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### **Brier Island Revisited: A 1991 Scallop Stock Status Report**

by

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## ABSTRACT

In the summer of 1991 the scallop beds in the lower Bay of Fundy were fished by the Bay of Fundy scallop fleet. These beds had not been targeted since 1985 and thus have been left "fallow" for 5 years. 136 t were landed by the 26 vessels for which data were available. Catches by the whole fleet may have been in excess of 400 t.

1991 research survey results indicate that the stock is numerically small with an extremely localized distribution. Small numbers of prerecruits were observed, as well as large numbers of older animals. This stock could probably yield similar landings in 1992.

## RÉSUMÉ

Au cours de l'été 1991, la flottille de pétoncliers de la baie de Fundy a pêché sur les gisements de pétoncles de l'avant-baie, qui n'avaient pas été exploités depuis 1985. Ces gisements sont donc restés en «jachère» pendant cinq ans. Les 26 bateaux à propos desquels on dispose de données ont débarqué 136 t de pétoncles. En réalité, toutefois, les débarquements totaux de la flottille pourraient dépasser les 400 t.

Les résultats de la campagne d'évaluation de 1991 révèlent que le stock est peu abondant et qu'il est très localisé. On a observé un petit nombre de pré-recrues ainsi qu'un grand nombre de pétoncles plus vieux. Ce stock pourrait sans doute produire des débarquements du même ordre en 1992.

## BACKGROUND

The scallop beds in the lower Bay of Fundy have never supported an extensive stable fishery, as have the beds off Digby, N.S. However, periodically, good recruitment has sustained short-term fishing on these grounds (Bourne 1964).

The scallop beds below Brier Island and areas to the south above 43°40' N (Fig. 1), were heavily exploited in the 1950's and 1960's (Jamieson and Lundy 1979). In the 1970's, scallop fishing on these grounds was both minimal and sporadic, and the stocks were considered to have been depleted by the earlier over-fishing. However, at the end of the decade catches increased as both the offshore and Bay of Fundy fleets fished these beds. Most of this effort was incidental to concentrated effort expended on German Bank (4Xq) and beds south of Lurcher Shoal. Fishing continued in this fashion through to the end of 1986. As of January 1, 1987 following the Inshore/Offshore Agreement the Bay of Fundy fleet restricted its activities from north of latitude 43° 40' N. Coincidentally, fishing effort ceased in the Brier Island area and more southerly beds (Robert et al. 1988). In 1987-88, exceptional catches in the inshore Bay of Fundy fishing grounds kept the fleet in the Digby area. The Digby stock has continued to provide fishermen with high catches through to 1989. However, in 1989, after a three year hiatus, the fleet once again became mobile. At that time, the inshore Digby scallops suffered a mass mortality and the fleet moved across the Bay to exploit scallop beds off Cape Spencer, N.B. and surrounding areas (Kenchington and Lundy 1991). However, with the decline of the New Brunswick beds the fishermen once again began to consider the Brier Island stocks as a supplement to the Digby catches. In May of 1991 most of the fleet moved off the Digby grounds to the Brier Island beds and areas in the upper reaches of Lurcher Shoal. A large proportion of the fleet fished there until the opening of the inside fishing zone off Digby in October, 1991.

The Department of Fisheries and Oceans has conducted three surveys of the Brier Island stocks. Surveys were conducted in 1982 and 1983, and again in 1991.

This document presents data on scallop abundance on the Brier Island grounds, and information on catches and fishing effort related to this stock.

## METHODS

### Fishery Data

Fishing effort is calculated using data from two main sources: logbooks and sales slips.

Captains of all scallop vessels over 25.5 G.T. are legally required to maintain logbooks. Logbooks provide information on catch location and effort. While many small vessel operators (less than 25.5 G.T. and/or under 14 m L.O.A.) provide log information, they are not required to do so by law. Vessel compliance with log regulations has been very poor over recent years; only 28% of the Bay of Fundy licensed vessels over 25.5 GT submitted logs in 1991 (Kenchington and Lundy 1992 ).

Fleet activity has also been monitored through sales slip records and port sampling information. All logbooks and sales slips recording catches from NAFO sub-area 4Xq (Fig 2) were used to estimate landings. In addition some sales slips which recorded location as NAFO sub-area 4Xr but identified the product as "Lurcher meats" were included in the landing estimates. Strict use of the NAFO sub-areas is inappropriate as the NAFO boundary divides these fishing grounds (Fig. 2).

## Survey Procedures

The 1982 and 1983 stock assessment surveys were catch stratified (Robert et al. 1985). 42 and 30 tows respectively, were completed in late September and early October in these surveys.

In 1991 a uniform 2 mile interval grid system was set over Brier Island Ledge and Lurcher Shoal (Fig. 2). This system was used because no log information was available with which to catch stratify the grounds. At each grid intersection a tow was made, provided the bottom was suitable. 59 tows were made in this way.

