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TECHNICAL REPORT NO. 3

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A BIOTIC SURVEY OF OOZY CREEK, A SMALL ARM OF BIDEFORD RIVER, PRINCE EDWARD ISLAND

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INTRODUCTION

A complete biotic survey of Bideford River, Prince Edward Island is underway but does not deal in great detail with any one area. When in 1964, one of us (M.J.P.) who was a summer student at the Biological Station, asked for suggestions on a self contained and useful ecological project, a detailed examination of a small part of the survey area was suggested. A small arm of the estuary later named Oozy Creek was selected as it had suitable size, location, and exhibited a considerable salinity gradient. Its general location is shown in Fig. 1.

METHODS

a) Survey Techniques

Although accurate shoreline and bathymetric charts are available for the Bideford River area, these were not detailed enough for the Oozy Creek survey. The shore contour was fixed by plotting from sextant angles taken every few feet along the shore. Reference points for sextant angles were permanent stakes of known position on the river banks, and temporary stakes set up for this survey. Positions of temporary stakes were determined by reference to the permanent ones.

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Bathymetric data was obtained from spot readings of position, depth and time. Depth was later corrected to depth at mean low water by reference to tide recorder charts. Heights of points above mean low water were taken either when the tide was high or their height above the water was measured by levelling to a rule set at water level.

All data obtained was plotted to produce a chart of the study area.

b) Faunal Collection

Quantitative collections of fauna and sediment were collected using a Hayward Dwarf Orange Peel Bucket #3, modified by the addition of a shroud. The volume of each grab sample was recorded and the area sampled calculated from data given by Merna (1962). The collected sample was placed on a sieve of 5.5 mm. (square) mesh opening and washed through into a sieve of 0.7 mm. (square) mesh opening. All material retained on the coarse sieve was sorted to species and the number of each recorded. For mollusca the number of shells from recently dead specimens was also counted and the total volume of old shell and fragments was recorded together with its principal constituents. Pelecypods with undamaged shells and an entire hinge and gastropods having undamaged shells were taken to be recently dead. Rough weight of each species of mollusca, echinodermata and decapod crustacea was obtained by weighing the animals entire. Wet weight for these groups was obtained with surface water removed by blotting

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after shucking or decalcification in dilute HCl. Wet weight for all other groups was taken with surface water removed. Dry weights were taken after over-night (16 hrs.) drying at 100°C.

Material retained on the fine sieve was first checked for large polychaete worms which were returned to the coarse sample. The volume of the sample was measured and then two sub-samples each of 100 ml. were taken. One sub-sample was weighed after overnight drying, decalcified and weighed again to determine its approximate inorganic and shell fragment composition. The other sub-sample was sorted to species under a binocular microscope and analysis carried out by similar techniques used for the coarse sample.

All results have been calculated to represent the yield for one square meter.

c) Floral collections

Submerged flora contained in orange-peel grab samples were treated as part of those samples.

Additionally visual surveys of the distribution of principal species were made and sketch maps drawn to show approximate distribution.

At one point on the west shore of the creek a transect was run at right angles to the water line (Fig. 2). Levels were fixed by reference to the water level with subsequent correction from tide records. Zones occupied by shore plants were recorded. In addition the position of the maximum con-

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centration and the upper limit of Volsella demissa, a littoral pelecypod and Littorina saxatilis, a gastropod were noted.

Size and abundance of the two species of submerged angiosperms Ruppia maritima and Zostera marina were studied in more detail by taking 1/10 m^2 samples at weekly intervals for five weeks from Aug. 5 to Sept. 2, 1964, at two stations in Oozy Creek. R. maritima was only present at one station but Z. marina was common at both. Plants from each species from these stations were counted, intact plants were measured and for Z. marina the width of the widest leaf on each plant was recorded. Samples were then weighed wet, dried overnight and weighed again. Results were calculated to represent samples of 1 m^2.

