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Upper and Northern Bay of Fundy Scallop Surveys, 1986-87

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UPPER AND NORTHERN BAY OF FUNDY SCALLOP SURVEYS, 1986-87

by

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ABSTRACT

Chandler, R. A., G. J. Parsons, and M. J. Dadwell. 1988. Upper and northern Bay of Fundy scallop surveys, 1986-87. Can. Tech. Rep. Fish. Aquat. Sci. 1665: iii + 37 p.

A survey was conducted to gather baseline data on populations, associated fauna, and biological parameters for sea scallop (Placopecten magellanicus) in the upper and northern Bay of Fundy. This primary survey was in response to recent vigorous commercial activity in an area that, historically, had contributed very little to total landings for the Bay of Fundy. Our catches were generally low but eight locations (25% of the stations) where scallops were concentrated (>5 kg round weight/tow) were identified. Meat yields of the Bay of Fundy decreased towards the head of the Bay, yet early growth was very rapid. A high scallop prerecruit (<75 mm shell height) abundance indicated good potential recruitment in some areas.

RÉSUMÉ

Chandler, R. A., G. J. Parsons, and M. J. Dadswell. 1988. Upper and northern Bay of Fundy scallop surveys, 1986-87. Can. Tech. Rep. Fish. Aquat. Sci. 1665: iii + 37 p.

Un relevé a été effectué pour recueillir des données de base sur les populations de pétoncles génants (Plecopecten magellanicus), la faune connexe et les paramètres biologiques dans le fond de la baie de Fundy et dans sa partie nord. Ce premier relevé a été exécuté comme suite à une pêche commerciale qui récemment s'était avérée assez active dans un secteur qui historiquement avait très peu contribué au total des débarquements pour la baie de Fundy. Règle générale, nos prises ont été faibles, mais nous avons cerné huit secteurs (25 % des postes) où se concentraient les pétoncles (> 5 kg poids brut par trait de chalut). Le rendement pour ce qui est de la chair de pétoncles dans la baie de Fundy était moins important dans le secteur du fond de la baie quoique la croissance ait été fort rapide dans les premières étapes du développement. Un taux d'abondance élevé du pétoncle avant le recrutement (taille du pétoncle de < 75 mm) laissait pressentir un bon taux de recrutement dans certains secteurs.

INTRODUCTION

Sea scallop (Placopecten magellanicus (Gmelin, 1791)) population assessments are routinely made in the Digby and Grand Manan areas of the Bay of Fundy (Jamieson et al. 1981; Dadswell et al. 1984; Robert et al. 1987), but no comprehensive scallop survey has been made in the upper (area A, Fig. 1) or northern (area B, Fig. 1) part of the Bay. In 1984-85, the area around Quaco Ledge and Ile Haute was heavily fished and, partly in response to this commercial activity, a survey was undertaken to determine scallop distribution.

High abundance of young scallops was reported by fishermen (W. Miner, pers. comm.) and researchers (Robert et al. 1987; pers. obs.) in most areas of the Bay of Fundy in 1985 and 1986, and we were particularly interested in their distribution and abundance in the upper Bay. As well, a substantial tagging program, primarily to study scallop movement and growth, was being conducted at that time and this cruise gave us an opportunity to increase our tag coverage.

During surveys in the Digby and Lurcher areas in the late 1960's, associated fauna caught in scallop drags were reported by Caddy (1970). We made similar observations and present some of the results here.

THE COMMERCIAL FISHERY

In the past, scallops had frequently been fished from deep water off Cape Spencer, N. B., but landings were low, especially in the upper Bay where they averaged <1 t of meats annually. During 1980, landings began to increase and, by 1984, the upper Bay was being heavily fished. At that time there were 14 vessels, all under 14 m and registered with "Cumberland" or 3-mi licences, fishing out of upper Bay ports (Robert et al. 1987). However, up to 70 boats, some from as far away as Grand Manan, fished the upper Bay at its peak in 1985 (D. Graham, pers. comm.) when catches at local ports reached 55.9 t of meats valued at $750,000 (Fig. 2, Table 1).

Five statistical districts are representative of the upper Bay of Fundy scallop landings: - districts 48 and 79 in New Brunswick, where St.

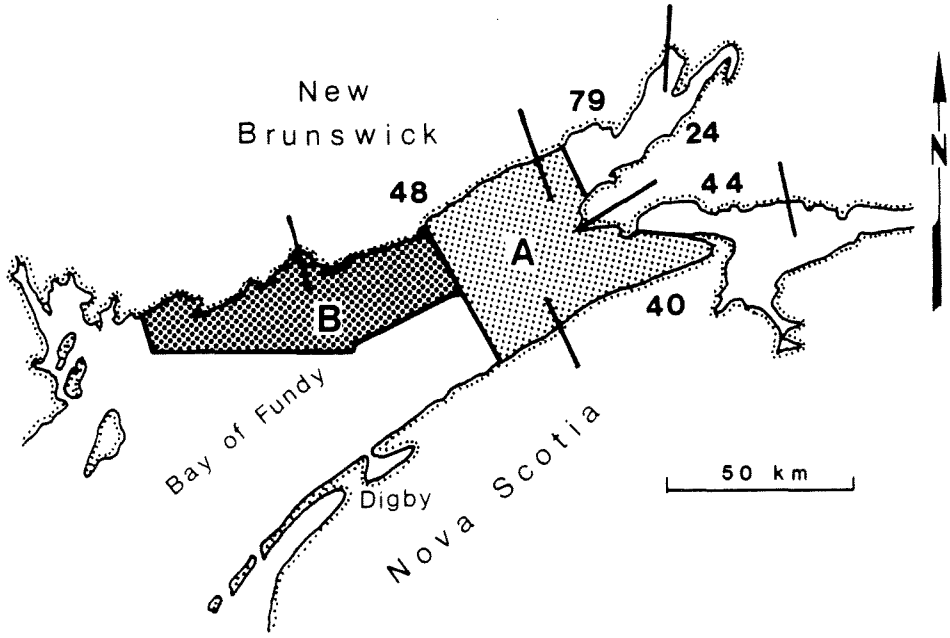

Fig. 1. Areas surveyed in upper Bay of Fundy (area A) in May and August 1986, and northern Bay of Fundy (area B) in June 1987. Also shown are the upper Bay of Fundy fisheries statistical districts (24, 40, 44, 48, 79).

