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THE INTERACTION OF LOBSTER, SCALLOP, AND IRISH MOSS FISHERIES OFF BORDEN, PRINCE EDWARD ISLAND

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ABSTRACT

Basket-dragrakes were towed across Irish moss (*Chondrus crispus*) beds off Borden, Prince Edward Island, from May through July, 1979, to determine seasonal distribution of lobsters (*Homarus americanus*) on the beds. Divers holding onto basket-dragrakes counted lobsters (0.04 $min.^{-1}$) and noted their behaviour. No lobsters were captured but gunnels, flounders, sculpins, crabs, and starfish were. The techniques were tested in *Chondrus* beds off Miminegash, Prince Edward Island, where lobsters were more abundant. Here, basket-dragrakes captured 0.18 lobsters $min.^{-1}$; divers observed 1.9 lobsters $min.^{-1}$. Lobsters move laterally or up to avoid basket-dragrakes. One lobster was captured in 120 tows of scallop rock drags over scallop beds off Borden. It was concluded that the decline in lobster landings off Borden was not due to *Chondrus* or scallop dragging.

Key Words: Fisheries interaction, *Chondrus*, Irish moss, scallops, lobster, *Homarus americanus*, dragraking, basket-dragrakes.

RESUME

Afin de déterminer la distribution saisonnière des homards (Homarus americanus) sur les lits de mousse d'Irlande (Chondrus crispus) au large de Borden, à l'Ile-du-Prince-Édouard, on a traîné des râteaux à panier sur les lits de mai à juillet inclusivement, en 1979. Des plongeurs, accrochés aux râteaux comptèrent les homards (0.04 $min.^{-1}$ et notèrent leur comportement. Aucun homard ne fut capturé, mais on remonta des sigouines, plies, chaboisseaux, crabes, et étoiles de mer. On mit la méthode à l'épreuve également sur les lits de Chondrus au large de Miminegash, I.-P.-É, où les homards sont plus abondants. Ici, les râteaux traînants à panier capturèrent 0.18 homard $min.^{-1}$; les plongeurs en observèrent 1.9 $min.^{-1}$. Pour éviter l'engin, les homards se déplacent latéralement ou vers le haut. Au cours de 120 traits de drague à pétoncle pour fonds rocheux sur les bancs de pétoncles au large de Borden, un seul homard fut capturé. Nous concluons que le dragage de Chondrus ou des pétoncles n'est pas responsable de la diminution des débarquements de homards en provenance du large de Borden.

INTRODUCTION

Lobsters (Homarus americanus) and Irish moss (Chondrus crispus Stack.) are ranked first and second respectively in commercial importance in Prince Edward Island fisheries. The former are trapped (DeWolfe, 1974), while the latter is dragraked (Pringle et al, 1979). Lobsters may be found in Chondrus beds during the Chondrus dragraking season (Pringle and Sharp, 1980). Fishermen speculated that the Irish moss fishery was extremely harmful to lobsters and should be banned in the Rustico area of Prince Edward Island (Figure 1). However, Scarratt (1972), following a study of the two fisheries, suggested that lobsters are adversely affected by Chondrus harvesting, but did not recommend the banning of dragrakes: "...there is good reason for limiting moss raking effort at North Rustico...to the level that permits fishermen to take a reasonable crop of moss without causing extreme mortality to lobster." Pringle and Sharp (1980) determined for the years 1975 and 1976 that Chondrus harvesting near the two western Prince Edward Island ports off Miminegash and Tignish caused a reduction in commercial lobster yields of 1% to 2%. The value of Chondrus more than compensates for this loss.