The research vessel "J.L. Hart" was used to carry out the survey. Four gang Digby gear with alternating lined (38 mm stretch mesh shrimp netting) and unlined buckets was used. Lined gear is used to retain the smaller scallops ("prerecruits" < 4 years old). The unlined gear is equivalent to commercial gear and retains larger animals. At each station the catch per bucket (live animals plus clappers (dead paired shells)) was weighed and the number of animals in 5 mm increment shell height classes was recorded. Live animals were processed separately from clappers. The data were prorated to 4-gang catches and 800 m tow distance to compare with historical data from the earlier surveys, and to 7-gang catches and 800 m tow distance to provide comparison with the Bay of Fundy (Digby) survey. Only data from the inside lined bucket and the outside unlined bucket were used. The number of 2 - 4 year olds from the lined bucket were added to the number of 5+ year olds from the unlined bucket to give a single catch value.

Spatial distribution of the scallops was contoured using ACON 5.01 (Black 1988) derived from Delaunay triangles and inverse distance weighted interpolation (Watson and Phillip 1985) as detailed in Robert et al. (1990). Values for input were obtained from the 7 gang proration. Volume estimates were calculated separately for the two areas. The resulting "volume" estimates (i.e. abundance integrated over area) are less accurate in areas of low station densities (Fig. 2).

## Biological Data

Very little is known of the growth and meat yield of this stock. Robert et al. (1986) reported a von Bertalanffy growth curve for this area based on 566 animals. The parameters of this curve are as follows:

Asymptotic Shell Height (mm)	$t_0$	k
155.775	1.2231	0.1755

This curve was used to estimate the ages of the 1991 survey catch.

Meat count per area, and catch composition were collected by a port sampler. 500 g meat samples were collected from the vessels as they landed. Individual meat weights and numbers were recorded from each sample. Port sampling was conducted from May through to November 1991.

## RESULTS

### Fishery Performance

Data from 26 boats were obtained from logbook and sales slip sources (Table 1). From 1979 to 1987 landings ranged from 11 t in 1985 to over 350 t in 1981. In 1979 through to 1982, CPUE was high for one or both NAFO sub-areas (Table 1). However CPUE began to decline in 1983 and continued to decline through to 1987 when fishing ceased, except for NAFO sub-area 4Xq which had exceptional CPUE in 1986. In 1991 CPUE was between 3 and 6 kg/hm which is comparable to the 1991 CPUE for the outside fishing zone in the Bay of Fundy (Kenchington and Lundy 1992). Unlike previous years (prior to 1987) where log coverage was over 90%, the landings data for 1991 only represents a quarter of the fleet activity. Even with only a quarter of the data, the documented 136 t represents an average catch for this area. The actual catch may be as high as 400 t or more if the fishing behaviour of the 26 vessels for which data is available is representative of the whole fleet. This represents the highest catch on record for the Digby fleet in this area, and makes this stock the most lucrative scallop fishing grounds outside of the traditional beds in 1991. Most of this catch was landed in Digby, N.S. (statistical district 38) which further complicates the separation of the landings (Kenchington and Lundy 1992). Landings in statistical district 34 (Yarmouth, N.S.), while low, show an increase of 500% from 1990 values, indicative of the increased effort in this area.

Only minimal data are available on the meat size distribution for this area in 1991 (Table 2). Meat weights were small, with mean values ranging from 8 to 15 g giving relatively high meat counts. The meat count regulation for this area is 72 meats / 500g and this was met according to the available data. These low yield values are probably reflective of slow growth of the scallops on these beds.

### Stock Survey

The average number of scallops at age caught in the 1991 stock survey are given in Table 3. Both survey areas show higher than average numbers of prerecruit scallops. The beds immediately below Brier Island (Fig. 3) have a healthy number of 2 year olds, whereas further south, below Lurcher Shoal greater numbers of 3 year olds were found. These animals may be from the same year class. Not enough data was available to calculate separate growth curves with any degree of confidence. The growth rate below Brier Island may well differ from beds further south. Nevertheless, the numbers of prerecruits are higher than those observed on the traditional beds off Digby (Kenchington and Lundy 1992) and may indicate that effort will be continued in this area in 1992.

There has been a change in the age class distribution of scallops since the 1982 and 1983 surveys (Fig. 4). At that time greater numbers of older animals were found, with very few prerecruits. In 1991 animals of all ages were caught with higher numbers of prerecruits and recently recruited animals. Nevertheless age 10+ scallops are the most abundant class in the Brier Island area. This change in age structure may be related to the decrease in fishing pressure in this area, however the survey data is not accurate enough to test this hypothesis.