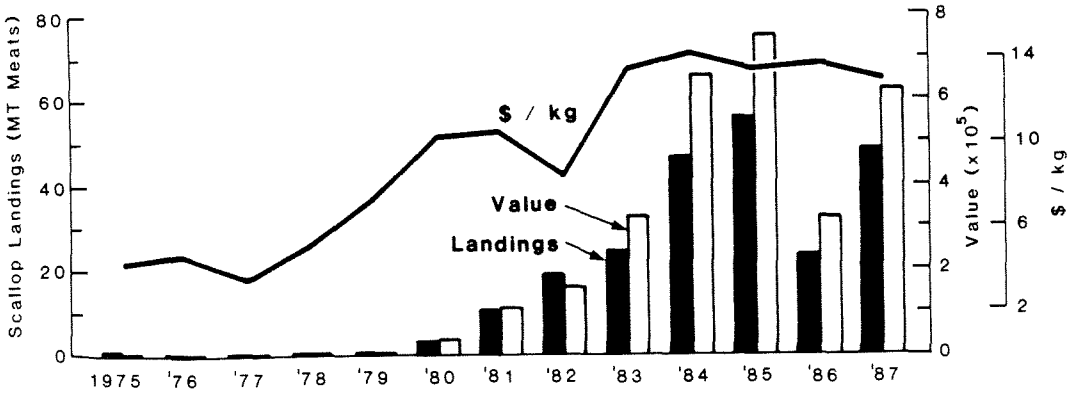

Fig. 2. Annual scallop landings and value for upper Bay of Fundy (statistical Districts 24, 40, 44, 48 and 79), 1975-87.

Table 1. Annual scallop landings (t meats) and value ($000) for upper Bay of Fundy statistical districts, 1975-87.

	Statistical District												
	48		79		24		44		40		Total		Price/
Year	L	V	L	V	L	V	L	V	L	V	L	V	kg
1975	-	-	-	-	-	-	0.64	2.80	0.31	1.36	0.95	4.16	4.38
1976	-	-	-	-	-	-	0.37	1.72	-	-	0.37	1.72	4.65
1977	-	-	-	-	-	-	0.07	0.25	-	-	0.07	0.25	3.57
1978	-	-	-	-	-	-	0.07	0.36	-	-	0.07	0.36	5.14
1979	-	-	-	-	-	-	0.16	1.14	0.14	1.05	0.30	2.19	7.30
1980	-	-	-	-	-	-	3.16	32.56	-	-	3.16	32.56	10.30
1981	0.19	1.90	1.33	13.11	-	-	8.95	94.57	0.17	2.05	10.64	111.63	10.49
1982	3.37	28	8.43	68	2.41	22	4.70	41	-	-	18.91	159	8.41
1983	5.06	76	12.53	167	0.24	2	6.51	80	-	-	24.34	325	13.35
1984	20.36	302	24.82	338	0.12	1	1.20	19	-	-	46.50	660	14.19
1985	27.71	380	26.87	351	-	-	1.33	18	-	-	55.91	749	13.40
1986	5.18	69	15.42	211	-	-	2.29	32	0.72	10	23.61	322	13.64
1987	10.25	127	15.78	204	3.61	20	21.07	268	0.60	7	48.19	626	12.99

Martins was home port for a large scallop fleet for several seasons, and districts 24, 40 and 44 in Nova Scotia (Fig. 1). Recent landings in these districts represent only a portion of the total catch from the upper Bay since a large number of Digby boats took part in the fishery and catches were landed at their home port (statistical district 38). Digby fishing logs (vessels >14 m) indicated that catch rates for the upper Bay varied from 4.48 to 17.00 kg per hour-meter (kg/hm) in 1985, depending on area fished (1.5-9.0 naut mi off Ile Haute), 3.00 kg/hm off Quaco Ledge in 1986 and 7.06 kg/hm for Ile Haute in 1987 (Robert, pers. comm.). The lack of fishing logs from upper Bay boats makes it difficult to determine their fishing performance; however, Robert et al. (1987) estimated that in 1985 and 1986, catch per vessel averaged 1630 kg and 1450 kg, respectively. By the time of our survey in May 1986, much of the earlier commercial activity had subsided and local landings dropped by 58% to 24 t of meats. During 1987, the catch rebounded to 48 t of meats.

METHODS

SURVEY

The survey consisted of three cruises using the Department of Fisheries and Oceans' vessel J.L. Hart. The upper Bay (area A) was surveyed in May 1986 (127 stations) and August 1986 (39 stations) and the northern side of the Bay (area B) from Quaco Head to Maces Bay in June 1987 (113 stations) (Fig. 3). The upper Bay was arbitrarily defined to the west by a line drawn from Port Lorne, N. S. to Quaco Head, N. B. A sampling grid with stations approximately 2 naut mi apart was established by using the Loran C main cross bearings on Canadian Hydrographic chart L/C4010 for area A and chart L/C4011 for area B. Commercial fishing areas in the upper Bay were identified from interviews with fishermen and fisheries officers and 27 extra tows were made in these areas by locating stations half way between the main "5930-x" Loran C cross bearing.

A tow of 8-min duration was conducted at each station using a four-gang Digby drag (Appendices 1a, 1b). Drag buckets were 76 cm wide and made of 75-mm rings knitted together with two rubber washers. The two inside drags were lined with 38-mm stretched mesh polypropylene netting. While towing, Loran C bearings were recorded every 30 s to determine distance and location. Mean tow length for all stations was 721 ± 27 m. Average calculated speed was 3 knots.

The total scallop catch from each bucket was weighed whole and shell height frequencies (in 5-mm shell height increments) recorded for live and dead (cluckers) individuals. Catches were averaged separately for the two lined and two unlined buckets and were each adjusted to a four-gang drag. This catch was then prorated to a tow length of 800 m (Robert et al. 1984) (Appendices 2a-d). Scallops <75 mm (shell height) are considered prerecruits, which approximates the shell height of the recently introduced regulation that prohibits harvesting scallops <3 in. (76.2 mm shell height) (Anon. 1987). Unlined drags caught 78% more recruits than lined drags. However, lined drags caught 41% more prerecruits than unlined ones. Therefore, the number of prerecruits was determined from catches in lined buckets and recruits were determined from unlined buckets (Robert et al. 1984). Similar gear behavior has been observed in several Bay of Fundy surveys (Jamieson and Lundy 1979; Robert et al. 1984; Parsons et al. 1987).