Lobster landings in central Northumberland Strait for 1960, 1967, 1974, and 1978 were 4950 MT, 1350 MT, 900 MT, and 1800 MT respectively. The cause of the marked decrease between 1960 and 1967 is unknown but thought to have been due to overharvesting (Caddy, pers. comm.[1]). Lobster landings improved somewhat in a number of ports to the west of Borden in 1978 and 1979 but decreased in Borden in 1979 by 14% (Table 1). The fishermen claimed the decrease was due to firstly Chondrus harvesting on Borden summer lobster grounds, and secondly, scallop fishing on the spring lobster grounds. A preliminary study was undertaken to determine if lobsters are present in commercially important Chondrus beds during late spring and early summer and if they are, to assess the impact on the lobster fishery by Chondrus dragraking. An attempt was also made to verify reports of a significant bycatch of lobsters in the spring scallop fishery.

METHODS AND MATERIALS

The locations of the commercially important Chondrus beds in the Borden area (Figure 1) were identified by Ancil Ferguson[2].

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[1]Dr. John F. Caddy, Research Scientist, Fisheries and Oceans Canada.

[2]Captain Ancil Ferguson, Chondrus harvester, Victoria, Prince Edward Island.

It had been noted that basket-dragrakes employed by Chondrus harvesters off Miminegash were effective in capturing lobsters (Pringle et al., 1979). Between May 18 and July 26, 1979, each bed was observed from three to five times by towing three basket-dragrakes for four 12 minute tows behind a 12 m inshore fishing vessel skippered by Chondrus harvester, Captain Leroy Clow. To verify the technique similar observations[1] were made July 12 on three commercially important Chondrus beds off Miminegash, Prince Edward Island (Figure 1). The number of lobsters returned in each basket-dragrake was noted as was the presence of other animals.

Lobsters tend to avoid moving dragrakes (Scarratt, 1972); thus, SCUBA-equipped observers were towed behind basket-dragrakes for 10 minutes/48 minutes of towing time. They noted the number of lobsters on the basket-dragrake track and a meter on either side. Because lobsters are nocturnal, one night observation was made off Chelton Beach (Figure 1) on July 10; a stainless steel line was laid out perpendicular to the shore through the bed. SCUBA-equipped observers with sealed beam lights swam the transect noting lobsters.

The second author boarded scallop boats skippered by Captains MacKenzie[2] and Arsenault[3] on April 24 and 26, and May 1 and 23, to determine the number of lobsters or portions thereof in the scallop drags. The boats departed either Borden or Summerside Harbours about 0600 h and returned about 1700 h. Approximately 30 tows/d were made with Gulf scallop rock drags on scallop beds southwest of Borden (for location of this bed see Jamieson et al., 1980)

RESULTS

Lobsters were not observed by the divers on any of the beds in the Borden area during mid May (Table 2); however, by late May three were observed; only one was noted in the mid-June observation period and two were observed in early July. During the late July observations, five lobsters were counted. During the study, divers spent 270 minutes holding on to the basket dragrakes and 11 lobsters were observed; this was 0.04 $min.^{-1}$ (Table 3). Lobsters were not observed during the night dive, nor were injured lobsters observed in the basket-dragrake tracks following their passage.

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[1]Captain Leo Gallant, fisherman, Miminegash, Prince Edward Island, skipper of the Centennial Pride.
[2]Captain George MacKenzie, scallop harvester, Borden, Prince Edward Island.
[3]Captain Fidele Arsenault, scallop harvester, Abrahm's Village, Prince Edward Island.

Lobsters were not captured in basket-dragrakes in the Borden area (Table 3) during the entire study (the basket-dragrakes were towed for 1,296 minutes) although crabs, snails, starfish, flounders, gunnels, and sculpins were commonly captured (Appendix Tables 1-6). Off Miminegash a total of 34 lobsters were captured in 192 minutes, which was 0.18 lobster $min.^{-1}$ (Table 3). Divers were attached to the basket-dragrakes for 40 minutes off Miminegash and 71 lobsters were observed, or 1.9 lobster $min.^{-1}$.

The scallop drags were on the bottom for approximately 30 h and only one lobster was captured.

