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ASSESSMENT OF NORTHUMBERLAND STRAIT SCALLOP STOCKS - 1980

by

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ABSTRACT

Scallop stock assessments are presented for each of the three regions of Northumberland Strait. Resource surveys confirmed relatively low recruitment in recent years in the western Strait, resulting in the establishment of a year-round scallop fishing closure zone in part of this region. The closed area also contains high densities of one-year-old scallops, an age class which has never before been fished in quantity with normal survey gear. Benefits hoped to be achieved are preservation of adult stock to facilitate possible future recruitment, and protection of prerecruits until they reach a size approaching optimal yield per recruit.

Relative age class frequency in the other two regions showed no similar recent decline in recruitment, but overall abundance is still historically low and little evidence of age one scallops existed. Overall scallop landings decreased slightly in 1980, although both CPUE and price increased.

RESUME

Le texte qui suit contient des évaluations de stocks de pétoncles pour chacune des trois régions du détroit de Northumberland. Les relevés confirment un recrutement relativement faible ces dernières années dans le secteur ouest du détroit, ce qui a conduit à une interdiction, pendant toute l'année, de la pêche des pétoncles dans ce secteur. Il y a de plus dans cette zone fermée une forte densité de pétoncles âgés d'un an, une classe d'âge qui n'avait pas encore été pêchée en quantité avec les engins normalement utilisés dans le relevés. On espère assurer la conservation du stock adulte, afin de faciliter le recrutement futur et de protéger les prérecrues jusqu'à ce qu'elles atteignent une taille qui se rapproche du rendement optimal par recrue.

Dans les deux autres régions, la fréquence relative des classes d'âge ne montre pas de déclin récent semblable du recrutement, mais dans l'ensemble l'abondance est encore historiquement faible et on a observé très peu de signes de l'existence de pétoncles d'âge un.

Les débarquements globaux de pétoncles diminuèrent légèrement en 1980, en dépit du fait que les PUE et les prix augmentèrent tous deux.

INTRODUCTION

Scallop fishery data for management purposes is meagre prior to 1979 (Jamieson, 1979), the first year when a scallop stock assessment was carried out based on stock age combination, CPUE and fishery performance (Jamieson et al., 1980). This report presents a follow-up assessment based on the age-frequency distribution and CPUE a year later, and evaluates the relative performances of mud and rock drags in Northumberland Strait stock assessments. The number of fishermen actively participating in the Northumberland Strait scallop fishery is estimated, and the types and sizes of gear used are described.

The Northumberland Strait scallop fishery is still at the historically low annual landing level of about 200 MT of adductor muscle (meat) (Fig. 1). Recently, positive efforts have been made by fishermen through the Northumberland Strait Scallop Advisory Committee to optimize management of the fishery. From a state of no management a few years ago, management policy affecting license acquisition, scallop fishing seasons, allowable meat count per unit weight at landing, scallop log reports, and scallop closure zones were approved at the regional level (Table 1), and are anticipated to be in regulation by the beginning of the 1981 fishing season.

METHODS

A. Resource Surveys

Resource surveys were undertaken in all three regions of Northumberland Strait (Fig. 2; Jamieson et al., 1980) in 1980. In the western Strait, two surveys (Fig. 2) were conducted between April 23 and May 3 as a result of concern that the 1979 survey (Jamieson et al., 1980) in this region did

not describe the age frequency distribution of scallops. The virtual absence in 1979 of scallops less than age eight in the areas of greatest yield raised concern that stock collapse was imminent, and so to achieve a definitive statement, survey vessels were chartered out of both New Brunswick (M/V GMV; Capt. Maxime Vatour) and Prince Edward Island (M/V Angela S.; Capt. Tony Sharpe). The percent value of the total scallop catch landed from each area (Fig. 4; Jamieson et al, 1980) in 1979 was used to assign each area where scallops were fished (Figs. 8 and 9) to one of three survey strata: high, medium and low scallop yielding areas (Table 2). As in 1979, stations were randomly assigned to fishing areas and since the total number of areas within a stratum sometimes exceeded the number of stations, not all fishing areas necessarily had stations. Within an area, stations were located randomly to an accuracy in seconds of longitude and latitude. This is in contrast to the cruder method used in 1979, (Jamieson et al, 1980), which divided each area into 100 discrete points and then randomly assigned station locations to these points only. One hundred stations were initially assigned for each charter, but because of time constraints, only 66 and 69 stations were completed by the New Brunswick and P.E.I. charters respectively.

In the central Strait, the survey commenced on July 9 (M/V Caspen. Anchor No. 1; Capt. Henry Stright) and 60 stations (Fig. 3) were completed. In the eastern Strait, the survey commenced on September 8 (M/V Sue and Bert; Capt. Daniel Elliott), but owing to prolonged strong winds, only 19 stations (Fig. 4) could be completed in the two weeks allocated for the charter.

In the central and eastern regions of the Strait, assignment of areas to strata utilized only the 1980 scallop log catch data available at the time of the survey, with subsequent station location within an area determined as above.

Navigation was greatly improved over the procedure used in 1979, which involved dead-reckoning and water depth, because of the introduction of Loran C into this region in late winter, 1980. On each charter, an Internav 123 receiver and CC2 coordinate converter (Internav Ltd., Sydney, N.S.) allowed precise calculation of location at both the beginning and end of tow. These positions and tow duration permitted estimates of tow speed and distance. In the P.E.I. charter, dead-reckoning and depth, as in 1979, were used to establish station location. Since actual distance sampled is unknown in this latter survey, this data has been analyzed separately.

In all surveys, gear was a four-gang drag (Fig. 5) consisting of two 61 cm mud (chain sweep) drags (18 cm high entrance) in the centre, one of which was lined with 38 mm stretch netting, and two 59 cm, toothed Gulf rock drags (25 cm high), one on each end. The rock drag not adjacent to the lined mud drag was also lined with a 38 mm stretch mesh liner. Because they rapidly filled with trash (Jamieson et al., 1980), untoothed (Digby) rock drags were not used in this year's Strait surveys. A combination of rock and mud drags was used since it was observed last year that with randomization of station location, no anticipation of substrate type could occur to allow optimal gear usage. Because of poor performance in 1979, no hood over the drags was used in the 1980 surveys.

Except for the P.E.I. survey in the western Strait, where tow duration was seven minutes, tow distance was maintained at about 800 m by use of the Internav CC2. However, because some variation occurred, scallop height frequencies were weighted in analysis to give a standard tow distance of 800 m. Optimal tow distances in each region on the basis of quantity of trash fished appear to be about 925, 750 and 550 m (1NM = 1,852 km) in the western, central and eastern regions of the Strait respectively.

For each tow, the following data were recorded: 1) height frequencies in 5 mm intervals for all the live scallops and cluckers fished by each bucket; 2) Loran C bearings at start and end of tow; 3) depth (m); 4) compass bearing (direction) of tow; 5) duration of tow (minutes); 6) ground speed as measured with the CC2; 7) substrate (trash) type; 8) flowmeter readings at the beginning and end of tow; and 9) number of vertical bucket rings counted that were covered by trash. Scallop age was inferred from height by the Von Bertalanffy growth parameters given by Jamieson et al (1980). The statistical test in gear performance comparisons was Tukey's HSD multiple range test (Steel and Torrie, 1960).

B. Log Reports

The same log book format as described by Jamieson et al. (1980) was used during the 1980 fishing season, with one modification. Each unit was subdivided into four equal subareas at the request of fishermen so that better representation of locations of scallop fishing would result. Each subarea was 2 km by 2.8 km, for a total area of 5.6 km².

Since daily log completion is not yet required by regulation, fishermen are still completing logs on a voluntary basis. In an effort to provide positive feedback, a summary of each individual's fishing performance (Table 3) as derived from log data was sent out to each fisherman last spring. Performance was presented as catch per unit effort per area fished so that no total catch or effort would be present to cause potential problems with either Revenue Canada or the Unemployment Insurance Commission.

Gear size surveys were conducted at our request by regional fisheries officers in 1979 and by port samplers in 1980. Number of licensed and active fishermen was estimated from scallop fishing licenses, by log returns and by conversations with regional fisheries officers.

RESULTS AND DISCUSSION

A. Gear Performance

Jamieson et al. (1980) demonstrated the unsuitability of untoothed, Digby rock drags for Northumberland Strait scallop stock assessment, and the propensity for lined gear to fish more prerecruits and fewer recruits, than unlined gear. In the 1980 field season, the performance of mud (chain sweep) drags was compared against that of toothed, Gulf rock drags (Table 4).

In the central and eastern regions of the Strait (all strata catches combined), mud drags landed about an equal number of prerecruits but fewer recruits than did rock drags ($P > .05$). In the western Strait, mud drags landed significantly fewer ($P < .05$) recruits than did rock drags.

For those stations where scallops were caught, rock drags fished more recruited scallops than did mud drags in 62, 59, and 31% of the stations in the western, central and eastern regions respectively. The better performance of mud drags in the eastern region may not be widespread, as only a restricted area was surveyed.

B. Resource Surveys

1) Population Age Structure

Only the catch from lined and unlined rock drags were used in subsequent estimations of relative prerecruit and recruit abundance. Since lined gear retains more prerecruits and underestimates recruits, a combination of the catches of both gear categories was used in determining regional population age frequencies (Table 5). As in 1979 (Jamieson et al, 1980), scallop catch, and hence density, was greatest in order in the high, medium and low catch strata respectively. Highest average density of recruited scallops was in the central region. However, the highest yielding areas of the eastern Strait could not be sampled and so the value from this region may not be representative. In 1979, the eastern Strait had the highest average density of recruited scallops (Jamieson et al., 1980).

The two surveys in the western Strait in May were initially planned to complement each other and thus each survey did not cover the whole fishing zone (Fig. 2). Since actual distances towed in the P.E.I. charter are unknown, direct comparison (Table 6) of the observations of the two charters is difficult. However, in general, they confirm the relative

absence of 4-7 year old scallops compared to scallops >8 years old.