Samples of 30 scallops each (46-129 mm shell height range) were collected from six locations in the upper Bay and three in Minas Channel in May 1986, and from four locations off Cape Spencer in June 1987. Scallops were dissected on board, separated into meat (adductor muscle), gonad and remaining viscera, and then frozen. In the lab, the thawed tissues were weighed wet and reweighed after drying for 2 d at 85°C. Meat yields for a 90-mm shell height scallop were determined from shell height-wet meat weight regressions. Von Bertalanffy growth parameters were calculated (Allen 1967) for the upper and northern parts of the Bay using back-calculated growth rings. The

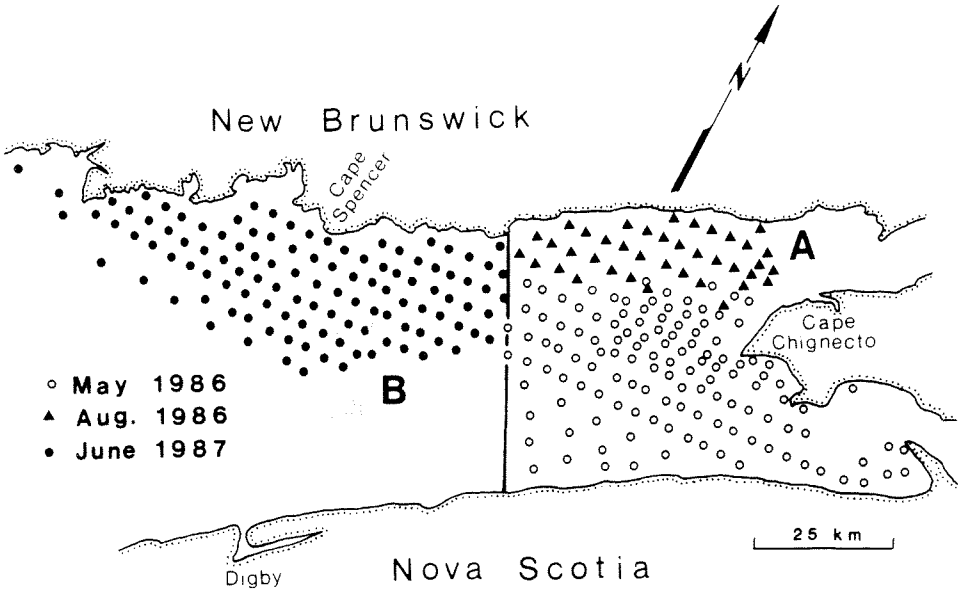

Fig. 3. Positions of tows made in area A in May (open circles) and August 1986 (closed triangles), and in area B in June 1987 (closed circles).

first annulus (approximately 25 mm shell height) represents shell growth attained by the second winter (i.e. 1.5 calendar years, approximately).

Bottom type and associated fauna were recorded for each tow. The associated fauna was quantified as follows: rare = 1-10 individuals, common = 11-100 individuals, and abundant = >100 individuals.

RESULTS AND DISCUSSION

Our catches generally reflected the low abundance of scallops reported by commercial fishermen in the upper Bay during 1986 and was demonstrated by the prorated weight of live scallops caught per tow in unlined drags (Fig. 4a). There were eight locations where scallops were concentrated and we have identified them by outlining areas or "beds" where tows exceeded prorated catches of 5 kg (Fig. 4b). Shell height frequencies for lined and unlined drags (Appendices 3a-h) and numbers of recruits and prerecruits per tow were calculated for these areas (Table 2).

CAPE CHIGNECTO BED

We made 15 tows on this bed (Appendix 1a; tows 4, 5, 7, 14, 15, 16, 17, 29, 33, 96, 138, 140, 141, 142, 147) which is located 4-5 naut mi northwest of Cape Chignecto and where a small fleet of local boats were fishing. The best catches in the upper Bay were from this bed and averaged 13.1 kg/tow (Appendix 2a).

Shell height frequencies for both lined and unlined gear show two modes of nearly the same magnitude at 50-55 mm and 115-120 mm, and a smaller one at 30-35 mm (Fig. 5, Appendix 3a). A fairly even catch of prerecruits (40/tow) and recruits (48/tow) (Table 2) indicated that this area had good commercial potential. Percent dead (number of cluckers/total number of scallops caught) for prerecruits and recruits were nearly the same, 10.4% and 10.8%, respectively.

Table 2. Average prorated number of scallop prerecruits (<75 mm shell height) and recruits caught per tow by area. Recruit abundance was calculated using catches from the unlined gear and prerecruits from the lined gear.

Area	Prerecruits	Recruits
Cape Chignecto bed	40	48
Advocate Bay bed	82	52
Scots Bay bed	1	52
Ile Haute bed	3	58
East Quaco bed	35	55
West Quaco bed	18	55
Cape Spencer inshore bed	150	125
Cape Spencer offshore bed	274	90
Upper Bay of Fundy	9	11
Northern Bay of Fundy	87	37

Bottom type was predominantly sand with a mixture of mud and shell gravel. Small boulders were common and the bryozoan Flustra foliacea was abundant (Fig. 8a). Depth averaged 36 m.

ADVOCATE BAY BED

Five tows were made in Advocate Bay but only one area (Appendix 1a; tow 30) had sufficient catch (20.6 kg) for commercial exploitation. High abundance of small scallops in several areas in the Bay were reported by fishermen (L. Fletcher, pers. comm.) and divers (K. Stokesbury). This was confirmed by our survey. We found a strong mode at 50-60 mm (Fig. 5, Appendix 3b). Number of cluckers was low, 2.6% for prerecruits and 7.7% for recruits. Catches suggested good commercial potential in this area.