Abundance estimates were derived from the survey data by calculating volumes under the contoured surface (Table 4). Subtriangulation of the surface may be used as an interpolation technique to smooth the contours, hence adding refinement to the volume estimates. Figure 3 shows the contoured distribution of scallops on an age basis. Unlike the beds off Digby, the scallops are not uniformly distributed within the survey area. There appears to be localized beds within each survey area where scallops of all ages are more abundant. The greater number of prerecruits in these areas compared to the beds off Digby is evident (Table 4). The number of clappers was 1%. This is lower than the long-term average of 3% for the Digby area prior to the

mass mortality event (Kenchington and Lundy 1991).

#### SUMMARY

Landings for the 1991 fishing season for the Brier Island and more southerly beds were relatively high. This is the first time that the Bay of Fundy fleet has fished in this area since 1986. 136 t were documented as being landed from these grounds. Landings could be as high as 400 t since the documented landings came from only 28% of the fleet. This stock(s?) provided the largest supplement to the landings from the traditional beds off Digby. The Brier Island beds were previously surveyed in 1982 and 1983 (Robert et al. 1985). At that time, few prerecruits were observed and the age structure was dominated by older animals. In 1991 abundance of recruited age groups was more uniform with a sizeable quantity of prerecruits. The spatial distribution of these animals was different from the even distribution observed off Digby. The animals of all ages seemed to be localized within the beds. The declining landings within the Bay of Fundy and the healthy status of this stock may lead to continued fishing on these grounds in 1992.

#### REFERENCES

- Black, G.A.P. 1988. Ms. ACON- A shaded contour program for plotting irregularly spaced data. (Version 4.18). 50pp.
- Bourne, N. F. 1964. Scallops and the offshore fishery of the Maritimes. Bull. Fish. Res. Bd Canada. 145: 60pp.
- Jamieson, G.S. and M.J. Lundy. 1979. Bay of Fundy Scallop Stock Assessment - 1978 Fish. Mar. Serv. Tech. Rep. 915: 14pp.
- Kenchington, E. and M.J. Lundy. 1991. 1990 Bay of Fundy Scallop Stock Assessment. Can. Atl. Fish. Sci. Adv. Comm. Res. Doc. 91/26: 28pp.
- Kenchington, E. and M.J. Lundy. 1992. 1991 Digby (Bay of Fundy) Stock Assessment. Can. Atl. Fish. Sci. Adv. Comm. Res. Doc. 92/41: 27pp.
- Robert, G., M.J. Lundy and M. A. E. Butler-Connolly. 1985. Scallop Fishing Grounds on the Scotian Shelf. Can. Atl. Fish. Sci. Adv. Comm. Res. Doc. 85/28: 45pp.
- Robert, G., M.J. Lundy and M. A. E. Butler-Connolly. 1986. Scallop Fishing Grounds on the Scotian Shelf - 1985. Can. Atl. Fish. Sci. Adv. Comm. Res. Doc. 86/41: 43pp.
- Robert, G., M.J. Lundy and M. A. E. Butler-Connolly. 1988. Scallop Fishing Grounds on the Scotian Shelf - 1987. Can. Atl. Fish. Sci. Adv. Comm. Res. Doc. 88/22: 40pp.
- Robert, G., M. A. E. Butler-Connolly and M.J. Lundy. 1990. Bay of Fundy scallop stock assessment - 1989. Can. Atl. Fish. Sci. Adv. Comm. Res. Doc. 90/31: 35pp.
- Watson, D.F. and G.M. Phillip. 1985. A refinement of inverse distance weighted interpolation. Geo-Processing 2: 315-327.

Table 1.- Fishery characteristics for the outer reaches of the Bay of Fundy (NAFO 4Xr) and German/Lurcher (NAFO 4Xq) for the Bay of Fundy fleet. Catches are in t of meat and CPUE pertains to Class 1 catch only. Following the Inshore/Offshore Agreement of 1986 the Bay of Fundy fleet is to restrict fishing activities in NAFO 4Xq above latitude 43°40'. Data prior to 1991 from Robert et al. (1988).

Year	Number of Vessels	4Xr			4Xq			Total log catch
		Log catch	Class 1 catch	CPUE (kg/hm)	Log catch	Class 1 catch	CPUE (kg/hm)	
1979	38	0.05	0.05	4.72	258.25	182.37	25.64	258.30
1980	37	135.31	119.05	12.05	89.91	65.96	10.17	225.22
1981	44	179.23	174.71	10.64	185.51	125.57	8.75	364.74
1982	45	161.25	155.06	7.52	119.11	78.11	6.33	280.36
1983	27	35.24	30.86	5.13	32.30	16.76	2.82	67.54
1984	29	24.90	23.96	3.12	32.90	25.29	3.30	57.8
1985	14	9.71	9.61	3.42	1.45	0.30	0.71	11.16
1986	32	2.11	2.11	1.19	34.62	22.41	20.66	36.73
1987	1	0.00	0.00	0.00	0.41	0.41	7.09	0.41
1988	-	-	-	-	-	-	-	-
1989	-	-	-	-	-	-	-	-
1990	-	-	-	-	-	-	-	-
*1991	26	47.42	26.88	3.24	39.94	25.88	5.62	**136.06

\*Preliminary

\*\*Sales Slip Catch

Table 2.- Characteristics of the 1991 meat size distribution in the commercial fishery while fishing below Brier Island and above latitude 43°40'.

