°09'54".0W	Squitty Bay
20	49°28'00".0N	124°14'30".0W	Boat Cove

TABLE 6: FRESHWATER SAMPLE STATION LOCATIONS.

Sample Station	Location
S1	Tucker Bay. Mouth of unnamed creek draining into Cove #1.
S2	Tucker Bay. Mouth of unnamed creek draining into Cove #2.
S3	False Bay. Mouth of unnamed creek draining into vicinity of marine sample station 2.
S4	Long Bay. Mouth of unnamed creek draining into vicinity of marine sample station 16.
S5	Boat Cove. Mouth of Ogden Creek.
S6	Lenny's Lagoon. Mouth of unnamed creek draining into south end of the lagoon.

APPENDIX II

BACTERIOLOGICAL RESULTS AND SAMPLING CONDITIONS

TABLE 7	BACTERIOLOGICAL ANALYSES RESULTS AND SAMPLING CONDITIONS FOR MARINE SAMPLES
TABLE 8	BACTERIOLOGICAL ANALYSES RESULTS AND SAMPLING CONDITIONS FOR FRESHWATER SAMPLES
TABLE 9	SUMMARY OF FECAL COLIFORM MPN DATA FOR PROPOSED SHELLFISH GROWING WATER STANDARDS
TABLE 10	NUMBER OF SAMPLES FOR CLOSURE LINE ESTABLISHMENT

TABLE 7: BACTERIOLOGICAL ANALYSES RESULTS AND SAMPLING CONDITIONS FOR MARINE SAMPLES.

Sample Station: 1			Location: False Bay						
Date 1974	Sample Time	Tide Conditions Time	Ht.Ft.	Water Temp. °C	Total Precip. in.	Wind mph.	Salinity ppt	Coliform MPN/100 ml	
								Total	Fecal
Feb. 26	1200	0735 1425	14.6 5.3	--	Trace	W @ 8	--	<1.8	<1.8
Mar. 5	0730	0355 0915	14.2 10.2	--	0.01	NW @ 18	--	7.8	7.8
Mar. 6 a.m.	1010	1005 1525	9.0 13.4	6.0	0.0	NW @ 5	--	2.0	<1.8
Mar. 6 p.m.	1627	1525 2205	13.4 3.2	7.0	0.0	SW @ 5	27.0	<1.8	<1.8
Mar. 11	1430	1340 2015	4.1 13.7	7.0	0.01	SE @ 15	27.8	<1.8	<1.8
Mar. 12	0730	0730 1425	14.0 4.0	7.0	0.32	W @ 12	27.0	2.0	<1.8

TABLE 7: BACTERIOLOGICAL ANALYSES RESULTS AND SAMPLING CONDITIONS FOR MARINE SAMPLES.

Sample Station: 2		Location: False Bay					
Date 1974	Sample Time	Tide Conditions Time Ht.Ft.	Water Temp. °C	Total Precip. in.	Wind mph.	Salinity ppt	Coliform MPN/100 ml <u>Total Fecal</u>
Feb. 26	1200	0735 14.6	--	Trace	W @ 8	--	13 <1.8
		1425 5.3					
Mar. 5	0730	0355 14.2	--	0.01	NW @ 18	--	26 <1.8
		0915 10.2					
Mar. 6 a.m.	1005	1005 9.0	6.8	0.0	NW @ 5	--	1.8 <1.8
		1525 13.4					
Mar. 6 p.m.	1620	1525 13.4	6.8	0.0	SW @ 5	26.5	23 <1.8
		2205 3.2					
Mar. 11	1430	1340 4.1	7.1	0.01	SE @ 15	26.0	2.0 <1.8
		2015 13.7					
Mar. 12	0720	0150 8.4	7.0	0.32	W @ 12	27.2	4.5 <1.8
		0730 14.0					

TABLE 7: BACTERIOLOGICAL ANALYSES RESULTS AND SAMPLING CONDITIONS FOR MARINE SAMPLES.