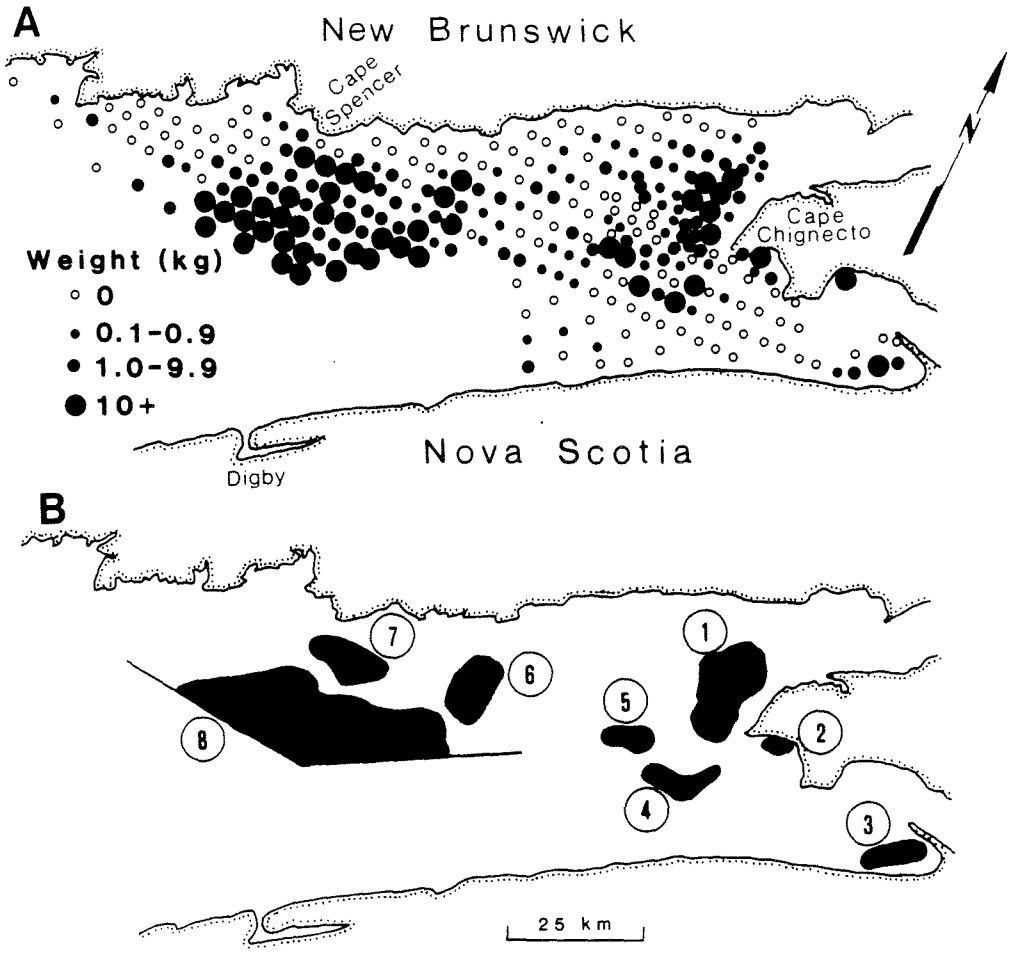

Fig. 4a. Scallop distributions prorated to reflect weight of whole scallops/ 800-m tow for 4 gang unlined drag.

4b. Location of scallop concentrations where prorated catches exceeded 5 kg: 1. Cape Chignecto bed, 2. Advocate Bay bed, 3. Scots Bay bed, 4. Ile Haute bed, 5. East Quaco bed, 6 West Quaco bed, 7. Cape Spencer inshore bed, 8. Cape Spencer offshore bed.

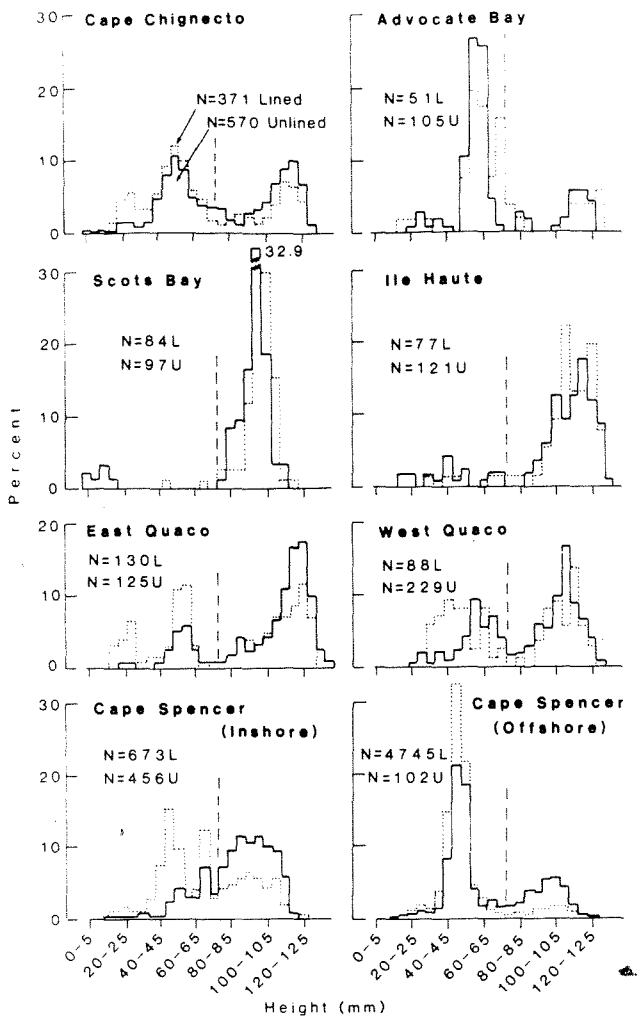

Fig. 5. Shell height frequency of scallops captured in lined and unlined drags. The dashed line is at 75 mm which approximates the minimum legal shell height of scallops available to the fishery.

Bottom type was mostly sand mixed with shell and gravel and small boulders. Flustra foliacea was abundant (Fig. 8a). Depth was 31 m.

SCOTS BAY BED

Three tows identified this bed (Appendix 1a; tows 85, 88, 90). Scallops were fairly abundant with catches averaging 9.6 kg/tow (Appendix 2a), but these scallops were poorly developed (i.e. their growth rate and meat yield were low) perhaps due to heavy shell infestation of the boring sponge, Cliona sp. There was a strong mode at 95-105 mm (Fig. 5, Appendix 3c). Prerecruits numbered one per tow, the lowest in our survey (Table 2). Percent cluckers was high for both prerecruits (33.3%) and recruits (25%).