Month	Meat weight (g)				Sample size (n meats)	Meat count per 500 g
	Mean	Min	Max	S.E.		
May	14.9	7.2	42.7	0.7	74	33.6
June	7.9	2.4	41.3	0.1	1260	63.1
July	10.1	3.4	37.0	0.3	437	49.6
August	8.5	4.1	28.0	0.3	134	58.9



Table 3.- 1991 stock survey. Average number of scallops at age caught in a seven-gang Digby drag projected from an end, unlined bucket for recruits (age >4 years) and from a centre, lined bucket for prerecruits (age ≤4 years).

	Age (years)									Total	No. of Stations	
	2	3	4	5	6	7	8	9	10+			
Brier Island Survey												
Below Brier Island	26	9	5	6	9	5	3	5	30	98	35	
Below Lurcher	12	42	7	24	52	22	5	1	8	173	24	

Table 4.- Surveyed areas (km<sup>2</sup>) of the nontraditional Bay of Fundy fleet fishing grounds. The area has been subdivided: Brier Island area and Lurcher area. Survey catch-rates (n are in 10<sup>6</sup>) on an age basis have been derived by volume calculations (smoothing interpolation technique with 16 subtriangles). Digby grounds are for comparison (Kenchington and Lundy 1992).

Area								
	Brier Island	Lurcher	Total					
	339.38	199.73	539.11					

Abundance	Age (years)							
	2	3	4	5	6	7	8	9
Brier Island	1.54	0.79	0.37	0.43	0.62	0.39	0.20	0.36
Lurcher	.50	1.92	0.38	1.56	3.71	1.58	0.26	0.05
Total area	2.04	2.71	0.75	1.99	4.33	1.97	0.47	0.40
Total area Digby grounds 1991	0.99	1.21	1.80	6.81	14.54	15.21	13.20	7.91