2) Prerecruit Abundance

In contrast to the 1979 survey (Jamieson et al., 1980), relatively large numbers of age 1 scallops (14-20 mm in height) were collected over a large area in the western Strait in 1980. Sixteen of the 135 stations surveyed (12%) had catches containing more than ten, one-year-old scallops, but since a few stations had exceptional quantities of these scallops (Table 7), the variance of average abundance is large. Because of the low selectivity (<1%) of 1-2 year scallops (Jamieson and Lundy, 1979; Dickie, 1955), the actual abundance of the 1979 year class in the western region appears significant. No similar abundance of prerecruits was found in either the central or eastern regions.

C. Commercial Fishery Characteristics

1) Gear

Regulations specify a maximum length of fishing vessel in the Northumberland Strait of <15.24 m (50 feet), but because of different overall lengths and riggings, a wide variety of bucket sizes and types are used in commercial scallop gear (Table 8). Regardless of whether the gear used is rock or mud (sweep chain) drags, the greater the number of buckets, the smaller was individual bucket size. Although one fisherman fished a total gear width >6 m in 1979, average total gear width for rock drags was 3.6 and 3.5 m in 1979 and 1980 respectively. For mud drags, average width was 3.5 and 3.5 m for both years.

2) Number of Fishermen

Although most individuals have scallop licenses, not all licenses are active in a given year (Jamieson, 1979). The number of licensed fishermen increased in the eastern Strait, but remained about constant in the other two regions during 1979-1980 (Table 9).

Number of active fishermen (N_A) is difficult to accurately estimate, since all fishermen do not complete logs and the statistical system utilizing sales slips does not provide the number of fishermen completing sales slips. As a result, N_A was estimated in each statistical district by the following equation:

$$N_A / C_T = N_L / C_L$$

therefore, $N_A = C_T \cdot N_L / C_L$

where- N_L = number of fishermen completing logs

C_T = total annual catch (sales slips)

C_L = total annual catch (log).

This assumes that total annual catch determined from log data never exceeds that determined from sales slip data, and that average catches for those fishermen that do and do not complete logs are similar. This method gives 369 and 261 active fishermen in 1979 and 1980 respectively. The field survey conducted to measure gear widths suggests that the minimum number of active fishermen was 321 and 206 in each year.

3) Catch and Effort

(a) Sales slip statistics

Preliminary landing statistics by month, province and region (Table 10-12) suggest that landings are reduced in 1980 compared to 1979. Although the fishery started well, catches quickly declined as the season progressed. Largest Northumberland Strait scallop landings are historically made in the spring and early summer, as fall fishing is often impeded by bad weather.

(b) Log record statistics

A decrease occurred in the log completion rate (Table 13) in 1980. A requirement for log completion is not yet in regulation and hence when fishermen stop completing logs, there is no method to ensure compliance. Nova Scotia fishermen were most reliable in completing logs. The worst log completion rate was in the central region.

Average CPUE values in 1980 (Table 14) were 1.72, 1.54 and 1.77 kg per hour for each metre of drag width fished in the ten most productive areas of the western, central and eastern regions of the Strait respectively. These compared to 1.23, 1.23 and 1.64 kg/hr-m respectively in 1979. Average provincial CPUE values (Table 15) by region decreased over the past year in the western region and increased in the central region. Provincial CPUE in the eastern region remained about the same. It should be noted that since two men characteristically fish scallops on each Northumberland Strait vessel, CPUE values should be halved to give effort per man, the unit of effort used in other scallop fisheries (Jamieson & Chandler, 1980).

Although overall CPUE and scallop price (Table 16) increased in 1980, actual landings appear to have decreased substantially. A monthly comparison of CPUE values (Table 17) indicates some seasonal decline in CPUE occurs, but whether or not this was a main factor to explain the decline in landings is not clear.

The 1980 pattern of distribution of fishing locations in Northumberland Strait (Figs. 7-8), presented as percentages of total regional catch, show some annual differences in locations of high yield when compared to 1979 data (Jamieson et al., 1980). Scallop concentrations which allow profitable fishing are often restricted in size, and it is thus not usual for them to be fished out in a single season.

4) Scallop Age Frequencies in Commercial Fishing

Monthly comparison of scallop age frequency fished (Fig. 9) versus scallop age frequency landed (Fig. 10) indicates that considerable culling occurs at sea. In 1980, port sampling effort was directed towards sampling the catches of a number of vessels on landing, with fishermen being asked to bring in a random sample of their day's catch (40 shells). Occasional sampling at sea was conducted by the port sampler to monitor sample bias, which was found to be minimal. In contrast to the offshore and Bay of Fundy scallop fisheries, individual weighing of meats from a subsample of the catch is logistically difficult in this fishery. The advantage of collecting data at sea is that fishermen often make repeat tows over the same ground all day, and once the height frequency of the

scallops in that bed has been determined, the port sampler's time becomes inefficiently utilized.

On a regional basis, pronounced modal ages of exploitation exist. In the western region, mostly 11+ yr-old scallops are fished, whereas in the other two regions, modal ages are typically between 5 and 8 yrs of age.

DISCUSSION AND CONCLUSIONS

The quality of data for stock assessment derived from a resource survey involving sample tows depends on two main factors: 1) knowing the area of sea bottom swept by the gear, and 2) the selectivity of the gear. In recent, unpublished studies of gear selectivity with toothed Gulf drags and mud (sweep chain) drags in the Northumberland Strait, no conclusive results could be attained because of very low scallop abundance in the study area (about 1 scallop/10 m²). Although scallop density may be somewhat greater on other commercial scallop grounds, sufficiently high scallop densities (preferably >1/m²) could not be located in areas accessible to divers. However, Caddy (1968) located ground with a scallop density of 5-6/m² in 1967, and so high scallop densities can occasionally occur. Until such ground is located, selectivity of unlined gear can only be estimated by comparison with lined gear performance [as in Jamieson and Lundy (1979)], and lined gear selectivity of prerecruits cannot be determined.

Use of accurate navigational gear to estimate tow length has allowed a significant improvement in data quality, since each tow's catch is now prorated to that expected with an 800 m tow distance. When tow duration is standardized for time, variables such as tidal current, wind drift, are not considered, and distance towed can vary considerably.

Confirmation of the scarcity of 2-6 year old scallops in the western region by the two May resource surveys resulted in a meeting of the Northumberland Strait Scallop Advisory Committee in late May, 1980. A scallop closure zone (Fig. 11) in the western Strait was recommended for an indefinite period of time at this meeting. This zone was created to: 1) allow establishment of a "preserve" where sufficient adult stock could exist to allow maximum spawning success and hopefully improve future recruitment (the apparent lack of significant recruitment in recent years, and the fact that this population is on the fringe of the species' geographical distribution, created concern that the population was only marginally self-sustaining and was particularly subject to stress); and 2) prevent indirect fishing mortality from decimating the newly located concentrations of prerecruits (Fig. 6).

With establishment of this closure zone on June 24, 1980, fishermen were allowed to exploit other populations in the region so long as all regulations (Table 1) were adhered to. The existence of this zone should offer sufficient protection of the western Strait stock to facilitate spawning success, and so no new conservation measures are proposed for the coming season.

In the central region and eastern regions, scallop stocks appear stable, with each age class reasonably well represented. Landings are likely to significantly increase only as a result of above-average recruitment, which does not appear imminent. Management should thus continue towards maximization of yield per recruit.

This year's landings are reduced in comparison to 1979's landings, while average CPUE and price are both higher. This suggests that in a multispecies system such as exists in the Northumberland Strait, magnitude of landings may reflect relative fishery performance more than stock status. Multispecies stock management may thus be necessary, as only in this way may the overall dollar value of competing fisheries be maximized and optimum yields for all the fisheries attained.

SUMMARY

1. Resource surveys confirm relatively low recruitment of scallops in recent years in the Western Strait. Since this population is on the fringe of the species' distribution and assuming that the stock is self-sustaining, conservative exploitation is advisable.
2. The 1979 year class in the western Strait appears to be above average in abundance, with little evidence of this year class in the other two regions.
3. Scallop landings decreased in 1980, although CPUE and price increased. Possible explanations are more profitable alternate fisheries and/or bad weather.

4. The frequency of log record completion is decreasing, since regulations requiring their completion do not yet exist.
5. Average CPUE was 1.77, 1.54 and 1.72 kg of meat per hour for each metre of drag width fished, for the ten most productive unit areas in the eastern, central and western Strait, respectively.

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Table: 1

Regulations (*) and policy applied to the Northumberland Strait scallop fishery in 1980.

Lobster
District 8

Lobster
District 7b1

*Season: April 28 - July 12
October 11 - December 31

*April 7 - July 15
September 15 - December 31

Meat count: 45/lb (99/kg)

48/lb (106/kg)

Log books: required

required

*License: freeze on all new entrants

*new entrants permitted if they have fished 30 weeks over the past 2 years for either lobster or scallop, and are considered a bona fide commercial fisherman.

*Closed area: shaded area in Fig. 11 is closed indefinitely to scalloping as of June 24, 1980.

Table 2: Strata designation and average scallop catch by age grouping in each of the three catch strata in each region of the Northumberland Strait. Scallops were fished with an unlined, toothed bucket.