Bottom was predominantly mud in shallow water (18 m) and gravel and small boulders in deeper water (33 m).

ILE HAUTE BED

Four tows were made in this bed (Appendix 1a; tows 44, 50, 51, 52). Catches averaged 12.8 kg/tow (Appendix 2a). Only one broad mode encompassing size increments from 100-140 mm was found (Fig. 5, Appendix 3d) with very few prerecruits (2.7/tow) (Table 2). Commercial potential appeared poor. The ratio of dead scallops (recruits) was 9.9%.

Depth was 45 m with bottom type being predominantly sand and small boulders. Flustra foliacea and Hyas coarctatus (toad crabs) were abundant.

EAST QUACO BED

Four tows were made in this bed (Appendix 1a; tows 39, 40, 102, 104). Mean catch was 11.4 kg/tow (Appendix 2a). Two modes were present, a small mode at 40-60 mm and a stronger one consisting of larger scallops with shell heights at 115-125 mm (Fig. 5, Appendix 3e). There was an average of 55 recruits/tow (Table 2) with 9.0% cluckers. Prerecruits averaged 25/tow and had a clucker ratio of 24.7%.

Depth was 54 m and bottom type was mainly sand and small boulders. Flustra foliacea and the horse mussel (Modiolus modiolus) were common (Fig. 8a, b).

WEST QUACO BED

Six tows were made in this bed (Appendix 1b; tows 42, 43, 47, 48, 93, 94). Average catch per tow was 12.0 kg (Appendix 2c). Two modes were present, a strong recruit mode at 105-110 mm and a broad, smaller mode at 40-60 mm (Fig. 5, Appendix 3f). Recruits averaged 55/tow (Table 2), with a low ratio of cluckers (1.4%) and prerecruits averaged 18/tow, with a high number of dead scallops (25%).

Depth varied from 45 to 70 m and bottom type was mostly sand and shell with small boulders. A horse mussel (Modiolus modiolus) bed was on the inshore part of this bed (Fig. 8b). Flustra foliacea occurrence was patchy (Fig. 8a).

CAPE SPENCER INSHORE BED

Five tows were made in this bed (Appendix 1b; tows 21, 35, 36, 37, 38). Catches were much higher in this area than found anywhere else in area A, and averaged 17.8 kg/tow (Appendix 2c). There were two modes for prerecruits, one at 40-45 mm and another at 65-70 mm. There was a broad recruit mode between 80-110 mm (Fig. 5, Appendix 3g). Prerecruits averaged 150/tow (Table 2) but had a high clucker ratio of 53.7%. Recruits averaged 125/tow, the highest of our survey, with a low number of dead scallops (0.9%). This bed should have good commercial potential if prerecruits survive.

Bottom was between 45-70 m with a mixture of sand, gravel and rock. Flustra foliacea was less abundant here than on other beds to the east (Fig. 8a).

CAPE SPENCER OFFSHORE BED

Thirty-six tows were made in this bed (Appendix 1b; tows 11, 18, 21, 25, 26, 27, 28, 29, 30, 31, 33, 35, 36, 37, 38, 52, 53, 54, 55, 56, 57, 58, 59, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112). This was the

largest bed and most promising area in our survey. The outer boundary was not delineated as it went beyond our survey mandate. Average catch was 18.0 kg/tow. The best catch of the survey occurred 13 naut mi south of Cape Spencer where tow 107 yielded 51 kg. There was a strong prerecruit mode at 45-55 mm (Fig. 5, Appendix 3h) with a weaker recruit mode at 95-105 mm. Prerecruits averaged 274/tow and had a clucker ratio of 15.2%, which was much lower than found inshore. Recruits averaged 90/tow (Table 2).

Depth was 80-100 m, the bottom a mixture of sand-mud. A large horse mussel bed occurred in the eastern part of this bed (Fig. 8b).

GROWTH AND MEAT YIELDS

Growth in the upper Bay appeared to be quite rapid for the first 3-4 yr (2-yr-old = 54.3 mm, 3-yr-old = 74.7 mm, Fig. 6, Table 3a, Appendix 4a), compared to that found at Grand Manan

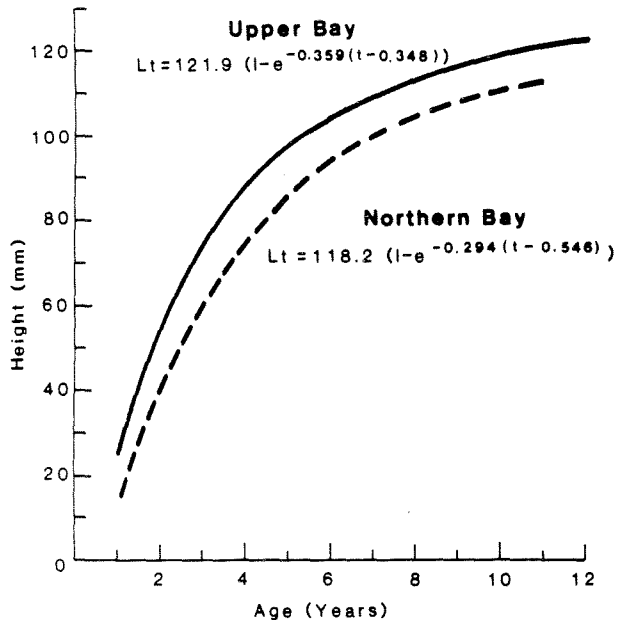

Fig. 6. Von Bertalanffy growth curves of scallops captured in the upper and northern areas of the Bay of Fundy.

(equivalent to 47.8 mm and 68.0 mm (Robert and Lundy 1987)) and Digby (equivalent to 43.3 mm and 63.2 mm (Robert et al. 1987)). However, maximum growth attained in the upper Bay was lower (L_{∞} = 121.9 mm for upper Bay, L_{∞} = 134.5 for Grand Manan and L_{∞} = 143.2 for Digby). Scallops off Cape Spencer appeared to be very slow growing (Fig. 6, Table 3b, Appendix 4b). More growth data should be obtained from this area to confirm these observations.