Sample Station: 3		Location: False Bay					
Date 1974	Sample Time	Tide Conditions Time Ht.Ft.	Water Temp. °C	Total Precip. in.	Wind mph.	Salinity ppt	Coliform MPN/100 ml <u>Total Fecal</u>
Mar. 5	0730	0355 14.2 0915 10.2	--	0.01	NW @ 18	--	13 <1.8
Mar. 6 a.m.	0955	0425 14.6 1005 9.0	6.2	0.0	NW @ 5	--	4.5 <1.8
Mar. 6 p.m.	1620	1525 13.4 2205 3.2	7.0	0.0	SW @ 5	26.8	2.0 <1.8
Mar. 11	1425	1340 4.1 2015 13.7	6.1	0.01	SE @ 15	27.9	2.0 <1.8
Mar. 12	0715	0150 8.4 0730 14.0	7.0	0.32	W @ 12	27.1	4.5 <1.8
Mar. 13	0845	0805 13.5 1505 4.2	6.0	0.26	SW @ 14	24.9	23 4.5

TABLE 7: BACTERIOLOGICAL ANALYSES RESULTS AND SAMPLING CONDITIONS FOR MARINE SAMPLES.

Sample Station: 4		Location: False Bay					
Date 1974	Sample Time	Tide Conditions Time Ht.Ft.	Water Temp. °C	Total Precip. in.	Wind mph.	Salinity ppt	Coliform MPN/100 ml <u>Total Fecal</u>
Feb. 26	1200	0735 14.6 1425 5.3	--	Trace	W @ 8	--	<1.8 <1.8
Mar. 5	0725	0355 14.2 0915 10.2	--	0.01	NW @ 18	--	13 <1.8
Mar. 6 a.m.	0955	0425 14.6 1005 9.0	6.1	0.0	NW @ 5	--	<1.8 <1.8
Mar. 6 p.m.	1615	1525 13.4 2205 3.2	7.0	0.0	SW @ 5	27.0	<1.8 <1.8
Mar. 11	1420	1340 4.1 2015 13.7	7.5	0.01	SE @ 15	24.8	2.0 2.0
Mar. 12	0715	0150 8.4 0730 14.0	7.0	0.32	W @ 12	27.8	2.0 <1.8

TABLE 7: BACTERIOLOGICAL ANALYSES RESULTS AND SAMPLING CONDITIONS FOR MARINE SAMPLES.

Sample Station: 5		Location: False Bay									
Date 1974	Sample Time	Tide Conditions Time	Ht.Ft.	Water Temp. °C	Total Precip. in.	Wind mph.	Salinity ppt	Coliform MPN/100 ml Total	Fecal		
Feb. 26	1200	0735 1425	14.6 5.3	--	Trace	W @ 8	--	2.0	2.0		
Mar. 5	0720	0355 0915	14.2 10.2	--	0.01	NW @ 18	--	<1.8	<1.8		
Mar. 6 a.m.	0940	0425 1005	14.6 9.0	4.8	0.0	NW @ 5	--	7.8	7.8		
Mar. 6 p.m.	1630	1525 2205	13.4 3.2	6.8	0.0	SW @ 5	26.5	<1.8	<1.8		
Mar. 11	1405	1340 2015	4.1 13.7	7.5	0.01	SE @ 15	22.9	<1.8	<1.8		
Mar. 12	0710	0150 0730	8.4 14.0	6.0	0.32	W @ 12	27.2	4.0	4.0		



TABLE 7: BACTERIOLOGICAL ANALYSES RESULTS AND SAMPLING CONDITIONS FOR MARINE SAMPLES.

Sample Station: 6			Location: Scottie Bay					
Date 1974	Sample Time	Tide Conditions Time	Ht.Ft.	Water Temp. °C	Total Precip. in.	Wind mph.	Salinity ppt	Coliform MPN/100 ml Total Fecal
Feb. 26	1300	0735 1425	14.6 5.3	--	Trace	W @ 8	--	<1.8 <1.8
Mar. 4	1430	1245 2015	12.9 3.0	--	0.09	SE @ 15	--	2.0 <1.8
Mar. a.m.	0715	0355 0915	14.2 10.2	--	0.01	NW @ 18	--	<1.8 <1.8
Mar. p.m.	1330	0915 2110	10.2 2.9	--	0.01	NW @ 12	--	<1.8 <1.8
Mar. a.m.	1140	1005 1525	9.0 13.4	5.8	0.0	NW @ 5	24.0	<1.8 <1.8
Mar. p.m.	1555	1525 2205	13.4 3.2	6.5	0.0	SW @ 5	27.0	<1.8 <1.8

TABLE 7: BACTERIOLOGICAL ANALYSES RESULTS AND SAMPLING CONDITIONS FOR MARINE SAMPLES.