DISCUSSION

The methods employed to assess presence of lobsters on Chondrus beds were satisfactory, but both the towing of basket-dragrakes and the observations by SCUBA-equipped personnel are required where lobsters are scarce. This was the case off Borden, where the only lobsters observed were by divers. Off Miminegash, the number of lobsters captured by basket- dragrakes was 0.18 $min.^{-1}$ of bottom time, whereas the number observed by divers was 1.9 $min.^{-1}$. Thus, even where the lobster density is high the divers are more accurate in assessing lobster abundance than are the basket-dragrakes. The basket-dragrake captured other highly motile animals: crabs, flounders, gunnels, and sculpins.

Eleven lobsters were observed in the ten-week study off Borden. Lobsters were not observed in mid May but were noted at the end of May on two beds separated by approximately 9 km. They were noted on every observation period thereafter, and five of the eleven were observed in late July. This suggests a seasonal migration of lobsters onto Chondrus beds, but the total numbers are so low that it makes it difficult to accept this hypothesis without further data.

The lobster density was considerably higher on the Chondrus beds off Miminegash than off Borden. The basket-dragrakes were towed for a total of 1,296 minutes off Borden and no lobsters were captured. However, 34 lobsters were captured in 192 minutes of towing time off Miminegash. This verifies the lobster landing statistics (Table 1) where, off Borden, the mean landing per boat was 1.0 MT; off Miminegash it was 3.8 MT.

The impact on lobsters of Chondrus dragraking off Borden appears slight. There are few lobsters on the Chondrus beds, and the bulk of those present avoided the oncoming basket-dragrake by either swimming to the side of it or going over the top (Table 2). Of 87 lobsters observed in the study (Miminegash and Borden), only two stayed on track permitting

the implement to ride over them. When the basket-dragrake track was demarcated and assessed for damaged or dead lobsters following the passage of the implement, none were found. Thus, even if lobsters were more abundant off Borden the impact by Chondrus harvesting would appear to be slight. This is particularly so with the banning of the basket-dragrake as the latter is far more deleterious to lobsters than the dragrake. When lobsters swim up to avoid the implement they may be captured in the basket, where they were often smashed with the enclosed rocks.

Scarratt (1972) noted that rockier bottom was more suitable lobster habitat than flat sandstone. He compared the impact of Chondrus harvesting on lobsters between a relatively rocky area (off Rustico) and a relatively flat area (off Miminegash) and noted that lobsters in the rocky area were more adversely affected. In the present study the basket-dragrakes returned 21.7 rocks $min.^{-1}$ of tow time off Borden and 70.7 rocks $min.^{-1}$ of tow time off Miminegash. This suggests that were there equal densities of lobster in the two areas, the damage would be less off Borden for equal Chondrus harvesting effort.

There are two interrelated factors which must be considered when assessing the impact of Chondrus harvesting on lobsters. First, Chondrus dragrakes cannot be successfully towed over rocky substrate; hence, dragraking tends to take place on relatively flat bottom. Scarratt (1972) pointed out that lobsters prefer a rocky substrate. Secondly, of the coast available for lobster fishing off Miminegash or Borden, only a small percentage of it is suitable for Chondrus harvesting (see Figure 1), and this area is likely the least productive for the lobster fishermen. B. Smith[1] (pers. observ.) noted this in his study of Chondrus harvesting and its impact on the lobster fishery in George Bay, Nova Scotia. For these reasons, lobster and Chondrus harvesting successfully coexist in many areas of the southern Gulf of St. Lawrence.

Thus, it is unlikely Chondrus harvesting is responsible for the decline in lobster landings in the Borden area and there is no reason to ban Irish mossing. This is even more evident when the lobster landings per boat are compared between Borden and Miminegash (Table 1). Miminegash had considerably more Chondrus harvesters and a rockier bottom, and yet the lobster landings per boat are greater than off Borden by a factor of 3.8.

The spring scallop fishery off Borden appears to have a negligible impact on lobsters although a more detailed study is required.

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[1]Mr. Barry Smith, Biologist, Nova Scotia Department of Fisheries.