Scallop meat yields varied from area to area. In general, meat yields in the Bay of Fundy decrease towards the head of the Bay (Fig. 7). The lowest meat yields found in this survey occurred at Scots Bay (5.0 and 6.4 g for a 90-mm scallop). A sample from Quaco Ledge had a yield of 8.5 g/90-mm scallop, the highest in this survey (Table 4). However, Robert et al. (1984) found inshore Grand Manan to have a relatively high meat

Table 3a. Age and average shell height summaries of scallops from the upper Bay of Fundy. Observed values are from back-calculated growth rings and predicted values are from von Bertalanffy growth equation.

Age	No.	Observed shell height (mm)	Predicted shell height (mm)
1	180	25.12	25.06
2	179	54.79	54.27
3	166	75.66	74.67
4	137	89.09	88.91
5	123	98.24	98.86
6	95	104.92	105.81
7	75	109.69	110.66
8	62	113.90	114.05
9	49	117.29	116.42
10	29	119.93	118.07
11	14	120.86	119.23
12	7	123.00	120.03

Table 3b. Age and average shell height summaries of scallops from the northern Bay of Fundy. Observed values are from back-calculated growth rings and predicted values are from von Bertalanffy growth equation.

Age	No.	Observed shell height (mm)	Predicted shell height (mm)
1	120	14.87	14.77
2	120	40.12	41.11
3	115	61.65	60.75
4	98	76.35	75.38
5	81	86.09	86.29
6	67	92.97	94.42
7	48	98.85	100.48
8	33	103.55	104.99
9	19	109.21	108.36
10	10	116.80	110.86
11	4	119.25	112.73

yield (10.1 g/90-mm scallop), and the highest yields in the Bay of Fundy occur in Passamaquoddy Bay (10.4/90-mm scallop) (Jamieson and Lundy 1979) (Fig. 7, Table 5).

ASSOCIATED FAUNA

The bryozoan, Flustra foliacea, was abundant in 46% of all tows and was very predominant above Cape Spencer (Fig. 8a). Caddy (1970) found it in the lower Bay of Fundy. This species can easily clog the rings of the drag and fill the buckets during even a short tow, resulting in poor gear efficiency and selectivity for scallops.

There is some interest in horse mussels, Modiolus modiolus, as a potential commercial species, but their growth appears to be slow, only reaching a length of approximately 76 mm (Caddy 1970, pers. obs.). They have a patchy distribution throughout the Bay and were abundant in only 17% of the tows (Fig. 8b).

Table 4. Location and regression constants for shell height-wet meat weight analysis for the upper Bay of Fundy, May 1986, and offshore of Cape Spencer, N.B., June 1987. Meat weights are calculated for a 90-mm scallop.

Location (station no.)	Depth (m)	Regression constants Slope	Intercept	r	Height range (mm)	Meat weight (g)
Area A						
Cape Chignecto (5)	40	3.46	-13.71	0.99	46-125	6.3
Cape Chignecto (15)	38	3.22	-12.76	0.98	62-124	6.8
Advocate Bay (30)	38	3.54	-14.12	0.99	60-126	6.3
Ile Haute (52)	55	2.96	-11.22	0.94	86-126	8.3
Ile Haute (101)	59	3.05	-11.70	0.97	58-130	7.6
Quaco Ledge (10)	64	4.18	-16.70	0.98	62-124	8.5
Scots Bay (88)	35	3.06	-12.14	0.92	81-117	5.0
Scots Bay (90)	40	3.14	-12.26	0.93	64-112	6.4
Greville Bay (84)	7	3.14	-12.13	0.95	66-125	7.3
Upper Bay of Fundy[a]	-	3.44	-13.51	0.97	58-130	7.1
Area B						
Cape Spencer (20)	86	3.10	-11.93	0.97	50-104	7.5
Cape Spencer (37)	73	2.85	-10.73	0.98	62-116	8.0
Cape Spencer (54)	88	3.13	-12.00	0.99	65-129	8.1
Cape Spencer (58)	84	2.81	-10.63	0.96	65-99	7.6
Cape Spencer[b]	-	3.09	-11.84	0.98	50-129	7.8

[a]Excluding Minas Channel stations.
[b]All stations combined.

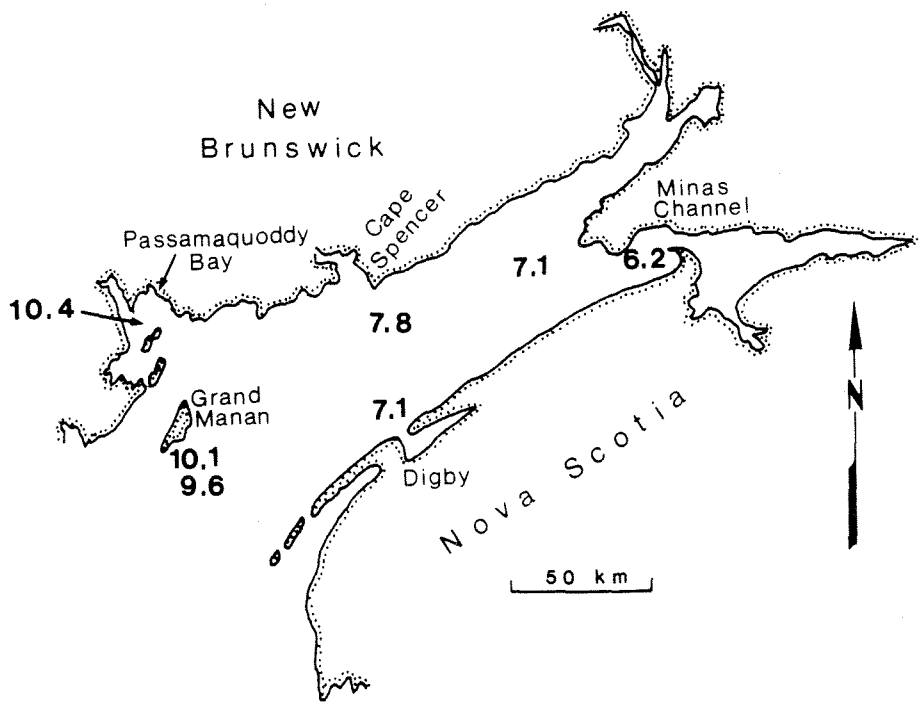

Fig. 7. Meat yields (g) for 90-mm shell height scallop from different areas of the Bay of Fundy.