Northumberland Strait									
Stratum	%* (Stratum range)	N* (Total no of areas)	n* (areas sampled)	n (stations)	Age			Total	Std. Error
					1-3	4-7	8+		
<u>Western†</u>									
High	5+	5	5	29	1.6	5.0	12.5	19.1	2.9
Medium	2-4.99	11	5	22	.2	2.3	8.3	10.8	3.0
Low	0-1.99	27	9	13	0	1.6	11.9	13.5	3.7
<u>Central</u>									
High	4+	3	2	15	5.9	29.3	6.5	41.7	7.3
Medium	1-3.99	13	11	24	10	28.4	7.8	46.2	11.2
Low	0-.99	22	12	21	2.3	16.4	10.1	28.8	10.6
<u>Eastern</u>									
High	5+	4	2	3	0	5.3	11.7	17.0	8.2
Medium	1-4.99	15	2	5	0	11.6	13.6	25.2	9.4
Low	0-.99	13	7	11	.3	2.9	4.7	7.9	3.8

*includes sub-areas

† data only from the NB charter

FISHERIES & OCEANS CANADA -- RESOURCE BRANCH

SCALLOP FISHERMAN REPORT FOR JANUARY - DECEMBER 1979

FISHERMAN'S NAME --

PROVINCE -- NEW BRUNSWICK

STATISTICAL DISTRICT 80 --

TIDNISH

CAP PELE TO

SQUARES FISHED	NO. OF VISITS TO THE SQUARE	CATCH AS A % OF TOTAL CATCH	CATCH PER UNIT EFFORT
149	4	16.10	0.62
157	12	44.25	1.14
158	7	28.82	1.05
166	3	10.83	0.98
4	26	100.00	0.97
AVERAGE			

Catch is defined as the weight in kilograms (one kilogram = 2.205 pounds) of scallop meat landed.

Effort is defined in metre-hours, where the width of your gear (10 rock drags, each 18 inches wide; 0 sweep chain drags each 0 feet wide) in metres is multiplied by the number of hours your gear was on the sea bottom (tow duration times number of tows).

Therefore, the average value of catch per unit effort means that for every hour each metre of drag width was fished, 0.97 kilograms of meat was landed.

We hope that this information will prove useful to you in the next fishing season. The value of this data to us both depends on your co-operation in the accurate completion of scallop log records.

Table 3: The format in which each fisherman's log data is summarized and returned to him at the end of each fishing season.

Table 4: Relative catch at age per 4-group drag per tow, all strata stations combined, for lined (A) and unlined (B) rock and mud buckets in the three regions of Northumberland Strait. * = data only from the May, New Brunswick charter.

Region & Stratum	Number of Stations	Age (yr)										
		1	2	3	4	5	6	7	8	9	10	11
<u>A. Lined Gear</u>												
<u>West*</u>												
rock	64	3.9	.1	.2	.1	.2	.1	.1	.2	.2	.1	.9
mud	64	3.8	.1	.3	.2	.1	0	.1	.1	0	0	.4
<u>Central</u>												
rock	60	.1	.5	.6	.8	.9	.6	.4	.5	.3	.1	.2
mud	60	.2	.3	.5	.5	.6	.5	.3	.3	.3	.2	.2
<u>East</u>												
rock	19	.1	0	.1	.1	.2	.3	.2	.3	.3	.1	.4
mud	19	0	.1	.1	.0	.3	.3	.5	.4	.3	.1	.6
<u>B. Unlined Gear</u>												
<u>West*</u>												
rock	60	.1	0	0	.1	.3	.2	.2	.4	.4	.3	1.6
mud	64	.8	0	0	.1	.2	.1	.1	.3	.3	.1	.8
<u>Central</u>												
rock	60	.1	.5	1.0	1.6	2.1	1.4	1.1	1.0	.5	.2	.2
mud	60	.1	.1	.2	.5	1.1	1.6	1.4	1.1	.5	.2	.6
<u>East</u>												
rock	19	.0	0	0	.1	.3	.6	.7	.7	.6	.3	.8
mud	19	.0	0	0	.3	.6	.5	.2	.1	.1	.1	.6

Table 5: Average catch per tow (800 m) 4-gang of a rock drag in each of the three strata in each region of Northumberland Strait. Ages 1-3 (prerecruits): from lined gear; ages 4+ (recruits): unlined gear. * : data only from the May New Brunswick charter.

Region & Stratum	Number Stations	Age (Year)										
		1	2	3	4	5	6	7	8	9	10	11+
<u>West*</u>												
High	29	15.6	.1	.6	1.1	1.0	.9	2.0	3.3	3.0	1.5	4.7
Medium	22	29.6	.5	.7	.6	1.2	.5	.1	.4	1.1	.6	6.2
Low	13	2.1	.3	.3	.1	.8	.6	.1	1.0	1.4	.7	8.8
<u>Central</u>												
High	15	.4	1.4	3.4	7.2	10.4	7.2	4.4	3.2	2.0	1.0	.3
Medium	24	1.2	2.9	2.1	8.0	9.7	6.2	4.5	3.9	2.3	1.0	.6
Low	21	.1	1.2	2.5	3.8	5.5	3.1	3.9	4.8	2.5	1.0	1.7
<u>East</u>												
High	3	0	0	0	0	1.1	2.7	1.5	4.1	4.2	2.2	1.3
Medium	5	.8	0	0	.8	1.9	3.7	5.2	3.1	2.2	1.1	7.2
Low	11	0	0	.9	.2	.2	1.2	1.4	1.2	1.2	.6	1.6

Table 6. Western Northumberland Strait scallop catch summaries by strata and drag type, April 1980. A. Ten-minute tow duration, actual distance unknown. B. 800 m tow distance.

	n	Age (years)		
		1-3	4-7	8+
<u>High Catch Strata:</u>				
A. lined rock	41	26.3	1.8	7.3
unlined rock	41	0.2	2.0	10.7
lined sweep	41	31.9	1.6	5.0
unlined sweep	41	0.2	1.8	12.8
B. lined rock	29	5.0	0.7	1.3
unlined rock	29	0.5	1.5	3.8
lined sweep	29	10.0	0.3	0.5
unlined sweep	29	2.3	0.9	2.4
<u>Medium Catch Strata:</u>				
A. lined rock	24	1.7	4.4	7.1
unlined rock	24	0.4	5.5	10.1
lined sweep	24	4.0	5.2	4.4
unlined sweep	24	0.2	6.6	10.9
B. lined rock	22	9.3	0.6	2.3
unlined rock	22	0.1	0.7	2.5
lined sweep	22	5.7	0.3	0.9
unlined sweep	22	1.1	0.5	1.4
<u>Low Catch Strata:</u>				
A. lined rock	2	0.0	0.0	2.6
unlined rock	2	0.0	3.3	6.3
lined sweep	2	0.0	0.0	2.9
unlined sweep	2	0.0	1.0	1.9
B. lined rock	13	0.8	0.4	1.4
unlined rock	13	0.0	0.5	3.7
lined sweep	13	0.8	0.8	0.6
unlined sweep	13	0.0	0.3	2.4

Table 7: Numbers of one-year-old scallops fished by both lined buckets in 1980 at stations where the number of such prerecruits exceeded ten per tow.

No. Scallops	Stn. No.	Area No.	Latitude	Longitude
<u>West</u>				
NB Charter				
183	8	25	46° 47' 54"	64° 35' 58"
30	9	25	46 49 14	64 35 19
14	13	38	46 48 16	64 31 09
45	14	39	46 46 30	64 31 27
40	30	26	46 46 21	64 34 56
31	35	39	46 47 16	64 30 28
53	37	39	46 47 18	64 30 35
87	38	39	46 46 28	64 31 07
30	39	39	46 46 07	64 31 32
26	66	55	46 48 48	64 29 55
PEI Charter				
12	12	39	-	-
95	13	39	-	-
43	14	39	-	-
2185	16	26	-	-
10	50	74	-	-
28	68	53	-	-

Table: 8:

Individual bucket width and numbers fished in drag gangs by scallop fishermen in the Northumberland Strait in 1979 and 1980.

	<u>No. Buckets</u>	<u>No. Fishermen</u>	<u>MEAN bucket width (m)</u>	<u>Std. Dev (m)</u>	<u>Total gear width (m)</u>
	<u>1979</u>				
	2	2	0.81	0	1.62
	3	27	0.79	0.08	2.37
	4	106	0.79	0.06	3.16
	5	30	0.71	0.13	3.55
	6	47	0.50	0.09	3.00
	7	12	0.51	0.08	3.57
Rock	8	25	0.59	0.07	4.72
Drags	9	25	0.53	0.08	4.77
	10	11	0.51	0.08	5.10
	11	0	-	-	-
	12	17	0.47	0.04	5.64
	13	0	-	-	-
	14	<u>1</u>	0.46	0	6.44
		303			
	<u>1980</u>				
Mud	1	40	2.56	0.48	2.56
Drags	2	<u>27</u>	2.43	0.06	4.86
		67			
	3	9	0.80	0.09	2.40
	4	86	0.77	0.07	3.08
	5	27	0.71	0.13	3.55
Rock	6	41	0.53	0.12	3.18
Drags	7	15	0.48	0.09	3.36
	8	29	0.63	0.12	5.04
	9	3	0.48	0.04	4.32
	10	5	0.46	0.01	4.60
	11	0	-	-	-
	12	<u>6</u>	0.48	0.06	5.76
		221			
Mud	1	16	2.84	0.60	2.84
Drags	2	9	2.33	0.22	4.66
	4	<u>1</u>	1.22	0	4.88
		26			

Table 9: Estimated numbers of licensed and active fishermen, and the number of fishermen who completed at least one log record, in 1979 and 1980. 1980 data is still preliminary.

Province	District	1979			1980		
		No. Licenses	No. Active	No. Submitting Logs	No. Licenses	No. Active	No. Submitting Logs
Nova Scotia	2	2	-	0	2	-	-
	3	6	-	0	0	-	-
	10	2	-	0	3	-	-
	11	53	34	28	55	32	20
	12	12	1	1	13	1	1
	13	25	8	8	30	7	3
	45	0	-	0	0	-	-
	46	0	0	4	0	0	2
New Brunswick	75	12	12	8	15	11	5
	76	30	30	23	34	34	8
	77	19	12	1	15	0	5
	78	21	20	3	17	-	-
	80A	66	55	41	66	42	19
Prince Edward Island	82A	37	35	13	53	22	11
	83	14	14	12	13	-	-
	85	6	3	3	13	0	4
	86	27	27	18	19	19	16
	87	148	79	30	169	88	18
	88	45	2	1	56	-	-
Total		525	332	194	573	256	112

Table 10:

Monthly scallop landings in Northumberland Strait in 1979 and 1980 (values are suggested to be underestimates of actual landings).