THE STUDY AREA

Figure I shows the general location of Oozy Creek in Bideford River. Bideford River is an estuary draining into Malpeque Bay which lies on the Northwest coast of Prince Edward Island.

Oozy Creek receives a small amount of fresh water drainage from a swampy area at its head. However, due to its shallow nature, salinities in the creek change rapidly as the tide empties and refills the area. Spot salinity checks have, therefore, little validity for such an area. Some idea of the general salinity range can be obtained from regular samples taken at a station 1500 feet upstream of Oozy Creek

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in the main body of Smelt Creek into which it drains. These readings are probably close to those prevailing in the outer half of Oozy Creek. In the upper part of the creek salinities would generally be lower and fluctuate from negligible values to about 28 °/oo.

The adjacent Smelt Creek station was monitored from May 25 to Nov. 10 in 1964. During this period the salinity range at the surface was 11.4 to 27.8 °/oo; at 6", 12.6 to 28.4°/oo; at 12", 15.7 to 28.4 °/oo; and at 18", 15.6 to 28.5 °/oo. During the same period the mean surface salinity was 22.58, at 6" it was 24.76, at 12", 25.56 and at 24", 26.12 °/oo. While these ranges and means may be fairly representative of summer conditions it is known that there are wider fluctuations particularly in winter and spring. Ice thickness in winter reaches an average value of about 25", a thickness greater than the maximum depth of water in the study area at low tide. Additionally, the ice plus fresh water layer frequently reaches a depth of 36" at spring run off. At such times Oozy Creek would be in an entirely fresh water régime.

Temperatures were taken with samples in Oozy Creek but as with the salinity data, such spot readings have little real significance. Temperatures for the adjacent Smelt Creek station can be used as an index. Temperatures in Oozy Creek, however, probably show greater extremes due to its shallow nature. Temperatures at the Smelt Creek station ranged from 4.5°C to 21.8°C during the observation period (May 25 to Nov. 10) in 1964. Spot readings in Oozy Creek showed temperatures up to 25.5°C. During winter, temperatures in Oozy Creek would be close to or just below zero for the period of ice cover. During the 1963-64 winter this extended from Jan. 5 to April 25 and in 1964-65 from Dec. 3 to April 27. It seems quite possible that freezing would extend into the bottom at least in the upper part of the Creek.

Bottom deposits in the creek are mainly organic in nature especially in the upper part. Some aspects of this will be discussed under results, below. In general, these deposits are of extremely soft consistency and will not support a persons weight.

RESULTS

1) Survey

The general location of Oozy Creek has been described above. Figure 2 shows the outline of the creek in detail. The stake S5 is a permanent marker established on the shore. S5A and S5B were temporary stakes.

Figure 2 also gives the bathymetric data obtained and shows the positions of sampling stations. It should be pointed out that the shoreline shown is at mean high water. Depths are given below mean low water. Mean low water lies about half way between the 6" contour and the shoreline but has not been accurately fixed except on the transect.

As shown in Figure 2 most of Oozy Creek lies in 6 to 18" of water, at mean low water.

2) Benthic Fauna

Sampling stations are shown in Figure 2. Table 1 details numbers and wet and dry weight of each species at each station. Where data is available rough weights are also presented. Table 2 shows the percentage of the total dry weight contributed by each species at each station.

As shown in Table 2, a total of 17 separate species were identified from the collections. Six were pelecypod molluscs, eight gastropod molluscs and three polychaetes. Two species, Macoma balthica (pelecypoda) and Hydrobia minuta (gastropoda) were collected at all stations; a second gastropod Bittium alternatum was collected at all stations except No. 1. Other species were not so evenly distributed but Volsella demissa (pelecypoda) was a major constituent occurring at six of the nine stations.

From a point of view of biomass (dry weight) the main species was M. balthica which contributed from 17 to 85% of the total biomass. Weights of this species were exceeded at three of the nine stations by V. demissa and/or the gastropod Nassarius obsoletus.