Sample Station: 7			Location: Scottie Bay					
Date 1974	Sample Time	Tide Conditions Time	Water Temp. °C	Total Precip. in.	Wind mph.	Salinity ppt	Coliform	
							MPN/100 ml	Total Fecal
Mar. a.m.	0715	0355	--	0.01	NW @ 18	--	2.0	2.0
		0915						
Mar. p.m.	1330	0915	--	0.01	NW @ 12	--	<1.8	<1.8
		1410						
Mar. a.m.	1140	1005	6.0	0.0	NW @ 5	23.8	<1.8	<1.8
		1525						
Mar. p.m.	1555	1525	6.8	0.0	SW @ 5	27.0	<1.8	<1.8
		2205						

TABLE 7: BACTERIOLOGICAL ANALYSES RESULTS AND SAMPLING CONDITIONS FOR MARINE SAMPLES.

Sample Station: 8			Location: Scottie Bay			
Date 1974	Sample Time	Tide Conditions Time Ht.Ft.	Water Temp. °C	Total Precip. in.	Wind mph.	Salinity ppt
					Coliform MPN/100 ml <u>Total Fecal</u>	
Feb. 26	1300	0735 14.6 1425 5.3	--	Trace	W @ 8	--
Mar. 4	1430	1245 12.9 2015 3.0	--	0.09	SE @ 15	--
Mar. 5 a.m.	0715	0355 14.2 0915 10.2	--	0.01	NW @ 18	--
Mar. 5 p.m.	1330	0915 10.2 1410 13.1	--	0.01	NW @ 12	--
Mar. 6 a.m.	1145	1005 9.0 1525 13.4	6.2	0.0	NW @ 5	24.0
Mar. 6 p.m.	1550	1525 13.4 2205 3.2	6.5	0.0	SW @ 5	26.8

TABLE 7: BACTERIOLOGICAL ANALYSES RESULTS AND SAMPLING CONDITIONS FOR MARINE SAMPLES.

Sample Station: 9		Location: Scottie Bay					
Date 1974	Sample Time	Tide Conditions Time Ht.Ft.	Water Temp. °C	Total Precip. in.	Wind mph.	Salinity ppt	Coliform MPN/100 ml Total Fecal
Feb. 26	1300	0735 14.6	--	Trace	W @ 8	--	23 7.8
		1425 5.3					
Mar. 4	1430	1245 12.9	--	0.09	SE @ 15	--	11 <1.8
		2015 3.0					
Mar. 5 a.m.	0715	0355 14.2	--	0.01	NW @ 18	--	2.0 2.0
		0915 10.2					
Mar. 5 p.m.	1330	0915 10.2	--	0.01	NW @ 12	--	6.8 4.0
		1410 13.1					
Mar. 6 a.m.	1145	1005 9.0	5.8	0.0	NW @ 5	23.0	<1.8 <1.8
		1525 13.4					
Mar. 6 p.m.	1545	1525 13.4	6.5	0.0	SW @ 5	26.5	4.0 4.0
		2205 3.2					

TABLE 7: BACTERIOLOGICAL ANALYSES RESULTS AND SAMPLING CONDITIONS FOR MARINE SAMPLES.