	Landings (kg)		
	N.B.	N.S.	P.E.I.
<u>1979[†]</u>			
March	-	-	365
April	133,425	7,184	157,734
May	345,052	1,585	152,465
June	225,177	5,856	161,042
July	7,535	40,221	248,147
August	-	-	11,614
September	565	10,628	33,288
October	4,487	32,223	142,027
November	4,894	31,799	45,586
December	-	-	-
Total Round Weight (kg)	721,135	129,496	952,268
Meat Weight (MT)	87	16	115
<u>1980[*]</u>			
April	51,544	3,249	122,844
May	350,628	437	209,479
June	140,163	5,481	103,550
July	34,849	29,579	163,762
August	5,497	-	75
September	1,340	11,828	29,585
October	1,709	48,017	134,271
November	-	51,197	41,027
December	-	-	1,653
Total Round Weight (kg)	585,730	149,788	806,246
Meat Weight (MT)	71	18	97

+3% of total landings may be gonad.

*Preliminary (9/12/80)

Table 11:

Regional scallop landings in Northumberland Strait in 1979 and 1980.

Province	S.D. District	Lobster District	Representative Ports	1979 ⁺ annual landing (round kg)	1980 [*] annual landing (round kg)
Nova Scotia	11	7b1	Caribou, Toney R., Cape John	108,507	141,960
	12	7b1	Lismore	4,133	-
	13	7b1	Bayfield, Cribben's Pt.	6,356	5,370
	45	8	Pugwash	5,052	1,648
	46	7b1	Wallace	5,248	780
New Brunswick	75	8	Cape St. Louis, Kouchibouquac	24,704	14,683
	76	8	Richibucto, Richibucto Cape	171,335	179,374
	77	8	Buctouche	89,739	4,799
	78	8	Shediac, Cape Bald	83,659	51,115
	80A	8	Murry Corner, Cape Tormentine	351,698	335,749
Prince Edward Island	82A	8	Howard Cove, Miminegash	216,021	195,357
	83	8	Borden	75,853	44,820
	85	7b1	Victoria	1,277	2,684
	86	7b1	Wood Is., Charlottetown	203,529	209,740
	87	7b1	Beach Pt., Gaspereau	445,587	339,104
	88	7b1	Annandale	10,001	14,541

+3% total landings are roe.

*Preliminary (9/12/80)

Table: 12:

Monthly Northumberland Strait scallop landings in Lobster Districts 7b1 and 8 in 1979 and 1980.

Month	1979 ⁺		1980 [*]	
	eastern	western	eastern	western
	7b1	8	7b1	8
January				
February				
March	365			
April	128,531	169,812	108,997	68,640
May	38,899	460,203	61,702	498,842
June	44,244	347,831	47,961	201,203
July	275,775	20,128	181,071	47,109
August	11,614	-	-	5,572
September	43,916	565	40,950	1,803
October	169,920	8,617	180,995	3,002
November	71,374	10,905	90,850	1,374
December	-	-	1,653	-
Total Round				
Weight (kg)	784,638	1,018,061	714,179	827,545
Meat Weight (MT)	95	123	86	100

+3% total landings are gonad.

*Preliminary (9/12/80)

Table 13: Preliminary sales slip and log scallop catch (kg) statistics for each province in each region of the Northumberland Strait in 1980 (1979 included for comparison).

	Statistic	Region Report	1980	1979
	Sales Slip Catch (kg)	Log Record Catch (kg)	% (log/SS)	% (log/SS)
Western N.B.	23,959	10,403	43	45
P.E.I.	23,537	11,609	49	37
Central N.B.	46,610	8,016	17	63
N.S.	199	-	0	0
P.E.I.	5,723	2,260	39	73
Eastern N.S.	17,845	11,683	65	89
P.E.I.	67,878	22,832	34	45
Total (kg)	185,751	66,803	36	53
mt	186	67		

Table 14: Percent of the total catch fished and catch per unit effort (kg meat per hour for each metre of drag fished) from the ten most productive unit areas (Figure 7) in each region of the Northumberland Strait as reported by log records. * = weighted average.

Northumberland Strait									
West			Central			East			
Sq. No.	%	CPUE	Sq. No.	%	CPUE	Sq. No.	%	CPUE	
59	9.86	-	166	18.92	1.60	274	13.23	1.77	
74	5.63	2.43	157	13.35	1.46	265	13.12	1.30	
91	5.62	1.27	175	11.87	1.09	267	10.31	2.13	
60	5.44	3.15	156	6.25	1.70	256	8.86	1.40	
73	5.14	1.51	165	5.98	1.63	263	6.86	1.99	
78	4.63	2.59	174	5.51	1.21	262	5.76	1.95	
40	4.14	.61	77	4.13	2.63	268	5.4	2.25	
55	3.86	1.36	158	3.12	1.19	251	4.59	1.36	
56	3.32	.78	150	1.59	3.45	275	4.23	2.19	
26	3.06	.67	167	1.45	1.02	252	2.26	1.98	
Total	9	40.84	1.72*	10	72.17	1.54*	10	74.62	1.77*
Total catch from region (MT meat)	22		10			35			

Table: 15:

Average provincial CPUE values for all regions fished in 1979 and 1980.
(1979 for comparison)

Province	Region	CPUE (kg/hr-m)	
		1980	1979
Prince Edward Island	West	1.09	1.37
	Central	1.28	1.11
	East	1.58	1.68
New Brunswick	West	1.01	1.12
	Central	1.40	1.21
Nova Scotia	East	1.70	1.53

Table 16: Average price (dollars)/kg. of scallops sold in the Northumberland Strait in 1979 and 1980.

Month	1979 Statistical District			1980 Statistical District		
	76	80	87	76	80	87
January						
February						
March						
April		6.61	6.99		8.27	
May		6.86	7.05	8.64	8.27	8.27
June	6.83	7.03	7.05	8.27	7.72	8.27
July	6.83		7.03	8.22	7.98	8.11
August		6.11	6.83	7.98	7.72	8.22
September	6.83		6.92			8.27
October		9.37	7.14	7.98	7.96	8.82
November		9.37	8.11	8.71		8.82
December	6.83		8.16			9.41

Table 17: Average monthly CPUE values (kg/hr-m) weighted by catch for each of the three Northumberland Strait scallop regions in 1979 and 1980.

Month	Western		Central		Eastern	
	1979	1980	1979	1980	1979	1980
April	3.41	1.00	1.18	1.60	2.09	1.94
May	1.30	1.33	1.26	1.32	2.02	1.62
June	1.13	1.46	1.35	1.02	1.51	1.38
July	.96	.80	.92		1.67	1.64
August						
September		.60	.51		1.45	1.21
October			.73		1.40	1.62
November			.93		1.34	1.9
December					1.49	2.0

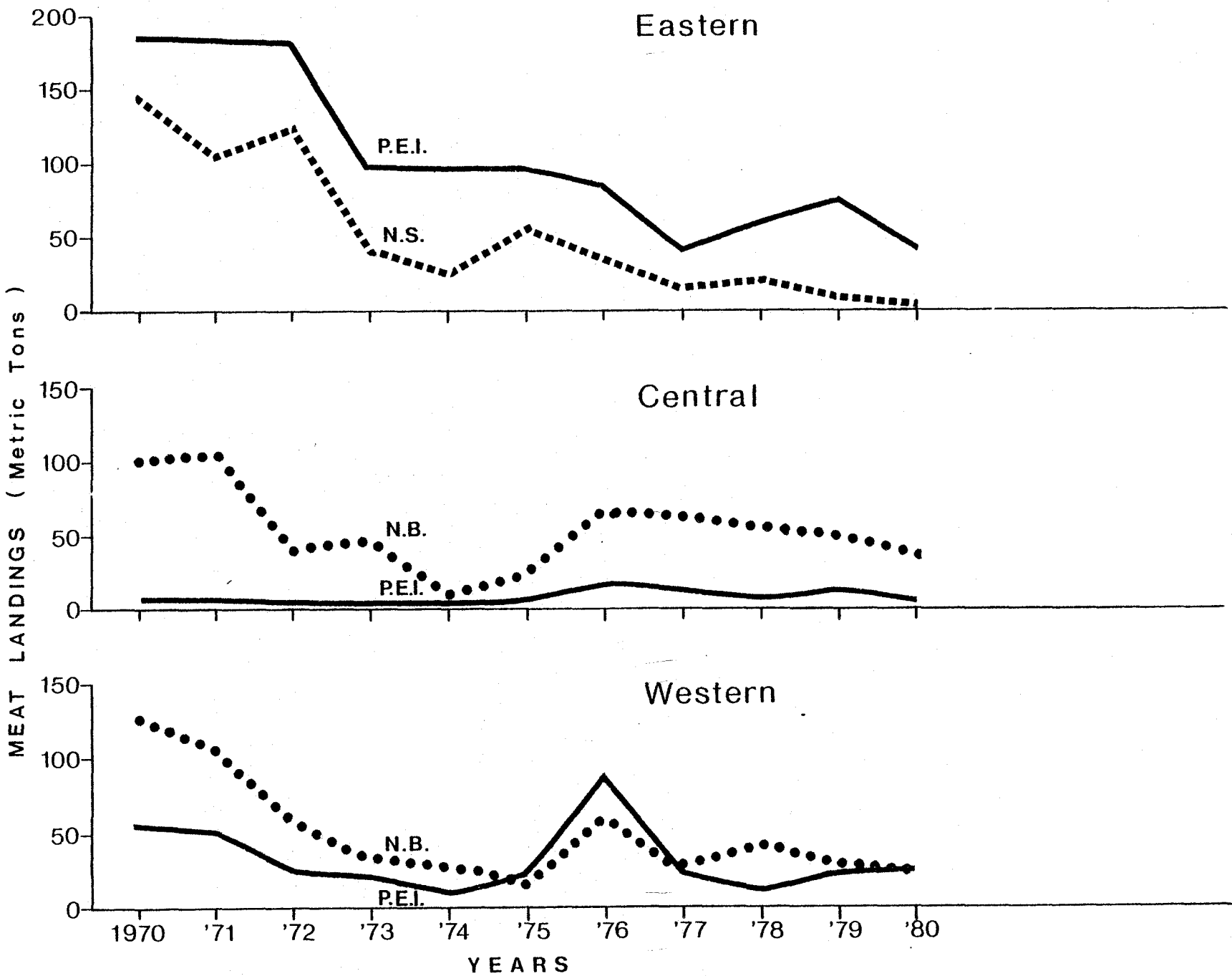


Figure 1. Annual scallop landings by province in the three regions of Northumberland Strait.