H. minuta was generally the most abundant species. Its abundance varying from $133/m^2$ at Stn. 2 to $19,700/m^2$ at Stn. 4. Its mean abundance being $3,800/m^2$. Due to its minute size the maximum contribution to the total dry weight was only 6.7%. B. alternatum was also numerous, its mean density being $2,900/m^2$; its maximum contribution to total dry weight was 9.2% at Stn. 9.

As shown in Table 2, no other species made up a significant portion of the biomass at more than two stations. The polychaete Nereis virens was important at Stn's 5 and 6.

It is considered that the characteristic benthic species of this area is M. balthica since it conforms to Thorson's (1957) definition of a first order characterising species. Other studies show that the local M. balthica community is much more extensive than this, however, (Thomas - unpublished data) and its presence alone does not separate Oozy Creek as an ecological area. H. minuta, on the other hand, is not as widespread as M. balthica and it does conform to a characterizing species of the second order (Thorson 1957). B. alternatum could also be used as a second order characterizing species but it is not as numerous or evenly distributed as H. minuta. We therefore propose to classify the area as a M. balthica, H. minuta community.

To compare the faunal similarity of the nine stations the trellis diagram method has been used. This method which is thoroughly described by Weiser (1960) and Sanders (1960) consists essentially of a summation for each pair of stations of the percentage occurrence (g/m^2 dry wt.) of species occurring at both stations. In comparing the stations the least percentage occurrence is taken for each species. The following example illustrates the comparison of stations 1 and 2. Referring to Table 3 it is evident that four species are common to these stations. These are M. balthica, V. demissa, Littorina saxatilis, and Hydrobia minuta. The common percentage occurrence for each species for the pair of stations is the least amount at either station. For these four species percentage occurrences are therefore 16.6, 39.2, 4.2 and 0.1% respectively, for a total of 60.1% as shown in Table 3. This method has been shown to be quite sensitive in illustrating similarities and differences between stations having diverse populations. In this way each station is compared to each other station and a percentage similarity obtained. Results are shown in Table 3. Table 3 also gives a diagramatic presentation of these results by ranking percentage similarity in three groups. The diagram clearly shows that in general the greatest similarity occurred in the stations 3-8 inclusive. Comparisons of all pairs of stations in this area exceeded 40% similarity, 5 pairs exceeded 70%. At the other extreme relatively little similarity was demonstrated between stations 1, 2 and 9 and the other stations. Referring to Fig. 2, it will be seen that stations 1 and 2 are the furthest upstream and station 9 the furthest downstream. The block of stations which were generally similar are in the central part of the creek. Stations 1, 2 and 9 show some similarities with other stations, in particular stations 2 and 9 were very similar. It should be mentioned that the degree of similarity in the whole group of stations was fairly high, the lowest comparison being 18%. This together with the comparison of species occurring at the various stations supports the view that all were in the same major faunal community. Differences illustrated by the trellis diagram are variations within this community.

3) Flora

a) Submerged flora

The submerged flora consisted mainly of eelgrass *Zostera marina* and widgeon grass *Ruppia maritima*. The two species

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grew in a mixed stand in the central portion of the creek but a clear dividing line was evident where the predominance of each species was established. This line is shown in Fig. 2. Upstream of the line R. maritima occurred in scattered patches, Z. marina being absent above Stn. 3. Below the line Z. marina was in general dense and long but density varied. Scattered R. maritima plants occurred throughout the study area.

Z. marina was present in two benthic samples, Stn's 4 and 6, where it contributed 93.5 and 128.6 g/m^2 dry weight respectively. These weights made up 84.9 and 91.2% respectively of the total dry weight at these stations. R. maritima did not occur in regular benthos samples.