Sample Station: 10			Location: West side of West Point					
Date 1974	Sample Time	Tide Conditions Time Ht.Ft.	Water Temp. °C	Total Precip. in.	Wind mph.	Salinity ppt	Coliform	
							MPN/100 ml	Total Fecal
Feb. 26	1400	0735	--	Trace	SE @ 12	--	<1.8	<1.8
		1425						
Mar. 4	1425	1245	--	0.09	SE @ 15	--	2.0	<1.8
		2015						
Mar. 5 a.m.	0700	0355	--	0.01	NW @ 18	--	<1.8	<1.8
		0915						
Mar. 5 p.m.	1325	0915	--	0.01	NW @ 12	--	<1.8	<1.8
		1410						
Mar. 6 a.m.	1150	1005	6.0	0.0	NW @ 5	24.0	<1.8	<1.8
		1525						
Mar. 6 p.m.	1540	1525	6.2	0.0	SW @ 5	26.5	<1.8	<1.8
		2205						

TABLE 7: BACTERIOLOGICAL ANALYSES RESULTS AND SAMPLING CONDITIONS FOR MARINE SAMPLES.

Sample Station: 11			Location: Lenny's Lagoon					
Date 1974	Sample Time	Tide Conditions Time	Tide Ht.Ft.	Water Temp. °C	Total Precip. in.	Wind mph.	Salinity ppt	Coliform MPN/100 ml Total Fecal
Mar. 5 a.m.	0700	0355	14.2	--	0.01	NW @ 18	--	2.0
		0915	10.2					
Mar. 5 p.m.	1325	0915	10.2	--	0.01	NW @ 12	--	2.0
		1410	13.1					
Mar. 6	1540	1525	13.4	6.5	0.0	SW @ 5	27.0	<1.8
		2205	3.2					
Mar. 11	1335	0700	14.5	6.9	0.01	SE @ 15	25.5	2.0
		1340	4.1					
Mar. 12	0640	0150	8.4	6.4	0.32	W @ 12	25.0	6.8
		0730	14.0					
								4.0

TABLE 7: BACTERIOLOGICAL ANALYSES RESULTS AND SAMPLING CONDITIONS FOR MARINE SAMPLES.

Sample Station: 12		Location: Tucker Bay					
Date 1974	Sample Time	Tide Conditions Time Ht.Ft.	Water Temp. °C	Total Precip. in.	Wind mph.	Salinity ppt	Coliform MPN/100 ml <u>Total Fecal</u>
Feb. 26	1400	0735 14.6 1425 5.3	--	Trace	SE @ 12	--	14 <1.8
Mar. 4	1410	1245 12.9 2015 3.0	--	0.09	SE @ 15	--	2.0 <1.8
Mar. 5 a.m.	0635	0355 14.2 0915 10.2	--	0.01	NW @ 18	--	11 11
Mar. 5 p.m.	1315	0915 10.2 1410 13.1	--	0.01	NW @ 12	--	4.5 <1.8
Mar. 6 a.m.	1230	1005 9.0 1525 13.4	6.2	0.0	NW @ 5	23.5	<1.8 <1.8
Mar. 6 p.m.	1510	1005 9.0 1525 13.4	6.0	0.0	SW @ 5	23.5	<1.8 <1.8

TABLE 7: BACTERIOLOGICAL ANALYSES RESULTS AND SAMPLING CONDITIONS FOR MARINE SAMPLES.

Sample Station: 13		Location: Tucker Bay					
Date 1974	Sample Time	Tide Conditions Time Ht.Ft.	Water Temp. °C	Total Precip. in.	Wind mph.	Salinity ppt	Coliform MPN/100 ml <u>Total Fecal</u>
Feb. 26	1400	0735 14.6 1425 5.3	--	Trace	SE @ 12	--	170 70
Mar. 4	1415	1245 12.9 2015 3.0	--	0.09	SE @ 15	--	<1.8 <1.8
Mar. 5 a.m.	0640	0355 14.2 0915 10.2	--	0.01	NW @ 18	--	<1.8 <1.8
Mar. 5 p.m.	1315	0915 10.2 1410 13.1	--	0.01	NW @ 12	--	2.0 <1.8
Mar. 6 a.m.	1230	1005 9.0 1525 13.4	6.5	0.0	NW @ 5	25.0	<1.8 <1.8
Mar. 6 p.m.	1515	1005 9.0 1525 13.4	6.5	0.0	SW @ 5	26.0	<1.8 <1.8
Mar. 11	1245	0700 14.5 1340 4.1	--	0.01	SE @ 14	--	<1.8 <1.8
Mar. 12 a.m.	0600	0150 8.4 0730 14.0	--	0.32	W @ 12	--	<1.8 <1.8
Mar. 12 p.m.	1330	0730 14.0 1425 4.0	--	0.32	NW @ 5	--	79 49
Mar. 13	0800	0240 9.5 0805 13.5	6.8	0.26	SW @ 14	27.1	<1.8 <1.8