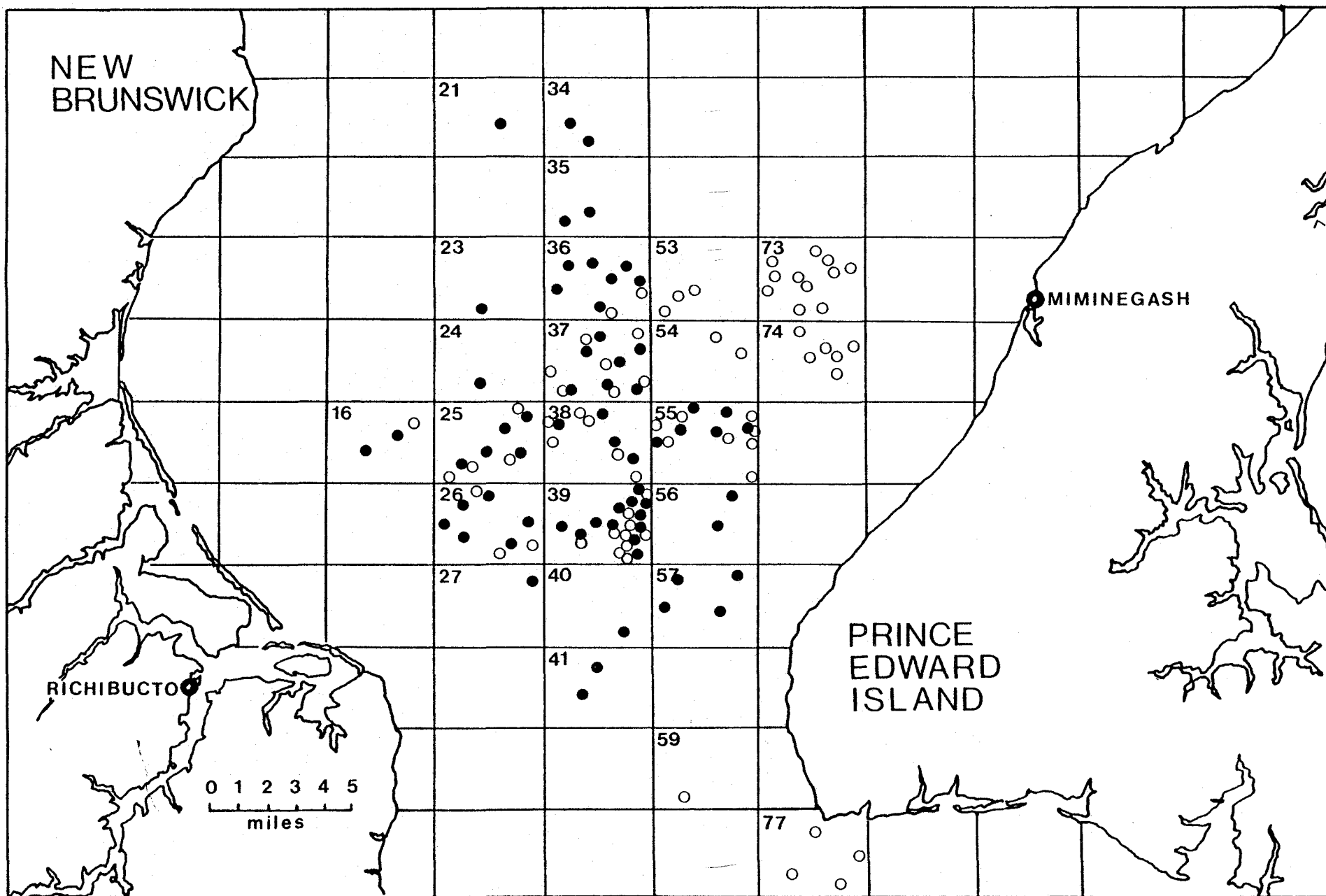


Fig. 2: Resource survey stations locations in the western Strait. Numbers are area designations. ●: New Brunswick Charter; ○: P.E.I. charter.

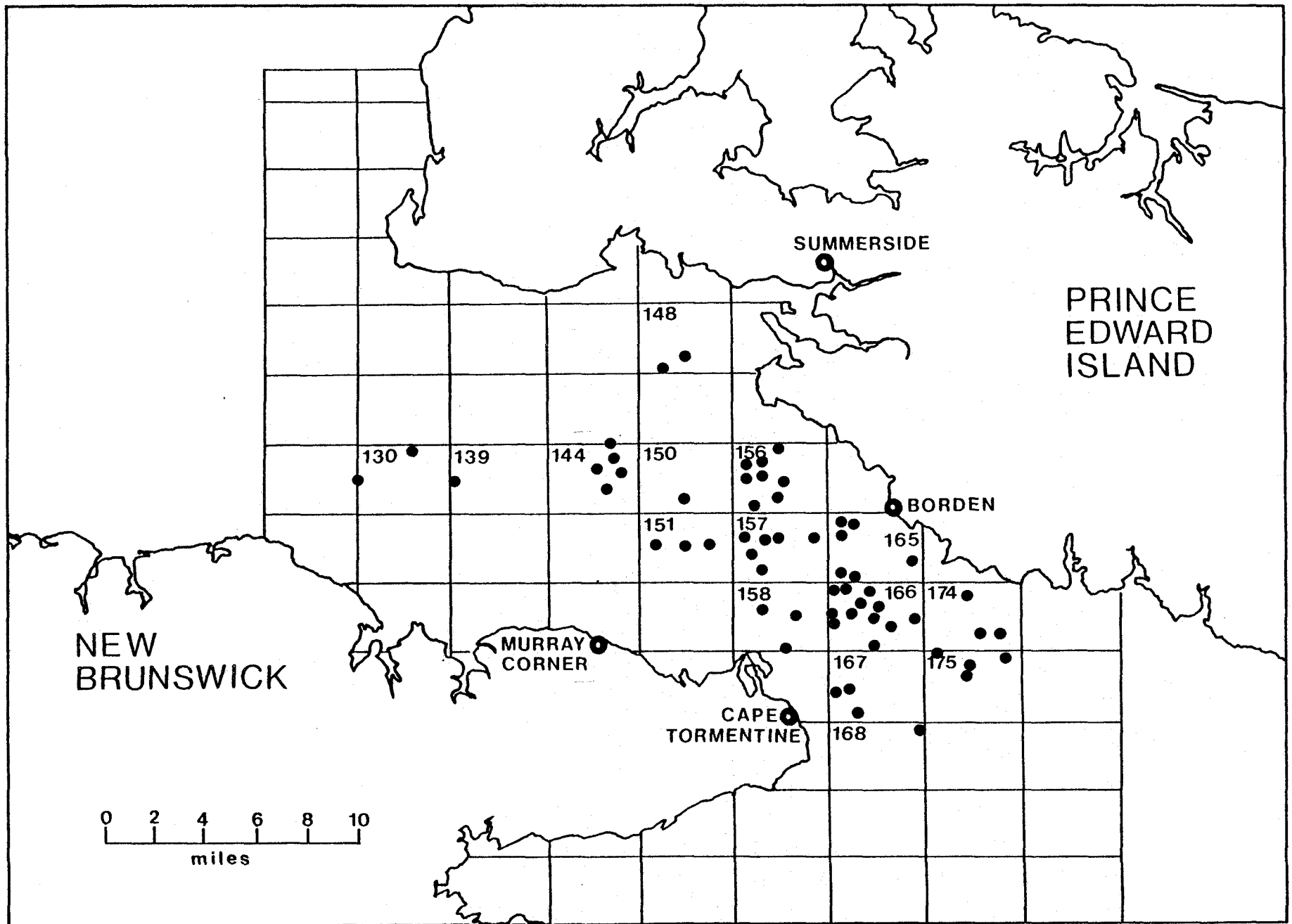


Fig. 3: Resource survey station locations in the central Strait.
Numbers are area designations.