Z. marina and R. maritima samples were collected weekly from two stations (A and B, Fig. 2) as described in the methods to collect data on their size and abundance. The sampling period was during the season of maximum size of plants (Thomas, unpublished data). Results are given in Table 4. R. maritima was more abundant than Z. marina; it averaged 1678 plants/m^2 compared to 476 and 384 plants/m^2 for the two eelgrass stations. However, due to the smaller plants of R. maritima its biomass was much below that of Z. marina having a mean of 35.5 g/m^2 (dry wt.) compared to 108.3 and 77.6 g/m^2 (dry wt.) for eelgrass at the two stations. These stations were reasonably representative of the area. During sampling it was noted that R. maritima was starting to degenerate at the beginning of September.

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Other submerged flora consists of several marine algae, mostly epiphytic on eelgrass. The green algae Ulva sp. and Enteromorpha sp. were common along the shore.

b) Emergent and shore plants

The position of the transect run to determine relative position of the shore vegetation is shown in Fig. 2. Fig. 3 shows a profile of the shore along the transect and shows the distribution of the main species of plants. Also indicated are the upper limits of the two principal intertidal animals Littorina saxatilis and Volsella demissa. In addition to the species shown in Fig. 3, the plant Triglochin maritima was collected from among Spartina alterniflora where it was very scattered. The zone occupied by Plantago maritima and Spartina patens was quite variable in the area and often extended higher up the shore than it did on the transect. Ruppia maritima was not encountered on the transect but observation showed it to start at about the same level as Zostera marina or a little higher. All the plants encountered on the transect are common in the area although the distribution of Scirpus americanus is quite patchy. Salicornia europa is common everywhere. Spartina pectinata, a plant not encountered on the transect is also very common, its distribution extending upwards from about the top of the S. americanus and S. europa zone.

4) Sediment

Rough sediment sample analysis showed that the substratum in Oozy Creek was mainly organic in nature. The proportion of inorganic sediments increased at the outer stations. The quantity of shell fragments in the fine sample averaged 20.4%.

DISCUSSION

Although the survey was reasonably complete in regard to benthic macro-fauna and macro-flora, no attempt was made to sample swimming fauna. Fish are often abundant in the area, particularly Fundulus heteroclitus, Menidia notata and Gasterosteus aculeatus. Crustacea, particularly amphipods, undoubtedly also play an important part in the ecology of the area. Although polychaete worms were only present in four of the nine samples, associated studies have shown that Nereis virens is an important member of the benthos of Z. marina beds. Evidence from wider studies suggests that this species is of prime importance in the conversion of decaying eelgrass vegetation.

The total of seventeen species of fauna found in Oozy Creek is very small compared to the fauna of Bideford River. It is also notable that eight of the seventeen species were members of the infauna. This is attributed to the highly variable salinity conditions in Oozy Creek and its surroundings. Sanders, Mangelsdorf and Hampson (1965) in a study of the Pocasset River estuary in Massachusetts, which also has a very variable salinity régime, also found that infauna were better represented than epifauna. They also investigated the salinity of the sediment as compared to the water and found it quite stable. The infauna may, therefore, be insulated from rapid salinity changes. All the epifauna

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in Oozy Creek were gastropods; many of these, e.g. *Hydrobia minuta* and *Bittium alternatum* are tolerant of reduced salinities and others, e.g. *Nassarius obsoletus* are migratory, leaving the area in winter when salinities are low and possibly at other periods of reduced salinity. Additionally most of the gastropods can seal the shell with the operculum to survive unsuitable salinity conditions.

Macoma balthica communities such as that in Oozy Creek are typical of such areas of low salinity (Thorson 1957). The community was first described by Petersen (1913, 1918) from Danish waters. Since his description, similar communities have been described from many places, which show a wide variety of secondary characterizing species. *M. balthica* communities have been studied in great detail in the Baltic Sea by Segerstrale (1960 a, b, 1962, 1965) and Lassig (1965). Lassig (1965) summarized available data on salinity tolerance of *M. balthica* and associated animals. *M. balthica* has been found in salinities down to 2‰ and occurs regularly at 3.5‰. *Mya arenaria* which is frequently found with *M. balthica* in shallow low salinity areas will survive down to 4.5‰. It is doubtful that salinities in Oozy Creek fall to these values except for limited periods in winter and spring when the fauna would not be active.