Table 5. Scallop shell height-wet meat weight relationships for several areas in Bay of Fundy. Meat weights are calculated for a 90-mm scallop.

Area	Regression constants Slope	Intercept	Meat weight (g)
Off Cape Spencer	3.09	-11.84	7.8
Upper Bay of Fundy	3.44	-13.51	7.1
Minas Channel	3.14	-12.29	6.2
Passamaquoddy Bay[a]	3.24	-12.24	10.4
Grand Manan inshore[b]	3.042	-11.379	10.1
Grand Manan offshore[b]	2.764	-10.175	9.6
Digby[c]	3.207	-12.473	7.1

[a]Jamieson and Lundy (1979).
[b]Robert et al. (1984).
[c]Robert et al. (1987).

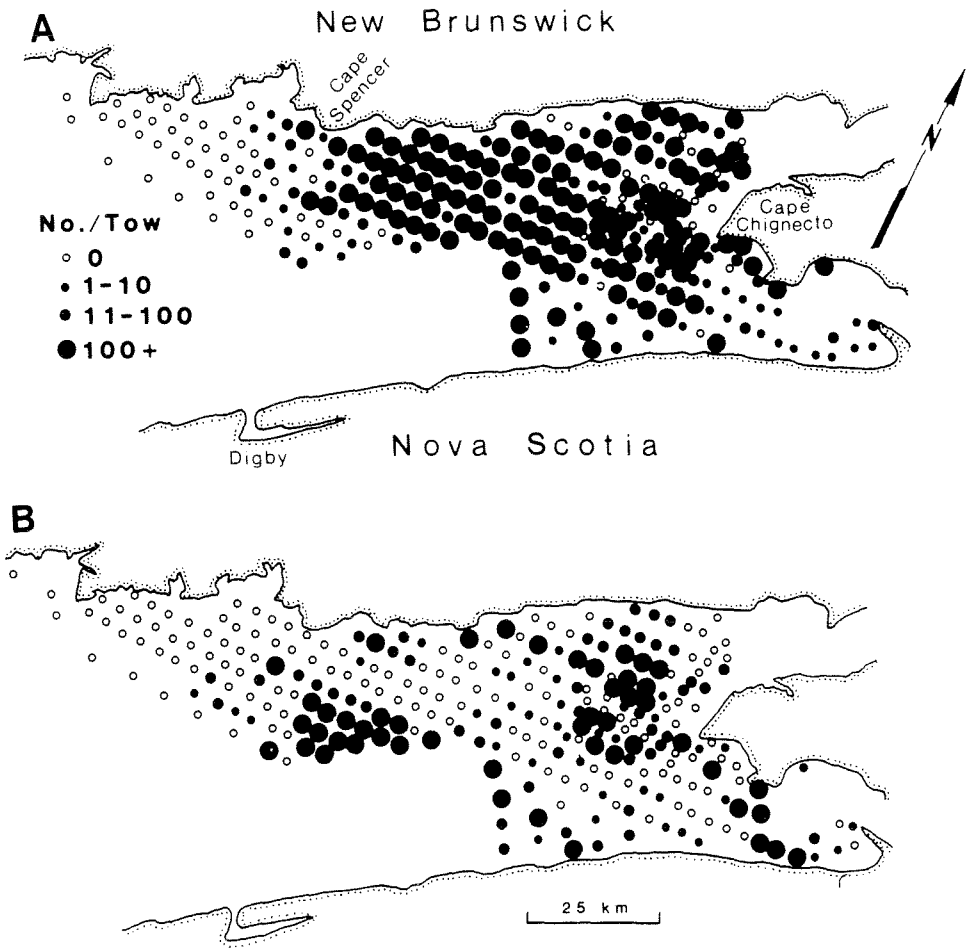

Fig. 8a. Distribution of the bryozoan, Flustra foliacea.

8b. Distribution of the horse mussel, Modiolus modiolus.

SCALLOP TAGGING

In the upper bay, 1674 young scallops were tagged at four sites (Greville Bay, 720; Advocate Bay, 299; Cape Chignecto, 454; and East Quaco, 201). Of special interest are 424 (mostly 2-yr-olds) released in May 1986 at a site in Greville Bay. By July 1987, 15% (62 tagged shells) were recaptured. When the 2-yr-olds (age at tagging) are considered by themselves, the release size was 51.1 mm (±0.75 mm S.E.M.) and the recapture size was 87.8 mm (±1.15 mm S.E.M.), a substantial growth increment of 71.8% over 14 mo, which confirms our observations on early rapid growth in the upper Bay. No other age groups of tag return scallops were analyzed for growth because of low sample sizes to date.

CONCLUSIONS

It would appear from our survey that there were some areas showing good recruitment and fisheries potential. Commercial interest will likely be sustained because of the high landed value of scallops, the limited possible expansion of alternate fisheries and the overcapacity of the Bay of Fundy fleet. Since biological data are scarce from the upper and northern Bay, future surveys may be warranted.

ACKNOWLEDGMENTS

G. Fawkes was especially helpful in that much of the computer work was done by him, from preparing the programs to running the summary data. W. McMullon and F. Cunningham drew the figures and B. Best and J. Hurley typed the report. P. McCurdy, J. Turner and C. Warren-Perry assisted with sea sampling. Thanks to the captain and crew of the J. L. Hart, especially Capt. F. S. Guptill, for maintaining contact and good cooperation from local fishermen which enabled the survey to progress smoothly. Drs. R. Mohn and G. Robert kindly reviewed the manuscript.

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Appendix 1a.