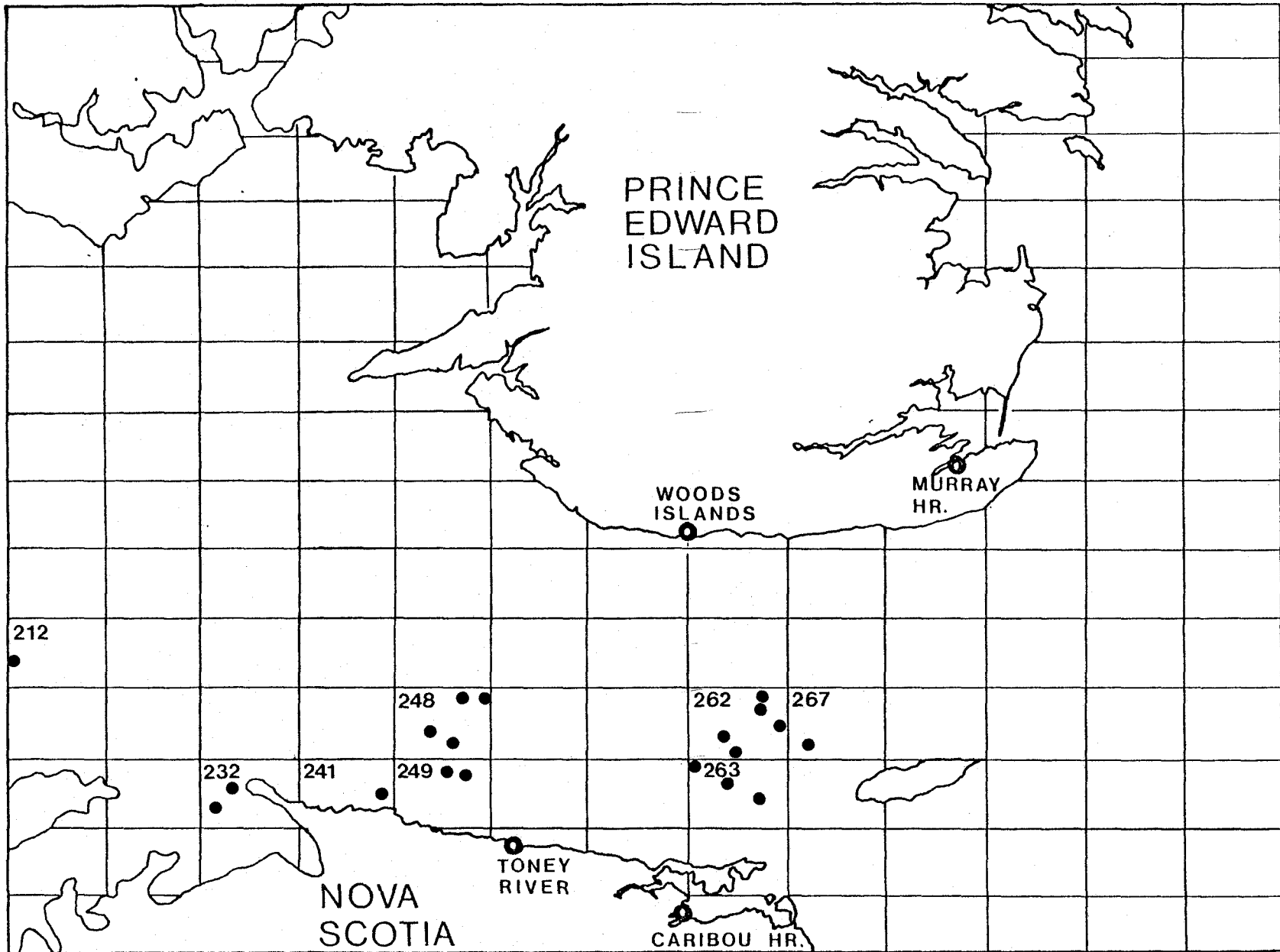
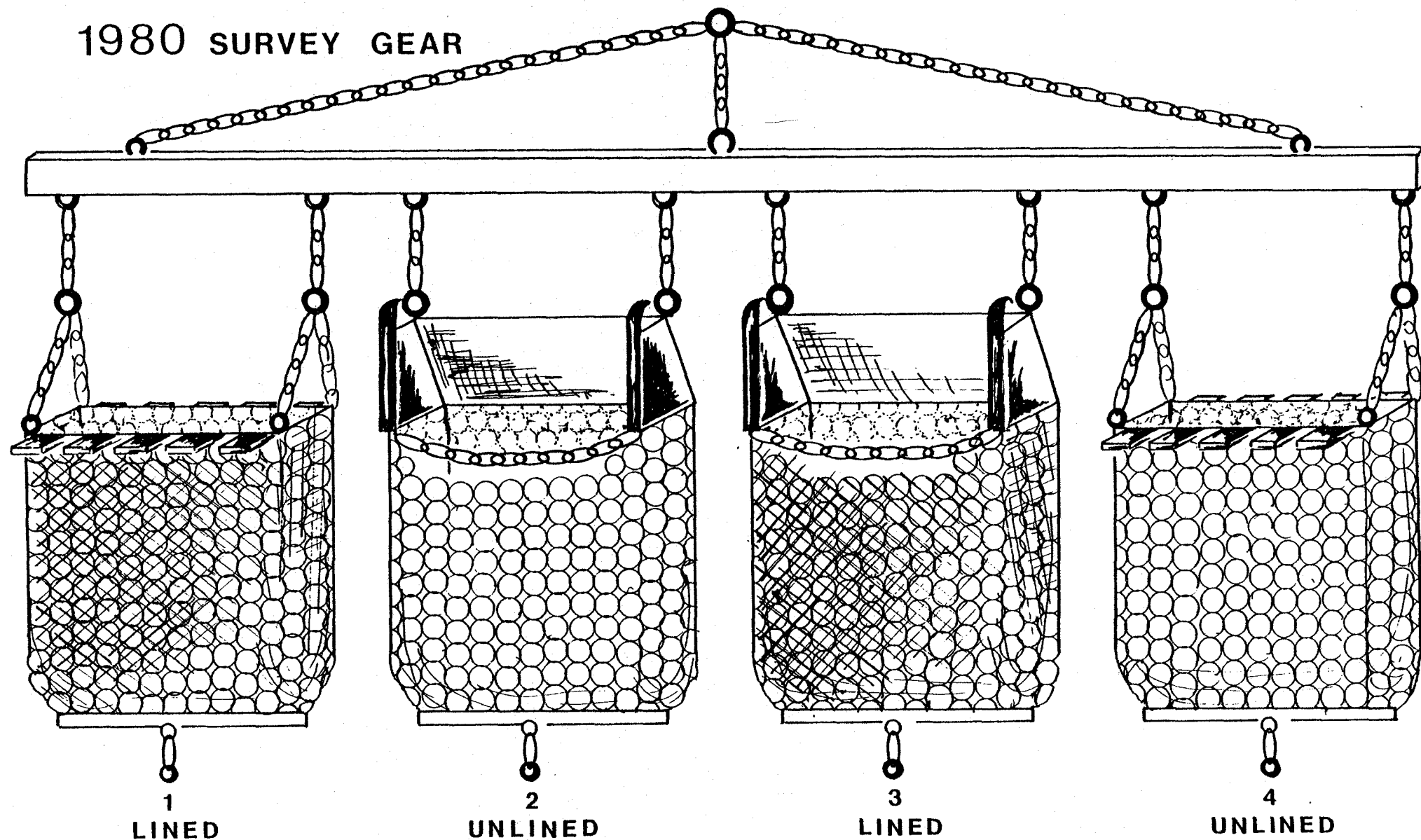


Fig. 4: Resource survey station locations in the eastern Strait.
Numbers are area designations.

1980 SURVEY GEAR



1 & 4 : Gulf Rock Drags (toothed)
2 & 3 : Gulf Mud Drags (chain sweep) with Pressure Plate

Fig. 5: Gear used in the 1980 scallop resource surveys in the Northumberland Strait.