M. balthica communities have not been studied in detail in eastern North America but some data has been collected as a result of general faunal surveys. McErlean (1964) studied *M. balthica* in the Patuxent River estuary in Maryland but did not describe associated fauna. Population densities found by him were similar to those found in Oozy Creek.

Comparisons of *M. balthica* communities in Bideford River and other Prince Edward Island areas will be included in a later report.

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Table 1.

Weights and Numbers per Square Meter of Benthic Fauna

Collected in Oozy Creek.

STATION 1

Species	Number/m^2 Alive	Dead	Rough Wt. g/m^2	Wet Wt. g/m^2	Dry Wt. g/m^2
Macoma balthica	11	11		1.93	1.15
Volsella demisa	11	0	33.02	10.20	2.71
Gemma gemma	835	126		0.28	0.08
Mysella planatula	253	397		< 0.01	<0.01
Nassarius obsoletus	11	0	19.00	5.98	2.49
Littorina saxatilis	253	0		0.32	0.29
Hydrobia minuta	2783	1012		0.44	0.14
Nereis virens	126			0.08	0.05
Totals	4333	1546		19.22	6.91

STATION 2

Species	Number/m^2 Alive	Dead	Rough Wt. g/m^2	Wet Wt. g/m^2	Dry Wt. g/m^2
Macoma balthica	27	240	3.91	2.87	1.29
Volsella demissa	66	0		5.63	3.07
Littorina saxatilis	133	1795		0.07	0.03
Hydrobia minuta	133	7115		0.07	0.01
Bittium alternatum	199	66		0.08	0.01
Totals	558	9216		8.72	4.41

Table 1. (Continued)

STATION 3

Species	Number/m2 Alive	Dead	Rough Wt. g/m^2	Wet Wt. g/m^2	Dry Wt. g/m^2
Macoma balthica	318	36		47.25	9.01
Volsella demissa	126	0		1.03	0.16
Gemma gemma	756	0		0.37	0.14
Mya arenaria	12	0		0.88	0.74
Littorina saxatilis	630	504		4.17	0.62
Bittium alternatum	6930	252		5.95	0.81
Hydrobia minuta	3402	13,230		1.70	0.21
Odostomia trifida	252	122		0.05	0.03
Turbonilla sp.	126	126		0.01	0.01
Retusa canaliculata	126	126		0.06	0.01
Totals	12,677	14,396		61.48	11.74

STATION 4

Species	Number/m2 Alive	Dead	Rough Wt. g/m^2	Wet Wt. g/m^2	Dry Wt. g/m^2
Macoma balthica	367	33	170.91	56.78	10.71
Volsella demissa	401	33	52.78	23.80	3.97
Gemma gemma	132	297		0.05	$<$0.01
Mya arenaria	67	67		0.06	0.01
Littorina saxatilis	301	801		0.17	0.05
Bittium alternatum	8,684	1,670		3.44	0.67
Hydrobia minuta	19,673	15,832		10.18	1.12
Odostomia trifida	134	67		0.19	0.05
Pyramidella fusca	100	0		0.02	0.01
Totals	29,859	18,800		94.68	16.59

STATION 5

Species	Number/m² Alive	Dead	Rough Wt. g/m²	Wet Wt. g/m²	Dry Wt. g/m²
Macoma balthica	207	57	117.13	31.99	5.06
Bittium alternatum	236	472		0.35	0.02
Hydrobia minuta	236	4248		0.09	0.05
Pyramidella fusca	472	236		0.09	0.05
Nereis virens	805			14.06	1.16
Notomastus latericeus	236			1.75	0.31
Totals	2192	5013		48.33	6.65