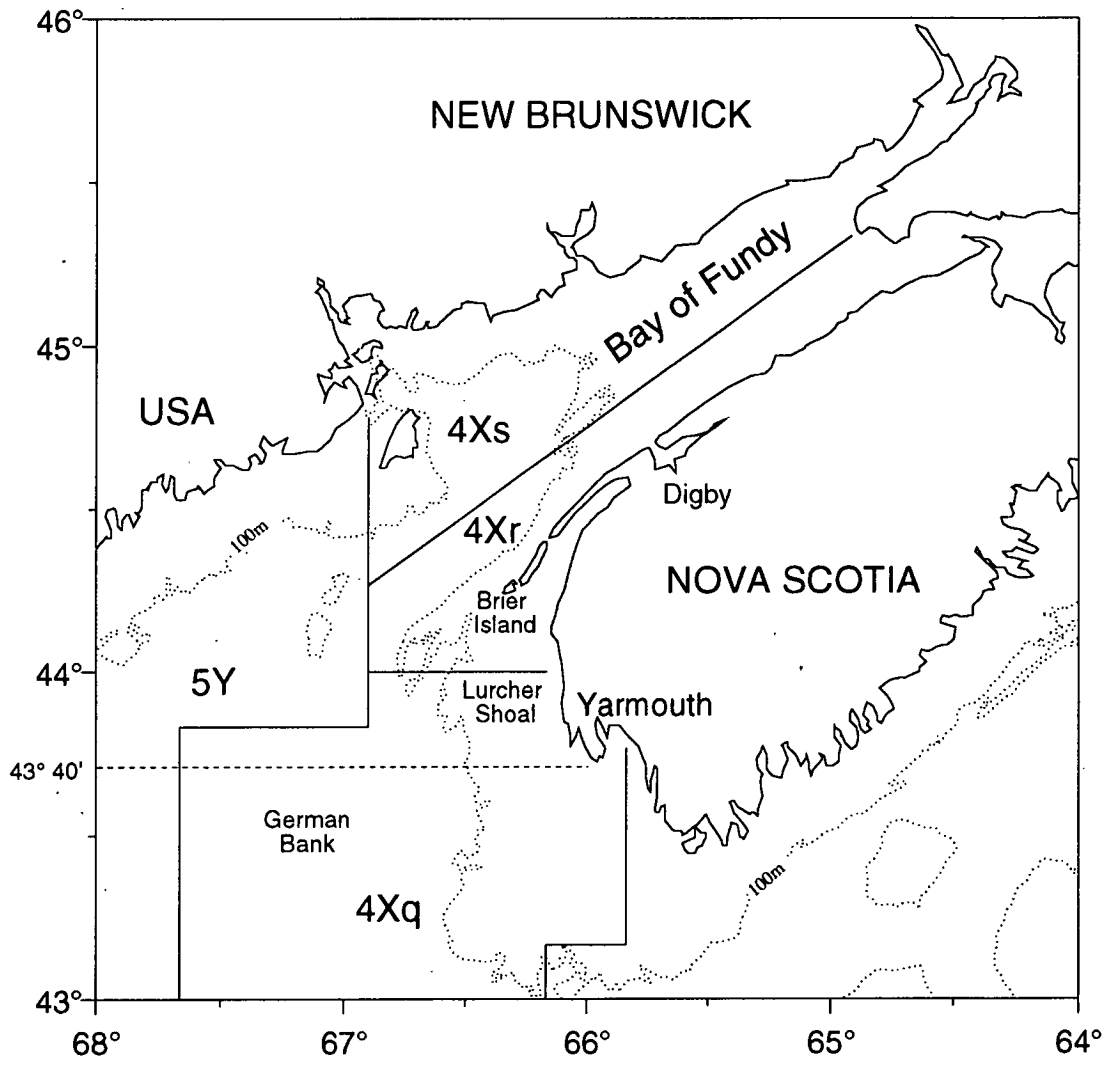


Figure 1.- Fishing grounds of the Bay of Fundy fleet with the NAFO subareas indicated. This fleet is restricted to grounds above latitude 43°40' N (dashed line).