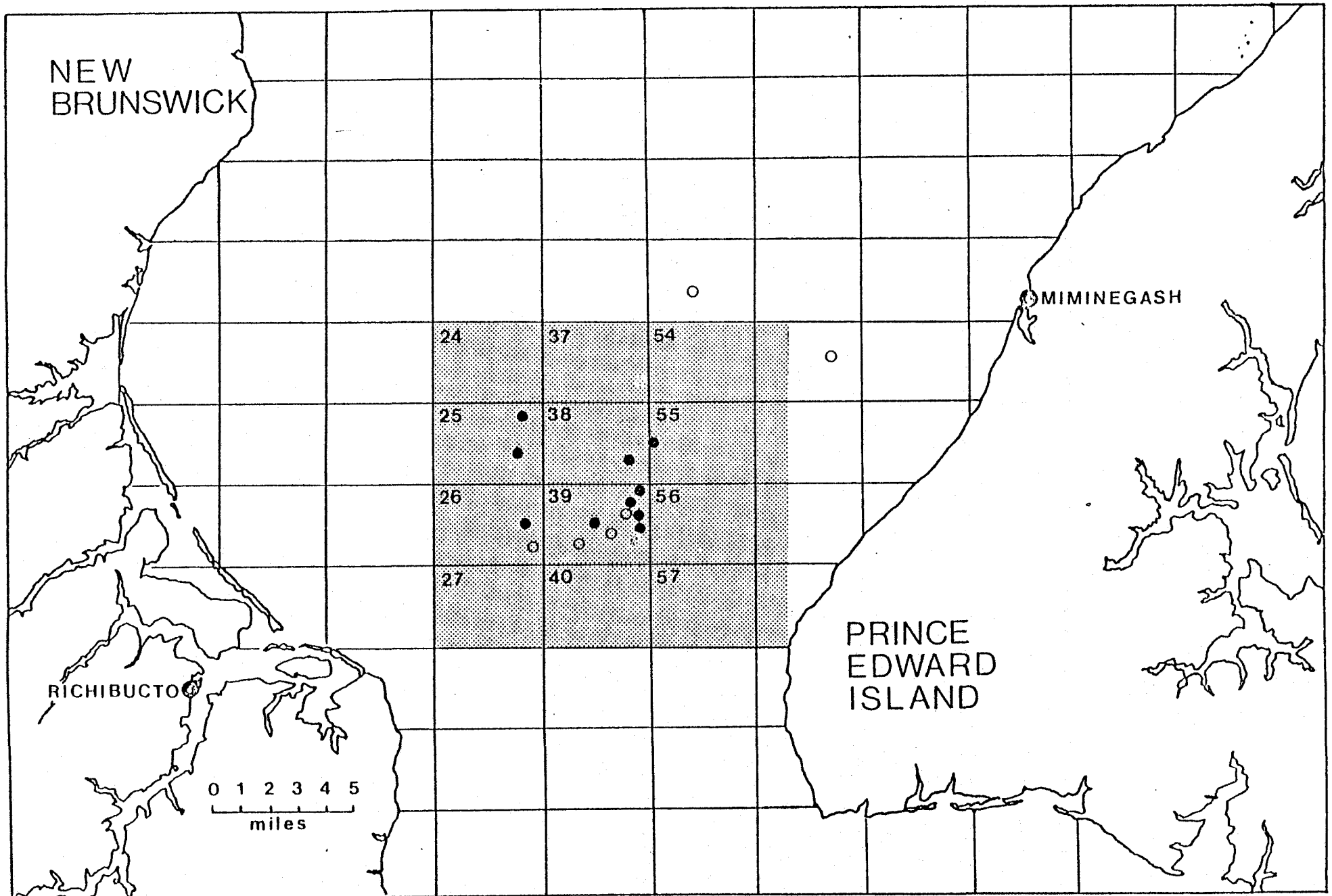
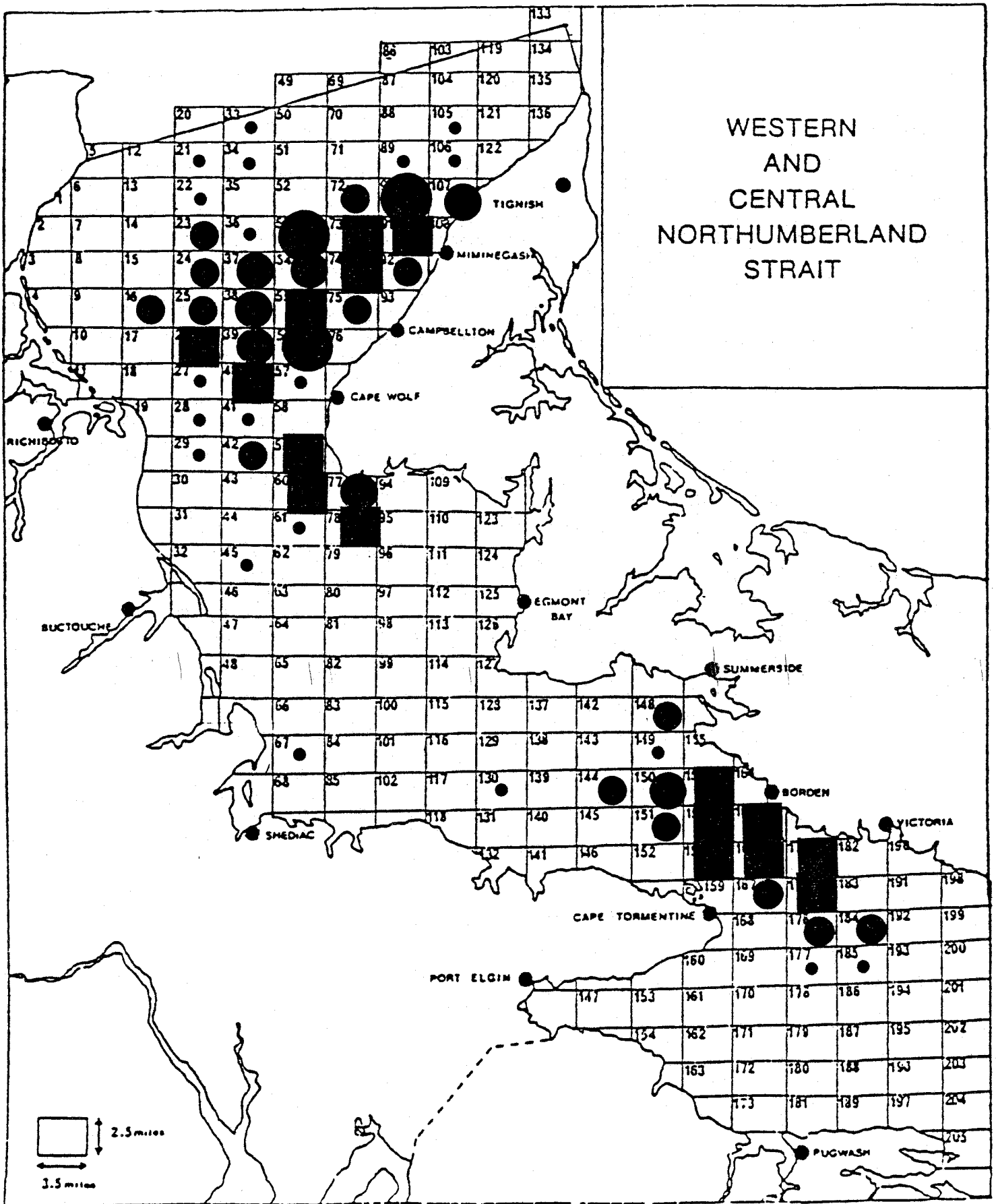


Fig. 6: Station locations in the western Strait where more than ten scallops less than age three were fished. Shaded area delimits the scallop fishing closure zone established on June 24, 1980.
 ●: New Brunswick charter; ○: P.E.I. charter.



WESTERN
AND
CENTRAL
NORTHUMBERLAND
STRAIT



Fig. 7: The geographical distribution and relative magnitude (% of total regional catch) of scallop catches in each area in the western and central regions of Northumberland Strait.

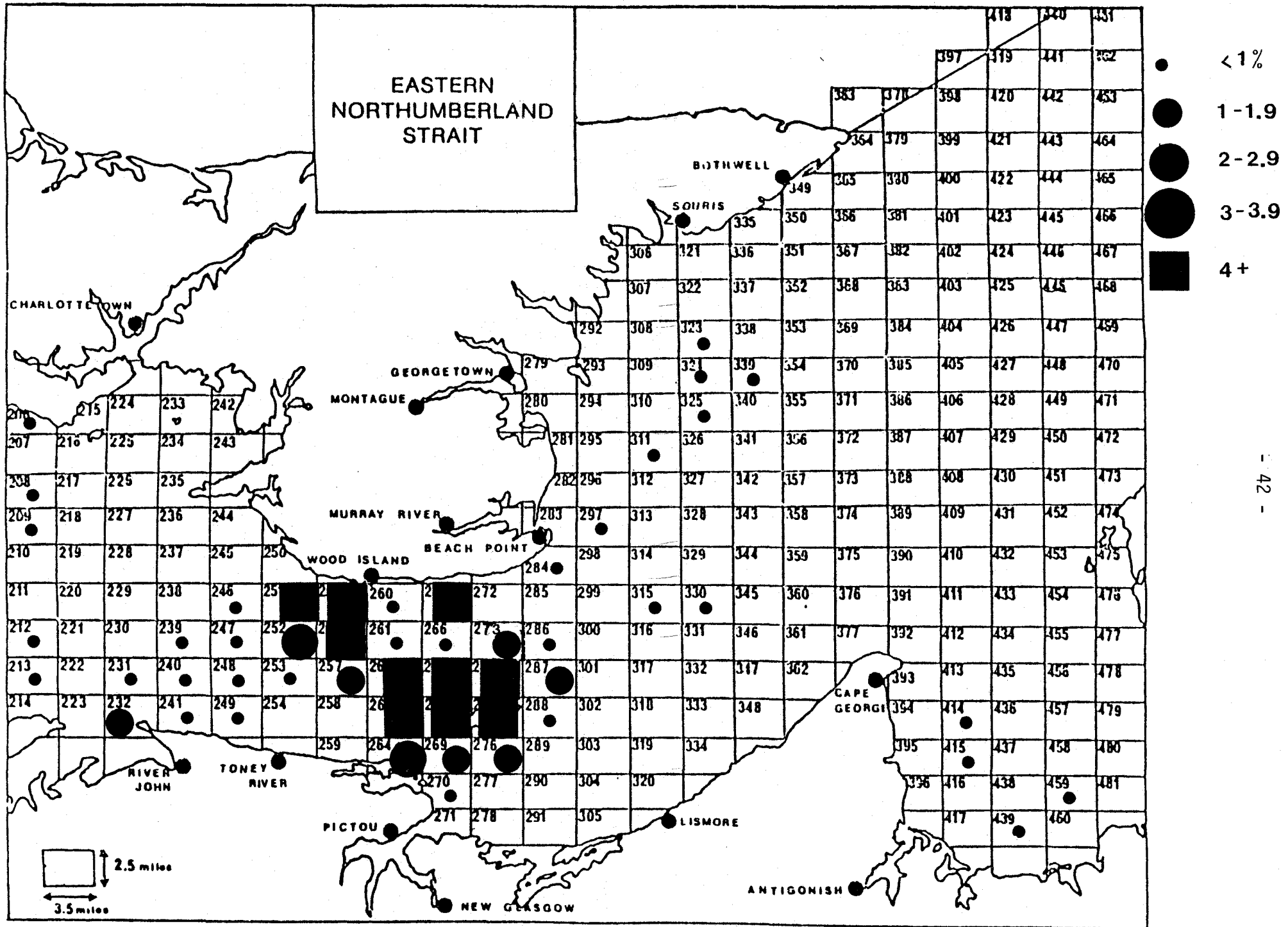


Fig. 8: The geographical distribution and relative magnitude (% of total regional catch) of scallop catches in each area in the eastern region of Northumberland Strait.