TABLE 7: BACTERIOLOGICAL ANALYSES RESULTS AND SAMPLING CONDITIONS FOR MARINE SAMPLES.

Sample Station: 14		Location: Tucker Bay					
Date 1974	Sample Time	Tide Conditions Time Ht.Ft.	Water Temp. °C	Total Precip. in.	Wind mph.	Salinity ppt	Coliform MPN/100 ml <div>Total Fecal</div>
Feb. 26	1400	0735 14.6 1425 5.3	--	Trace	SE @ 12	--	<1.8 <1.8
Mar. 4	1415	1245 12.9 2015 3.0	--	0.09	SE @ 15	--	<1.8 <1.8
Mar. 5 a.m.	0640	0355 14.2 0915 10.2	--	0.01	NW @ 18	--	<1.8 <1.8
Mar. 5 p.m.	1310	0915 10.2 1410 13.1	--	0.01	NW @ 12	--	2.0 2.0
Mar. 6 a.m.	1225	1005 9.0 1525 13.4	6.2	0.0	NW @ 5	25	2.0 <1.8
Mar. 6 p.m.	1520	1005 9.0 1525 13.4	6.5	0.0	SW @ 5	26.5	<1.8 <1.8
Mar. 11	1250	0700 14.5 1340 4.1	7.0	0.01	SE @ 14	27.2	<1.8 <1.8

TABLE 7: BACTERIOLOGICAL ANALYSES RESULTS AND SAMPLING CONDITIONS FOR MARINE SAMPLES.

Sample Station: 15			Location: Tucker Bay						
Date 1974	Sample Time	Tide		Water Temp. °C	Total Precip. in.	Wind mph.	Salinity ppt	Coliform MPN/100 ml	
		Time	Conditions Ht.Ft.					Total	Fecal
Mar. 4	1425	1245	12.9	--	0.09	SE @ 15	--	<1.8	<1.8
		2015	3.0						
Mar. 5 a.m.	0645	0355	14.2	--	0.01	NW @ 18	--	<1.8	<1.8
		0915	10.2						
Mar. 5 p.m.	1310	0915	10.2	--	0.01	NW @ 12	--	<1.8	<1.8
		1410	13.1						
Mar. 6 a.m.	1225	1005	9.0	6.5	0.0	NW @ 5	24	<1.8	<1.8
		1525	13.4						
Mar. 6 p.m.	1520	1005	9.0	6.5	0.0	SW @ 5	24.3	<1.8	<1.8
		1525	13.4						

TABLE 7: BACTERIOLOGICAL ANALYSES RESULTS AND SAMPLING CONDITIONS FOR MARINE SAMPLES.

Sample Station: 16			Location: Long Bay					
Date 1974	Sample Time	Tide Conditions Time Ht.Ft.	Water Temp. °C	Total Precip. in.	Wind mph.	Salinity ppt	Coliform MPN/100 ml Total Fecal	
Mar. 4	1420	1245 12.9 2015 3.0	--	0.09	SE @ 15	--	2.0	<1.8
Mar. 5 a.m.	0645	0355 14.2 0915 10.2	--	0.01	NW @ 18	--	220	220
Mar. 5 p.m.	1305	0915 10.2 1410 13.1	--	0.01	NW @ 12	--	3.7	3.7
Mar. 6 a.m.	1220	1005 9.0 1525 13.4	6.2	0.0	NW @ 5	24	<1.8	<1.8
Mar. 6 p.m.	1525	1005 9.0 1525 13.4	6.5	0.0	SW @ 5	26.2	<1.8	<1.8
Mar. 11	1250	0700 14.5 1340 4.1	7.2	0.01	SE @ 14	25.5	<1.8	<1.8
Mar. 12 a.m.	0625	0150 8.4 0730 14.0	6.7	0.32	W @ 12	26.8	<1.8	<1.8
Mar. 12 p.m.	1400	0730 14.0 1425 4.0	--	0.32	NW @ 5	--	4.0	4.0
Mar. 13	0810	0805 13.5 1505 4.2	6.5	0.26	SW @ 14	25.2	7.8	4.5