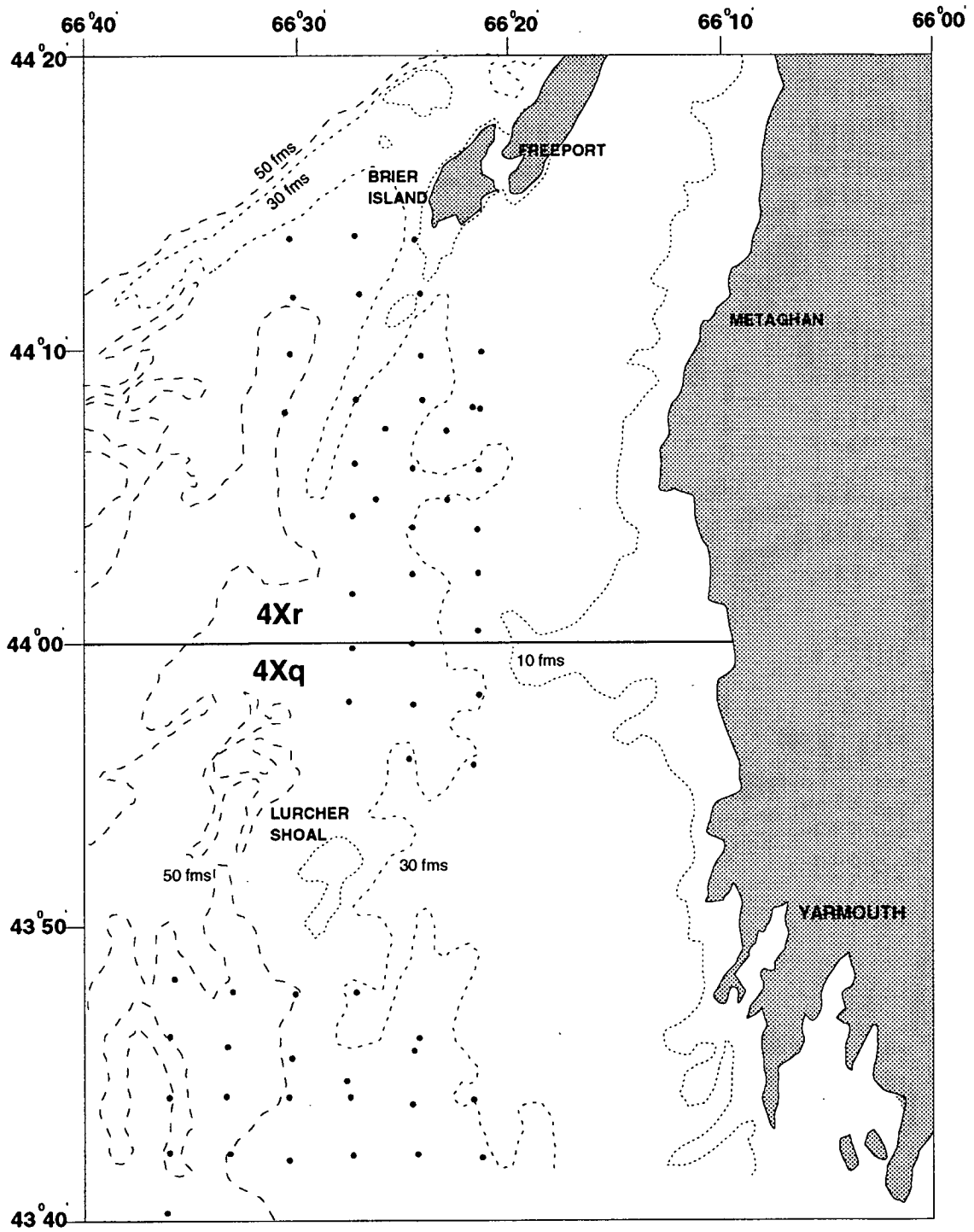


Figure 2.- Fishing grounds below Brier Island with the 1991 survey stations indicated by solid dots. NAFO subareas 4Xr and 4Xq are also indicated.

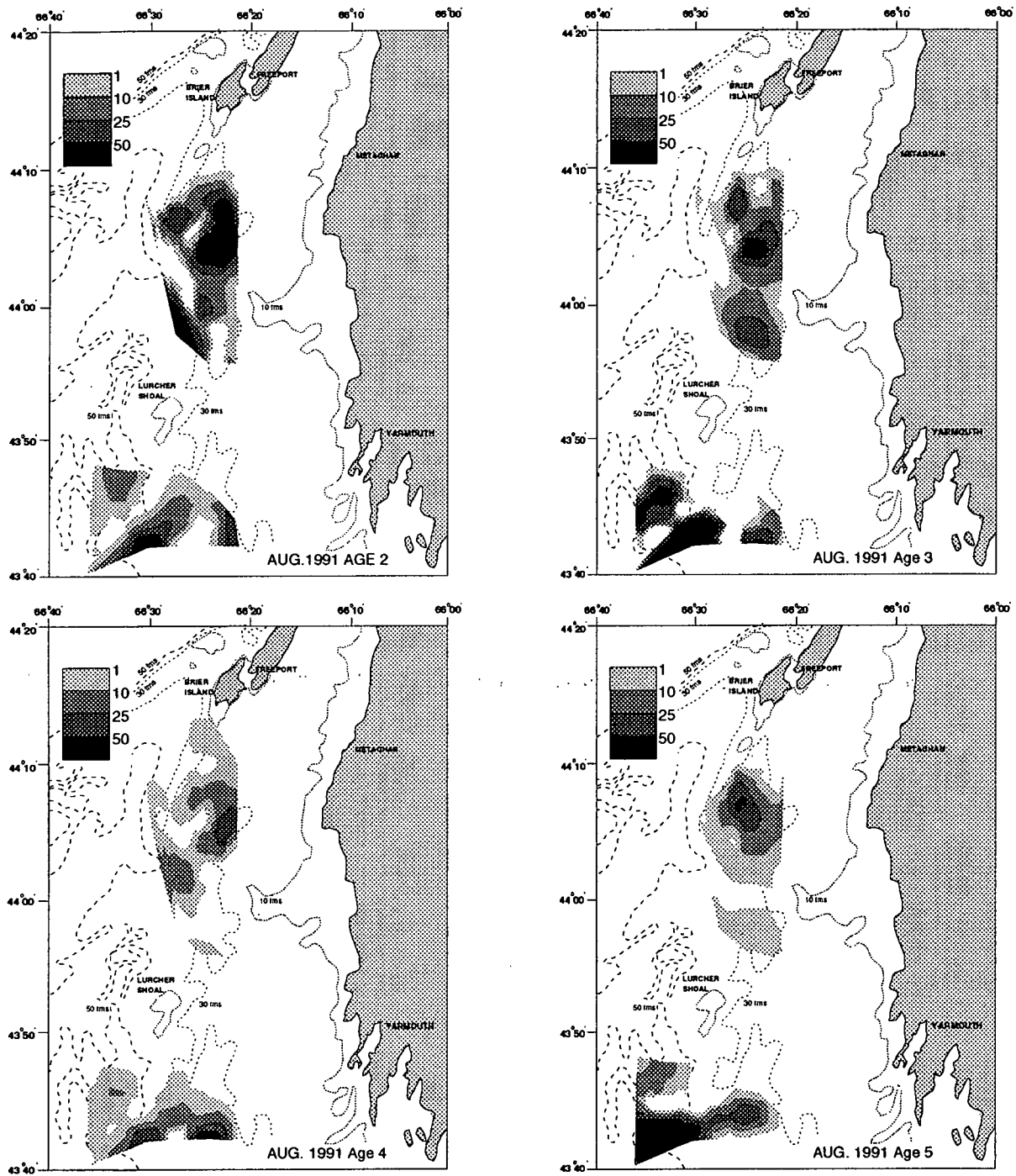


Figure 3.- 1991 survey catch rates. Scallop distribution on an age basis from abundance isopleths of survey data. Darkening shades of grey within isopleths refer to increasing number of scallops per standard tow (grey scale in upper corner of plot).