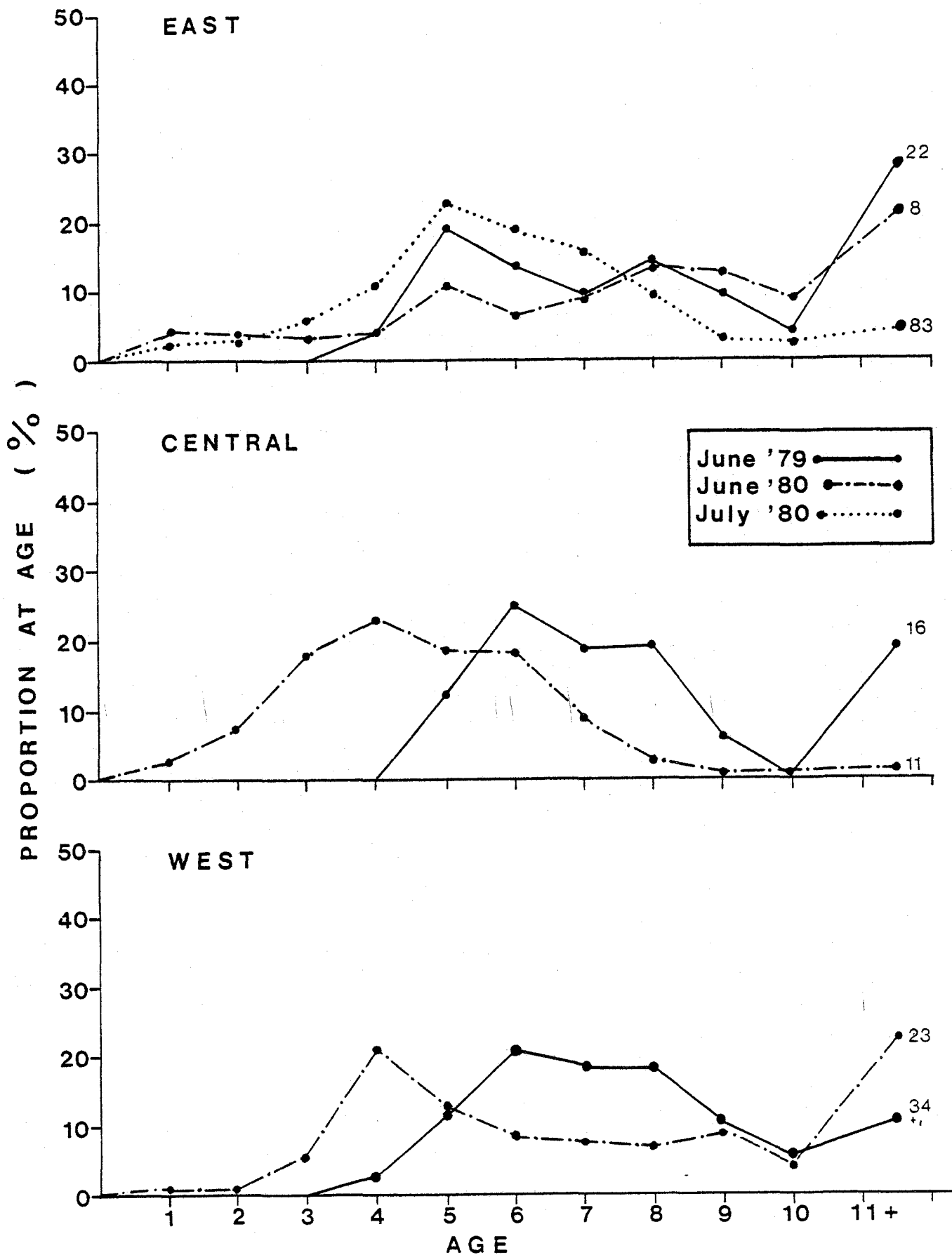


Fig. 9: The monthly age frequencies of scallops as landed on vessels in commercial fishing in Northumberland Strait.

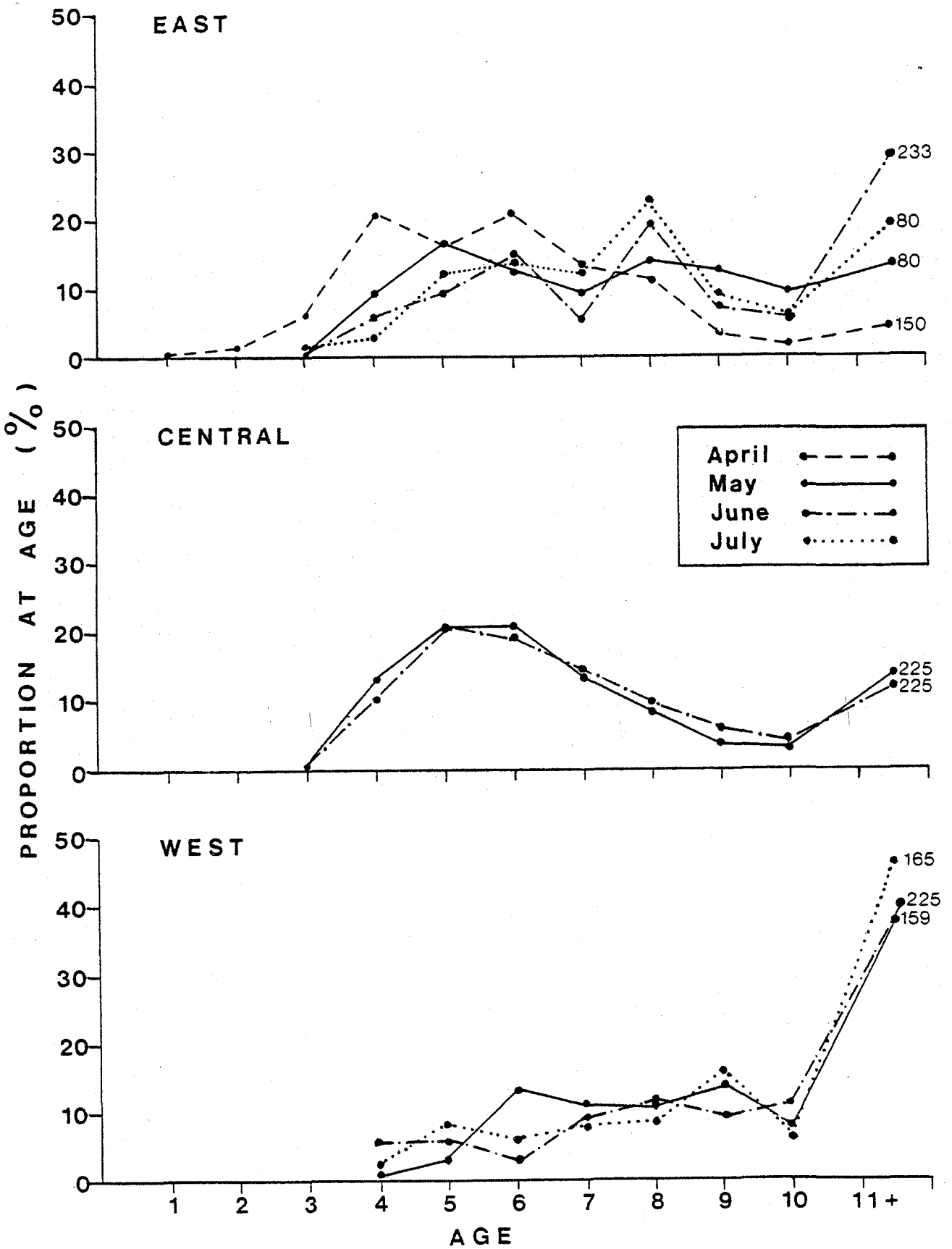


Fig. 10: The monthly age frequencies of scallops as landed at port in commercial fishing in Northumberland Strait. Values = number of scallops.

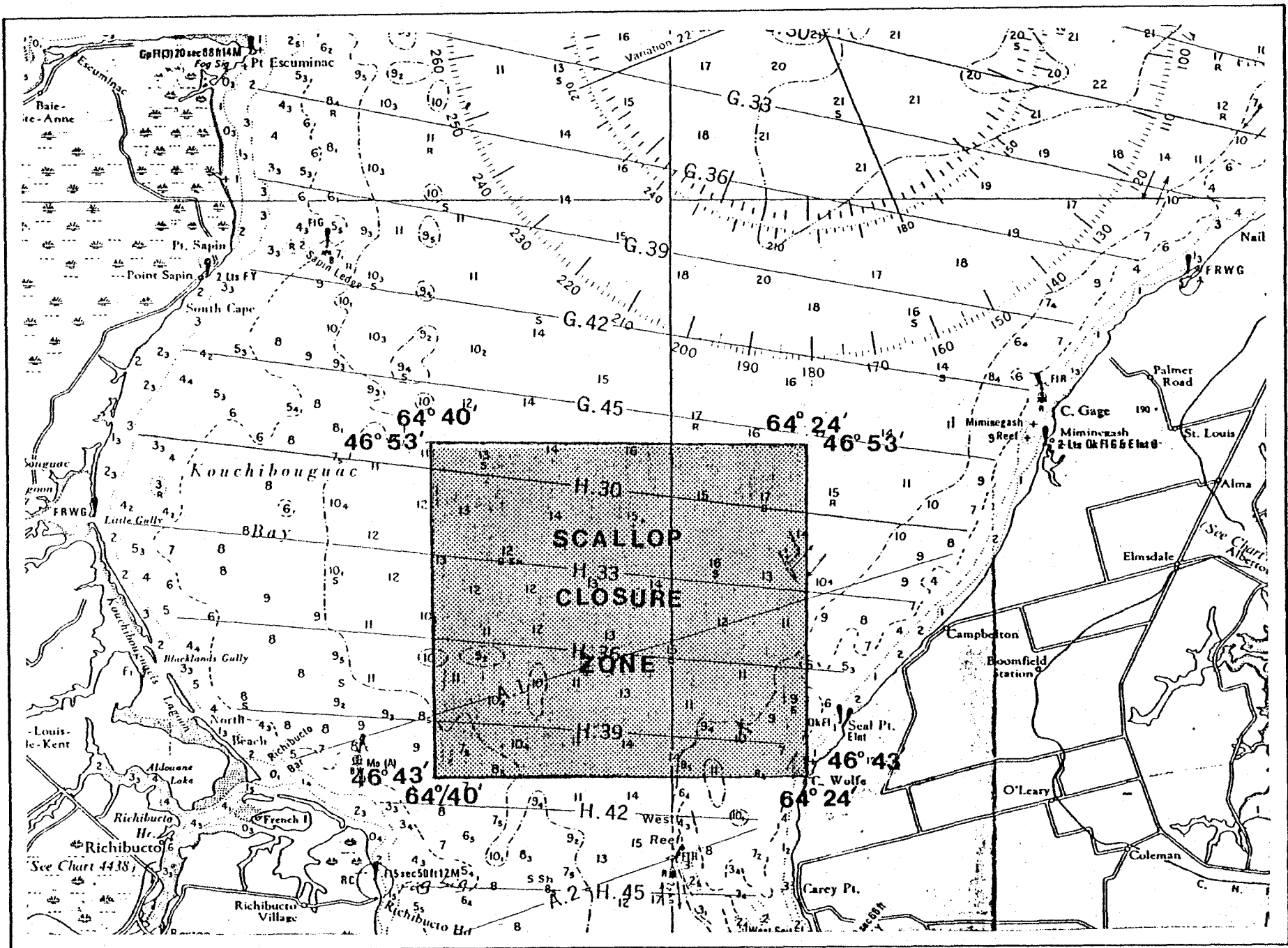


Fig. 11: The latitudes and longitudes of the scallop closure zone established on June 24, 1980, in the western region of Northumberland Strait.