STATION 6

Species	Number/m² Alive	Dead	Rough Wt. g/m²	Wet Wt. g/m²	Dry Wt. g/m²
Macoma balthica	244	12	274.92	60.70	10.35
Mya arenaria	116	0		0.84	0.06
Bittium alternatum	1856	580		0.80	0.14
Hydrobia minuta	2552	2784		0.60	0.08
Odostomia trifida	232	0		0.22	0.01
Turbonilla sp.	232	116		0.13	0.02
Pyramidella fusca	232	348		0.21	0.03
Nereis virens	35	0		18.37	1.64
Notomastus latericeus	12	0		0.04	0.02
Totals	5511	3840		81.91	12.35

Table 1. (Continued)

STATION 7

Species	Number/m² Alive	Dead	Rough Wt. g/m²	Wet Wt. g/m²	Dry Wt. g/m²
Macoma balthica	69	34	20.88	10.48	1.74
Nassarius obsoletus	11	11	7.13	2.84	0.97
Bittium alternatum	1150	690		0.97	0.09
Hydrobia minuta	1610	23,230		0.85	0.09
Turbonilla sp.	230	0		0.25	0.02
Nereis virens	11			0.07	0.03
Notomastus latericeus	11			0.03	0.02
Scoloplos fragilis	11			0.09	0.04
Totals	3103	23,965		15.58	3.01

STATION 8

Species	Number/m² Alive	Dead	Rough Wt. g/m²	Wet Wt. g/m²	Dry Wt. g/m²
Macoma balthica	181	84	156.79	47.71	8.48
Volsella demissa	36	0	92.19	28.04	4.98
Mya arenaria	12	0	1.90	1.08	0.55
Mytilus edulis	96	0		0.05	0.01
Bittium alternatum	1152	672		0.74	0.17
Hydrobia minuta	2976	1440		0.88	0.07
Totals	4453	2196		78.50	14.26

Table 1. (Continued)

STATION 9

Species	Number/m^2 Alive	Number/m^2 Dead	Rough Wt. g/m^2	Wet Wt. g/m^2	Dry Wt. g/m^2
Macoma balthica	42	139		9.36	1.73
Volsella demissa	14	0	65.49	21.25	3.74
Mya arenaria	292	0		0.36	0.07
Littorina saxatilis	97	292		0.20	0.03
Bittium alternatum	5838	292		4.63	0.57
Hydrobia minuta	875	5935		0.31	0.04
Turbonilla sp.	97	97		0.15	0.04
Totals	7255	6755		36.26	6.22

Table 2.

Percentage of the Total Dry Weight Contributed by

Each Species at Each Station

Species	% of Dry Weight at Stations 1	2	3	4	5	6	7	8	9
Macoma balthica	16.6	29.2	76.7	64.6	76.2	83.7	57.8	59.5	27.8
Volsella demissa	39.2	69.7	1.4	23.9				34.9	60.2
Gemma gemma	1.1		1.2	<0.1					
Mysella planatula	<0.1								
Mya arenaria			6.3	0.1		0.5		3.9	1.1
Mytilus edulis								0.1	
Nassarius obsoletus	36.0						32.2		
Littorina saxatilis	4.2	6.0	5.3	0.3					0.5
Bittium alternatum		3.0	6.9	4.1	0.4	1.1	3.1	1.2	9.2
Hydrobia minuta	2.0	0.1	1.8	6.7	0.7	0.7	3.1	0.5	0.6
Odostomia trifida			0.2	0.3		0.1			
Turbonilla sp.			0.1			0.2	0.8		0.6
Pyramidella fusca				<0.1	0.7	0.3			
Retusa canaliculata			0.1						
Nereis virens	0.7				17.5	13.3	1.0		
Notomastus latericeus					4.6	0.2	0.7		
Scoloplos fragilis							1.3		
No. of Species	7	5	10	9	6	9	8	6	7

Table 3.

Trellis Diagram Illustrating Degree of Uniformity of the Benthos at Oozy Creek Stations.