CONCLUSIONS

1. Diver observations of lobster density are more accurate than assessments through capture in towed basket-dragrakes.

2. It appears that lobsters migrate near shore in July, but more data are required to verify this hypothesis.

3. July lobster densities in Chondrus beds off Miminegash are considerably greater than off Borden.

4. Chondrus beds studied off Miminegash are rockier by a factor of 3.5 than those off Borden.

5. Lobsters tend to avoid oncoming dragrakes by either swimming in a lateral or vertical direction.

6. The impact on lobsters of Chondrus harvesting off Borden is slight and is not responsible for the decline in lobster landings nor the difference between the landings by Borden fishermen and those from other ports in the district.

7. Chondrus dragraking should be permitted in the Borden area of Marine Plant Harvesting District 6.

8. It appears that lobster bycatch in scallop drags off Borden in April/May is negligible.

RECOMMENDATIONS

1. That Chondrus dragraking be continued at the same level as permitted during 1978 in all of Marine Plant Harvesting District 6.

2. That a reassessment of the ecological impact of Chondrus harvesting on lobsters be undertaken in Marine Plant Harvesting Districts 3 and 4, which are presently closed to dragraking.

3. That a rigorous study of the impact of scallop harvesting on lobsters be undertaken in the southern Gulf.

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TABLE 1. Annual lobster landings for certain ports in Lobster Fishing District 8 - 1977 through 1979.

Port	1977			1978			1979			1978/1977 ratio	1979/1978 ratio
	No. of boats	Landings/ boat (MT)	Total landings (MT)	No. of boats	Landings/ boat (MT)	Total landings (MT)	No. of boats	Landings/ boat (MT)	Total landings (MT)		
Victoria	2	-	-	2	0.8	1.6	2	1.3	2.6	-	1.54
Borden	7	2.0	14.0	7	1.7	11.9	8	1.0	8.0	0.86	0.58
Summerside	4	1.9	7.6	5	2.3	11.5	5	1.5	7.5	1.13	0.65
Cape Egmont	19	3.3	62.7	17	3.9	66.3	16	3.5	56.0	1.19	0.84
Egmont Bay	27	3.8	102.6	26	4.7	122.2	28	3.7	103.6	1.22	0.85
Higgins Wharf	5	2.7	13.5	6	3.4	20.4	8	2.5	20.0	1.25	0.98
Brae Harbour	15	2.3	34.5	11	4.7	51.7	11	2.4	26.4	2.10	0.51
West Point	32	5.8	185.6	24	7.1	170.4	27	4.2	113.4	1.24	0.67
Howards Cove	27	3.1	83.7	33	4.5	148.5	33	3.6	118.8	1.45	0.80
Miminegash	58	2.4	139.2	55	3.2	176.0	54	3.8	205.2	1.35	1.15
Skinners Pond	84	3.1	260.4	72	3.3	237.6	73	4.5	328.5	1.08	1.38
Totals:	280	3.0	903.8	258	3.6	1018.1	265	2.9	990.0	1.36	0.90

Table 2. Lobsters observed by SCUBA-equipped divers towed behind basket dragrakes over *Chondrus* beds in the Borden area.

Date	Location	Number of lobsters observed	Approximate size of lobster	Comments
May 18	All beds	-	-	-
May 30-31	Seacow Harbour Kelly's Harbour	1 2	Canner Market & Short	Lobsters swam over basket dragrake.
June 18	Chelton Beach	1	Short	Lobsters swam over basket dragrake.
July 5	Seacow Head	2	?	?
July 25-26	Seacow Head Bell's Point Kelly's Point	1 1 3	Market Canner Canner	Lobsters swam over basket dragrake or off to the side.

Table 3. Data from basket-dragrake tows and diver observations off both the Borden area and Miminegash, Prince Edward Island during May through July, 1979.