TABLE 7: BACTERIOLOGICAL ANALYSES RESULTS AND SAMPLING CONDITIONS FOR MARINE SAMPLES.

Sample Station: 17			Location: Small cove east of Long Bay				
Date 1974	Sample Time	Tide Conditions Time Ht.Ft.	Water Temp. °C	Total Precip. in.	Wind mph.	Salinity ppt	Coliform MPN/100 ml <div>Total Fecal</div>
Mar. 5	1230	0915 10.2 1410 13.1	--	0.01	NW @ 8	--	2.0 2.0
Mar. 6 a.m.	1210	1005 9.0 1525 13.4	6.0	0.0	NW @ 5	24.2	<1.8 <1.8
Mar. 6 p.m.	1525	1005 9.0 1525 13.4	6.5	0.0	SW @ 5	26.8	<1.8 <1.8
Mar. 11	1300	0700 14.5 1340 4.1	7.2	0.01	SE @ 14	27.5	<1.8 <1.8
Mar. 12 a.m.	0630	0150 8.4 0730 14.0	6.4	0.32	W @ 12	27.0	<1.8 <1.8
Mar. 12 p.m.	1400	0730 14.0 1425 4.0	--	0.32	NW @ 5	--	79 49

TABLE 7: BACTERIOLOGICAL ANALYSES RESULTS AND SAMPLING CONDITIONS FOR MARINE SAMPLES.

Sample Station: 18			Location: Boho Island				
Date	Sample Time	Tide Conditions Time Ht.Ft.	Water Temp. °C	Total Precip. in.	Wind mph.	Salinity ppt	Coliform MPN/100 ml Total Fecal
Mar. 5	1300	0915 10.2	--	0.01	NW @ 8	--	<1.8 <1.8
		1410 13.1					
Sample Station: 19			Location: Squitty Bay				
Mar. 6	1425	1005 9.0	--	0.0	SW @ 5	--	<1.8 <1.8
		1525 13.4					
Sample Station: 20			Location: Boat Cove				
Mar. 6	1430	1005 9.0	--	0.0	SW @ 5	--	6.8 <1.8
		1525 13.4					

TABLE 8: BACTERIOLOGICAL ANALYSES RESULTS AND SAMPLING  
CONDITIONS FOR FRESHWATER SAMPLES.

Sample Station: S1		Location: Tucker Bay - Cove #1		
Date 1974	Time of Collection	Total Precip. in.	Coliform MPN/100 ml	
			Total	Fecal
Feb. 26	1400	Trace	49	11
Mar. 6	1510	0.0	6.1	4.0
Mar. 11	1230	0.01	33	17
Mar. 12 a.m.	0600	0.32	2.0	2.0
Mar. 12 p.m.	1330	0.32	23	23
Mar. 13	0800	0.26	7.8	7.8

TABLE 8: BACTERIOLOGICAL ANALYSES RESULTS AND SAMPLING  
CONDITIONS FOR FRESHWATER SAMPLES.

Sample Station: S2			Location: Tucker Bay - Cove #2	
Date 1974	Time of Collection	Total Precip. in.	Coliform MPN/100 ml	
			Total	Fecal
Mar. 8	0850	0.18	22	13
Mar. 11	1245	0.01	33	33
Mar. 12 a.m.	0600	0.32	13	13
Mar. 12 p.m.	1330	0.32	240	240
Mar. 13	0800	0.26	46	46

TABLE 8: BACTERIOLOGICAL ANALYSES RESULTS AND SAMPLING  
CONDITIONS FOR FRESHWATER SAMPLES.