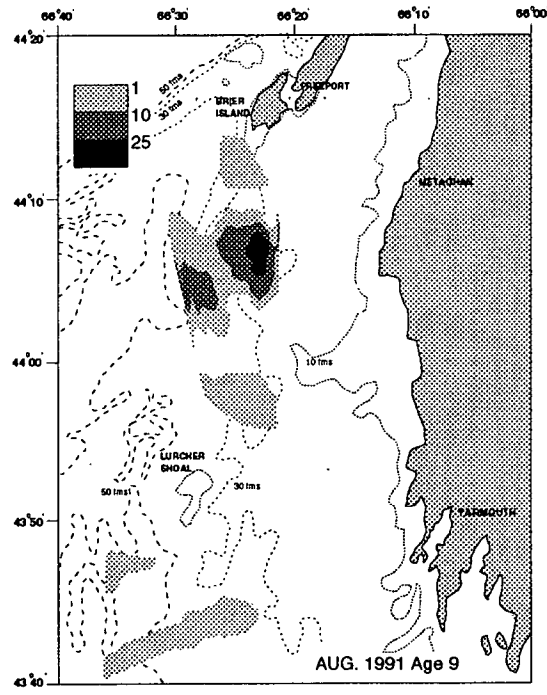
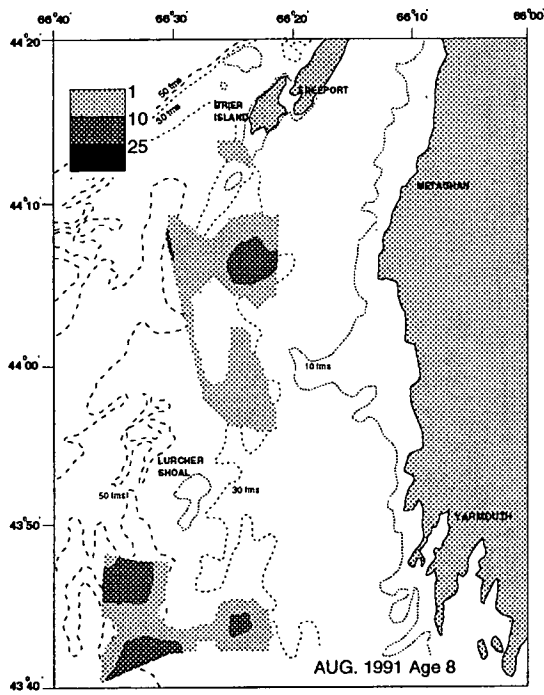
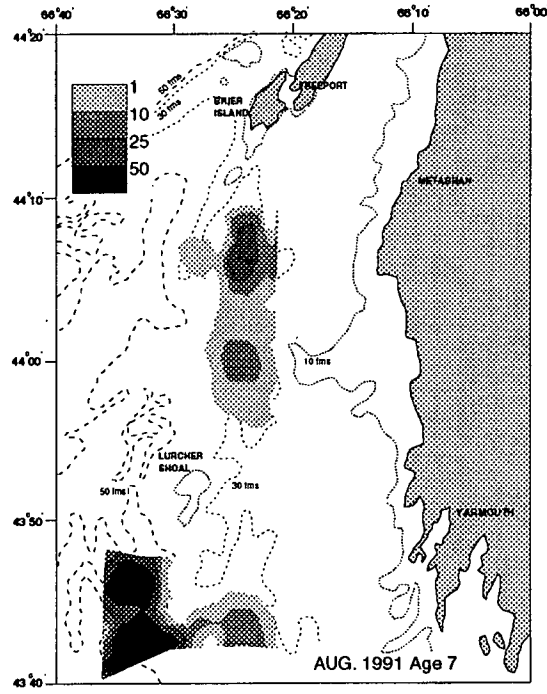
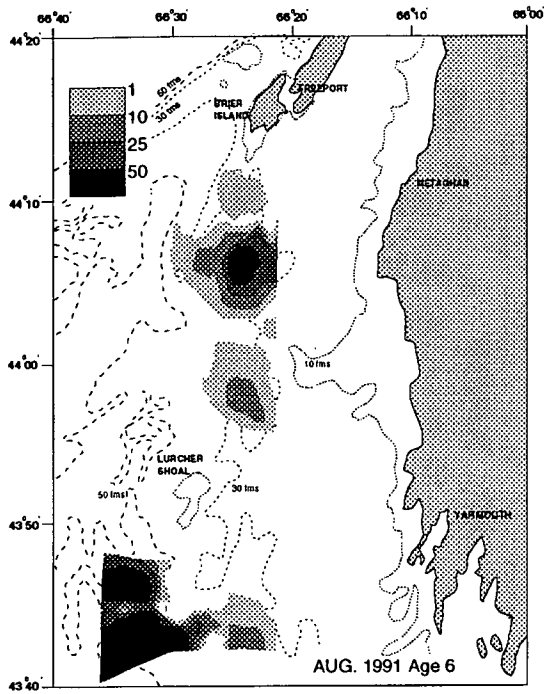


Figure 3.- Continued. 1991 survey catch rates.