	Bottom time(min.) diving	No. of Tows (Minutes of towing)	Mean No. of rocks per ton	Mean No. of lobsters Captured/Obs. min^{-1}		Range of lobsters captured - basket-dragrakes (carapace length - cm)	Comments
				Basket Dragrakes	Diving		
Miminegash	4	16 (192 min)	73.6	0.18	1.9	3.5 - 7.5	The majority of the lobsters observed by divers either flipped to the side of the implement or went over top, two only remained in the track. 34 lobsters were captured by the basket-dragrake; 50% were not visibly damaged, 17.5% had one claw missing, 29.4% had both claws missing, and 3% were completely smashed. See Table 2.
Borden	270	108 (1296 min)	21.7	0.0	0.04		

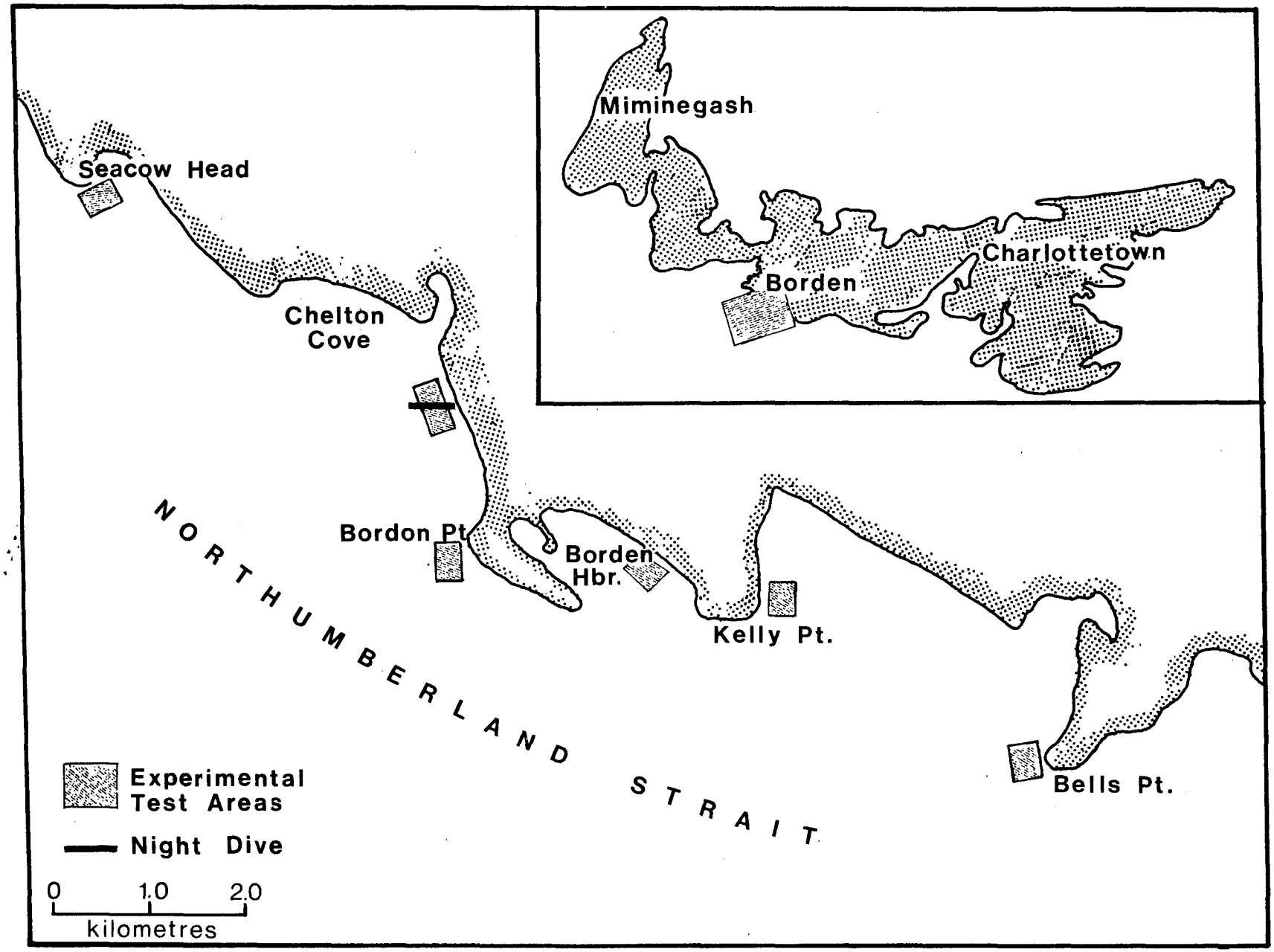

Figure 1. Prince Edward Island (inset) and the Borden area, showing the location of the commercially important Chondrus beds.

APPENDIX

Table 1. Data gathered in basket-dragrakes off Seacow Head, Prince Edward Island, during 1979.

Date	Water temperature (°C)	Water depth (m)	No. of tows	Rocks and other animals observed						
				Rocks	Gunnels	Snails	Flounder	Crabs	Sculpin	Starfish
May 18	10.0	3.5	4	49		X		X		
May 30	10.5	6.5	4	19		X		X		X
June 18	14.0	6.0	4	62	X	X	X	X		
July 5	17.0	3.5	4	24				X		
July 25	19.0	3.5	4	29	X			X	X	

Table 2. Data gathered in basket-dragrakes off Chelton Beach, Prince Edward Island, during 1979.

Date	Water temperature (°C)	Water depth (m)	No. of tows	Rocks and other animals observed						
				Rocks	Gunnels	Snails	Flounder	Crabs	Sculpin	Starfish
May 18	9	3.5	4	314	X	X		X		
May 30	10	3.5	4	308	X	X		X		