	1	2	3	4	5	6	7	8	9
1	\	60.1	25.1	42.8	18.0	18.0	51.5	52.0	56.9
2	\	\	39.0	56.5	29.7	30.4	32.3	65.4	91.6
3	•	•	\	72.5	77.3	78.2	62.8	66.5	38.4
4	\	\	X	\	65.7	66.6	64.0	85.2	56.8
5	•	•	X	\	\	91.8	60.6	60.5	27.8
6	•	•	X	\	X	\	61.0	61.6	29.3
7	\	•	\	\	\	\	\	59.5	32.1
8	\	\	\	X	\	\	\	\	65.5
9	\	X	•	\	•	•	•	\	\

X => 70% \ =40-70% • =<40%

Table 4.

Mean Length, Width, Biomass/m^2 and Abundance of *Zostera marina* and *Ruppia maritima* at Stations A and B

Station A - *Zostera marina*

Date	Mean Length	Mean Width	Wet Wt. g/m^2	Dry Wt. g/m^2	Shoots g/m^2
5 Aug	397.7	3.9	1343	74.6	530
11 Aug	409.8	3.6	924	122.7	730
19 Aug	420.2	4.0	993	127.3	410
26 Aug	421.9	3.7	665	103.0	330
2 Sept	364.8	3.4	628	113.9	300
Means	402.9	3.7	911	108.3	476

Station B - *Zostera marina*

Date	Mean Length	Mean Width	Wet Wt. g/m^2	Dry Wt. g/m^2	Shoots g/m^2
5 Aug	291.3	3.5	437	55.0	420
11 Aug	346.9	4.0	502	62.3	270
19 Aug	313.6	3.5	499	67.2	320
26 Aug	356.4	3.6	607	79.2	440
2 Sept	380.1	3.4	762	124.3	470
Means	337.7	3.6	561	77.6	384

Station B - *Ruppia maritima*

Date	Mean Length	Mean Width	Wet Wt. g/m^2	Dry Wt. g/m^2	Shoots g/m^2
5 Aug	340.3	-	284	42.0	1640
11 Aug	287.0	-	472	51.8	1730
19 Aug	257.2	-	294	34.1	2420
26 Aug	283.2	-	190	33.4	1750
2 Sept	231.0	-	130	16.4	850
Means	279.7	-	274	35.5	1678

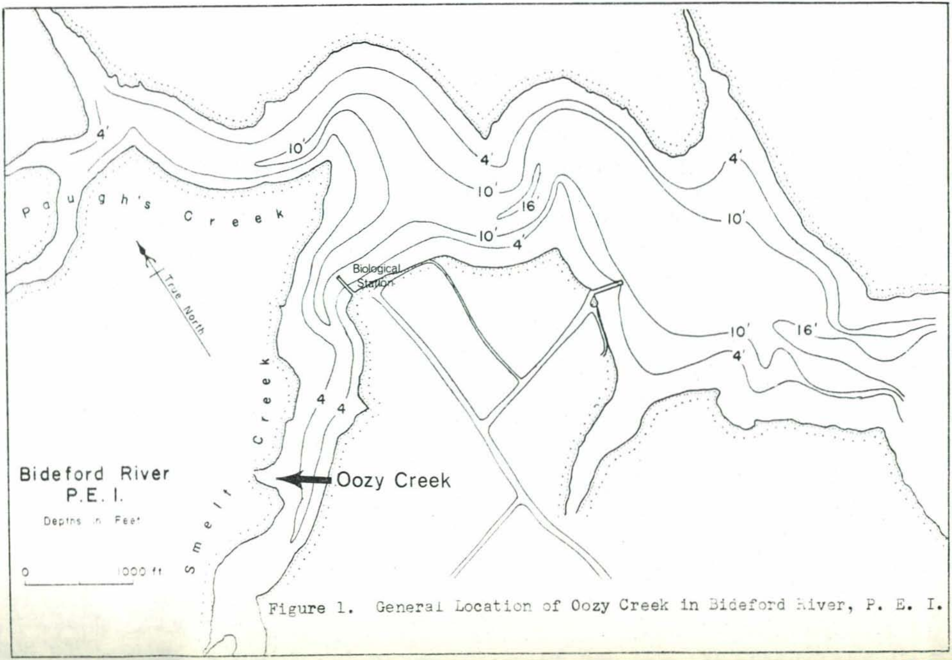

Figure 1. General Location of Oozy Creek in Bideford River, P. E. I.