Sample Station: S3		Location: False Bay		
Date 1974	Time of Collection	Total Precip. in.	Coliform MPN/100 ml	
			Total	Fecal
Mar. 6	1620	0.0	220	110
Mar. 11	1430	0.01	33	4.5
Mar. 12	0725	0.32	79	7.8
Mar. 13	0900	0.26	130	49



TABLE 8: BACTERIOLOGICAL ANALYSES RESULTS AND SAMPLING CONDITIONS FOR FRESHWATER SAMPLES.

<u>Sample Station: S4</u>		<u>Location: Long Bay</u>		
<u>Date</u> <u>1974</u>	<u>Time of</u> <u>Collection</u>	<u>Total</u> <u>Precip.</u> <u>in.</u>	<u>Coliform</u> <u>MPN/100 ml</u>	
			<u>Total</u>	<u>Fecal</u>
Mar. 12 a.m.	0625	0.32	4.5	4.5
Mar. 12 p.m.	1345	0.32	79	79
Mar. 13	0810	0.26	49	49
<u>Sample Station: S5</u>		<u>Location: Ogden Creek</u>		
Mar. 6	1430	0.0	14	4.5
<u>Sample Station: S6</u>		<u>Location: Lenny's Lagoon</u>		
Mar. 12	0645	0.32	7.8	7.8

TABLE 9: SUMMARY OF FECAL COLIFORM MPN DATA FOR PROPOSED SHELLFISH GROWING WATER STANDARDS.\*

Sample Station	Number of Samples	MPN Range	Median MPN	% Over 43 ( <sup>2</sup> )	% Over 76 ( <sup>1</sup> )
1	6	< 1.8 - 7.8	< 1.8	0.0	0.0
2	6	< 1.8 - <1.8	< 1.8	0.0	0.0
3	6	< 1.8 - 4.5	< 1.8	0.0	0.0
4	6	< 1.8 - 2.0	< 1.8	0.0	0.0
5	6	< 1.8 - 7.8	~ 1.9	0.0	0.0
6	6	< 1.8 - <1.8	< 1.8	0.0	0.0
7	4	< 1.8 - 2.0	-	-	-
8	6	< 1.8 - 2.0	< 1.8	0.0	0.0
9	6	< 1.8 - 7.8	3.0	0.0	0.0
10	6	< 1.8 - <1.8	< 1.8	0.0	0.0
11	5	< 1.8 - 4.0	~ 1.9	0.0	0.0
12	6	< 1.8 - 11	< 1.8	0.0	0.0
13	10	< 1.8 - 70	< 1.8	20	0.0
14	6	< 1.8 - 2.0	< 1.8	0.0	0.0
15	6	< 1.8 - <1.8	< 1.8	0.0	0.0
16	9	< 1.8 - 220	< 1.8	11.1	11.1
17	6	< 1.8 - 49	< 1.8	16.6	0.0
18	1	< 1.8	-	-	-
19	1	< 1.8	-	-	-
20	1	< 1.8	-	-	-

\* U.S. Food and Drug Administration proposed standards per 100 ml.

(1) Proposed at Microbiology Task Force Meeting June, 1973  
median MPN of 23, 90 percentile of 76.

(2) Proposed at 8th National Shellfish Sanitation Workshop  
median MPN of 14, 90 percentile of 43.

TABLE 10: NUMBER OF SAMPLES FOR CLOSURE LINE ESTABLISHMENT:  
EVALUATION OF ADEQUACY.\*

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Number of Samples	If Median is: very low $<20$ or very high $>200$	If Median is: near 70 or between 20-200
<hr/>		
5	May be adequate certain situations	Inadequate
6-10	Adequate to judge the absence or presence of pollution	Inadequate
11-15	Good Confidence in Median.	Median may be accurate but variation with respect to the 90 percentile of 230 (or 330) is critical.
16 or more	Oversampling	Median and Variation are accurate. Establish closure according to standards.

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\* Shellfish Growing Area Survey Procedures (Training Course Manual), U.S. Food and Drug Administration. Lecture 10, page 25 (1973).

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