June 18	14	5.5	4	60		X		X	X	
July 5	17	4.5	4	123				X		
July 25	19	3.5	4	140				X	X	X

Table 3. Data gathered in basket-dragrakes off Bells Point, Prince Edward Island, during 1979.

Date	Water temperature (°C)	Water depth (m)	No. of tows	Rocks and other animals observed						
				Rocks	Gunnels	Snails	Flounder	Crabs	Sculpin	Starfish
May 17	10	3.0	4	76	-		-	9		2
May 31	14	4.5	4	111		X		5		1
June 19	12	3.5	4	65	X	X	X	X		
July 9	19	3.5	4	51				X		
July 26	21	3.5	4	16				X		

Table 4. Data gathered in basket-dragrakes off Borden, Prince Edward Island, during 1979.

Date	Water temperature (°C)	Water depth (m)	No. of tows	Rocks and other animals observed						
				Rocks	Gunnels	Snails	Flounder	Crabs	Sculpin	Starfish
May 30	10	4.0	4	71	X	X		X		X
June 18	14	5.0	4	37		X		X		X
July 5	17	3.5	4	69	X			X	X	
July 25	19	3.5	4	34	X		X	X	X	X

Table 5. Data gathered in basket-dragrakes in Borden Harbour, Prince Edward Island, during 1979.

Date	Water temperature (°C)	Water depth (m)	No. of tows	Rocks and other animals observed						
				Rocks	Gunnels	Snails	Flounder	Crabs	Sculpin	Starfish
June 19	11	2.5	4	141			X	X	X	
July 5	19	4.5	4	81				X		
July 26	21	3.0	4	65				X		

Table 6. Data gathered in basket-dragrakes off Kelly Point, Prince Edward Island, during 1979.

Date	Water temperature (°C)	Water depth (m)	No. of tows	Rocks and other animals observed						
				Rocks	Gunnels	Snails	Flounder	Crabs	Sculpin	Starfish
May 17	10	3.0	4	47				X		X
May 31	12	4.5	4	151		X		X		X
June 19	12	3.5	4	69			X	X	X	
July 9	19	3.5	4	54				X		
July 26	21	3.0	4	31				X		