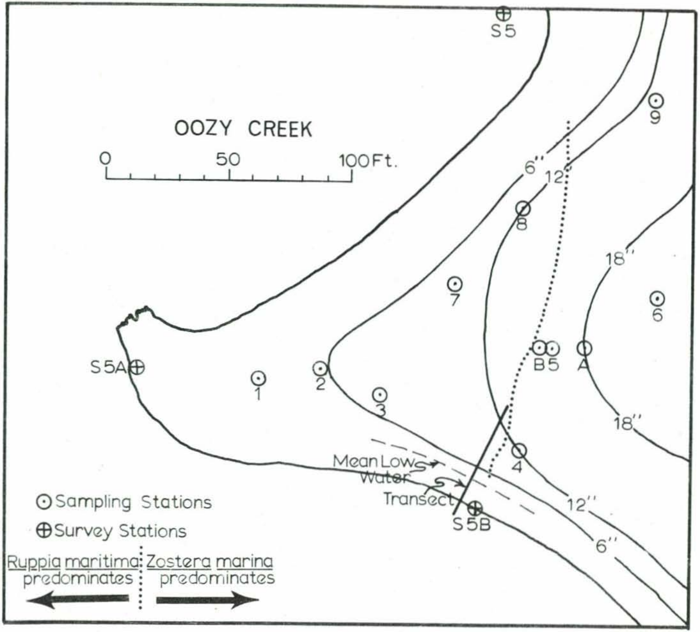

Figure 2. Oozy Creek showing depth contours, sampling stations, survey stations, the location of the transect and the *Zostera marina* - *Ruppia maritima* zones.

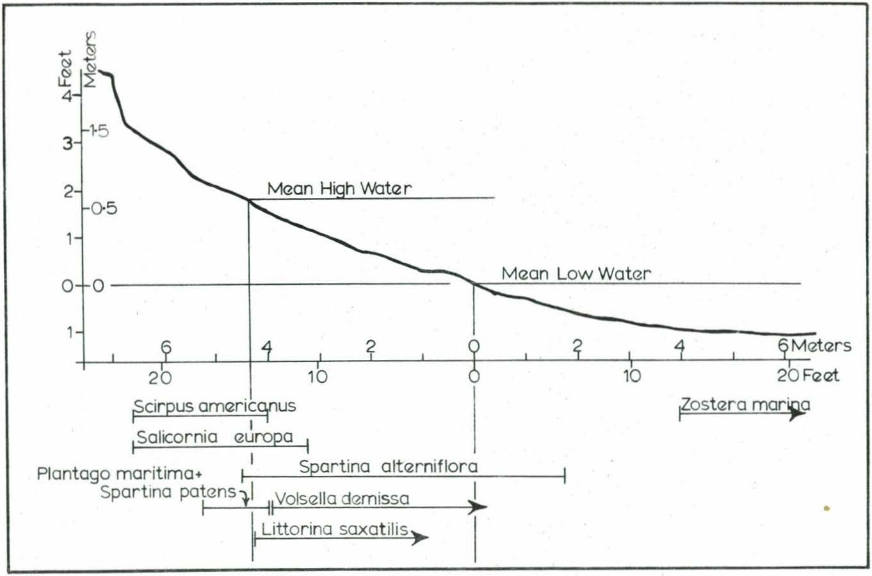

Fig. 3. Shore profile and zonation of main species of flora and fauna along the Oozy Creek transect.