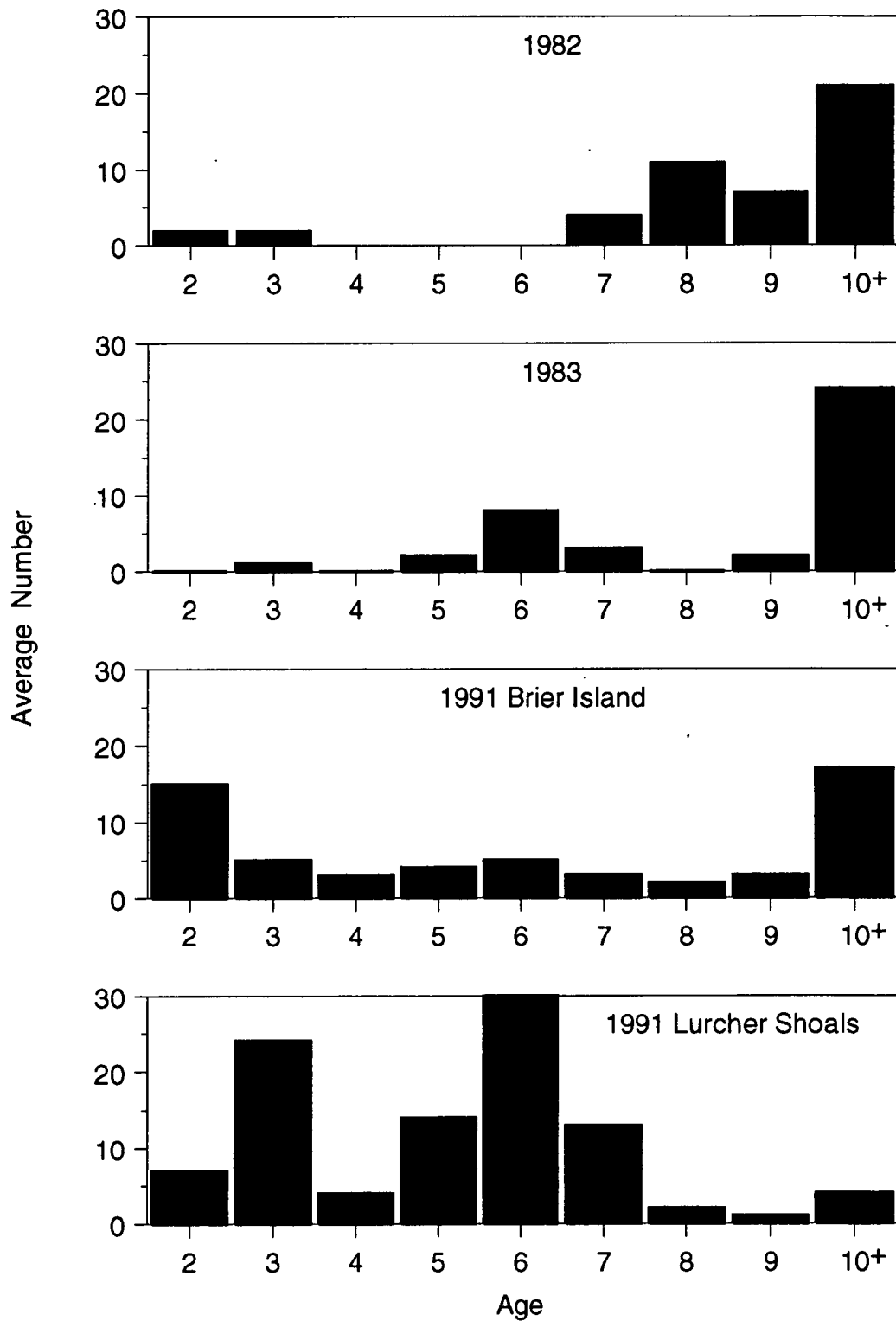


Figure 4.- Average number of scallops at age caught in a 4 gang Digby drag projected from an end unlined bucket for recruits (age > 4 years) and from a centre lined bucket for prerecruits (age < 4 years). Data of the 1982 surveys from Robert et al. (1985).