Tow data for upper Bay of Fundy (Area A)

Tow no.	Loran C bearings Start 5930X	Start 5930Y	Finish 5930X	Finish 5930Y	Duration min.	Distance (m)
1	14242.4	31013.6	41242.4	31009.5	8	739.07
2	14241.7	30999.4	14241.8	30996.0	8	738.94
3	14240.5	30975.7	14241.5	30972.4	8	789.09
4	14240.2	30957.4	14240.3	30953.9	8	651.57
5	14240.1	39038.5	14240.5	30935.3	8	730.67
6	14039.9	30919.3	14038.9	30915.7	8	706.28
7	14220.4	30920.7	14220.5	30922.0	8	319.45
8	14200.8	31117.7	14201.5	31113.1	8	1032.45
9	14201.2	31100.6	14201.5	31096.4	8	811.47
10	14200.9	31078.1	14200.2	31074.7	8	671.24
11	14199.4	31060.0	14199.3	31057.5	8	498.32
12	14199.9	31010.0	14199.9	31037.8	8	451.02
13	14200.1	31018.3	14199.8	31015.4	8	568.83
14	14260.6	31921.6	14260.0	31924.6	8	832.68
15	14260.1	30937.8	14259.4	30941.1	8	706.89
16	14259.9	30962.6	14258.7	30964.4	8	595.46
17	14230.7	30941.1	14230.1	30943.6	8	571.10
18	14229.6	30960.4	14230.2	30963.3	8	548.60
19	14230.3	30981.2	14231.1	30984.1	8	547.58
20	14229.9	31001.2	14228.5	31003.0	8	612.45
21	14220.1	31000.8	14221.0	31003.0	8	523.23
22	14220.1	31021.3	14220.8	31024.0	8	535.03
23	14220.1	31039.1	14218.7	31035.8	8	672.76
24	14220.2	31059.9	14219.9	31056.3	8	727.73
25	14210.5	31019.5	14210.8	31016.5	8	595.22
26	14210.2	31999.8	14210.4	31996.6	8	897.22
27	14210.1	30978.8	14210.1	30975.6	8	645.31
28	14209.0	30960.8	14207.8	30961.1	8	348.68
29	14210.3	30939.9	14210.0	30935.9	8	751.37
30	14220.3	30860.9	14220.5	30864.6	8	739.11
31	14209.7	30880.9	14209.6	30884.7	8	737.19
32	14209.5	30901.2	14208.1	30901.5	8	407.60
33	14209.7	30920.6	14209.7	30918.6	8	582.77
34	14200.8	30920.7	14201.1	30919.5	8	339.12
35	14201.1	30941.1	14203.4	30942.1	8	610.39
36	14201.1	30961.3	14203.2	30962.9	8	557.34
37	14199.8	30981.7	14199.9	30984.9	8	615.98
38	14200.1	31000.1	14197.6	30999.1	8	613.28
39	14179.5	30998.0	14179.3	30994.8	8	659.97
40	14179.5	30979.8	14179.7	30976.0	8	746.68
41	14180.1	30956.7	14179.8	30952.1	8	861.51
42	14179.7	30937.9	14180.8	30933.5	8	925.41
43	14174.9	30918.3	14174.5	30912.3	8	1073.92
44	14180.5	30900.9	14180.5	30897.9	8	725.36
45	14189.4	30898.7	14187.2	30896.3	8	896.12
46	14179.7	30879.8	14179.4	30882.4	8	772.79
47	14200.0	30900.7	14199.4	30903.5	8	618.73
48	14200.8	30881.9	14202.0	30885.0	8	617.34
49	14200.0	30858.5	14199.9	30854.7	8	751.07
50	14159.8	39092.7	14159.5	30905.8	8	678.93
51	14160.1	30922.6	14158.0	30921.2	8	558.83
52	14160.8	30943.1	14160.0	30946.8	8	773.05
53	14159.7	30961.4	14159.0	30958.2	8	617.37
54	14159.5	30978.8	14158.2	30975.3	8	707.13
55	14160.0	31003.2	14159.1	31007.1	8	793.32
56	14160.7	31022.6	14160.2	31026.1	8	785.11
57	14160.3	31040.7	14159.9	31044.4	8	765.02
58	14139.7	31038.9	14139.8	31036.2	8	509.29
59	14140.5	31019.8	14141.8	31017.4	8	635.41

Appendix 1a. (cont'd)

Tow no.	Loran C bearings Start 5930X	Start 5930Y	Finish 5930X	Finish 5930Y	Duration min.	Distance (m)
60	14139.6	31001.3	14139.8	30997.7	8	720.61
61	14140.6	30979.3	14142.4	30976.3	8	853.56
62	14139.9	30957.6	14140.9	30954.2	8	754.95
63	14140.8	30936.8	14142.1	30933.3	7	813.15
64	14181.1	30780.7	14180.6	30782.6	8	589.57
65	14179.6	30801.0	14178.8	30803.9	8	654.55
66	14180.3	30822.2	14180.0	30824.9	8	552.01
67	14180.3	30843.6	14181.1	30847.1	8	684.25
68	14180.6	30864.1	14180.3	30867.2	8	594.53
69	14218.8	30877.0	14219.1	30874.3	8	550.48
70	14210.1	30859.9	14211.0	30856.8	8	673.27
71	14210.2	30839.1	14210.9	30835.7	8	726.18
72	14160.3	30781.3	14160.9	30783.5	8	505.14
73	14159.8	30701.2	14159.6	30703.5	8	469.81
74	14160.3	30821.6	14160.8	30824.8	8	643.29
75	14160.0	30842.2	14159.5	30845.6	8	724.15
76	14159.7	30862.3	14158.9	30865.8	8	759.51
77	14159.8	30882.8	14159.4	30886.9	8	820.45
78	14139.8	30920.8	14138.7	30917.6	8	606.73
79	14139.7	30900.6	14139.8	30897.2	8	660.27
80	14139.9	30879.6	14140.3	30876.6	8	605.19
81	14139.9	30859.6	14140.4	30856.3	8	667.69
82	14138.8	30847.8	14138.8	30834.9	8	645.55
83	14139.8	30819.6	14139.2	30815.9	8	718.49
84	14228.4	30777.6	14227.0	30779.6	8	620.95
85	14186.5	30666.1	14190.3	30667.8	8	1004.50
86	14201.0	30681.7	14204.2	30687.7	8	1240.78
87	14200.1	30700.0	14198.3	30698.9	8	671.47
88	14179.9	30680.9	14176.4	30678.8	8	924.45
89	14180.1	30710.1	14179.6	30713.7	8	786.72
90	14166.3	30699.5	14165.3	30703.9	8	897.38
91	14161.3	30718.4	14161.4	30714.6	8	753.57
92	14160.2	30739.4	14160.9	30736.4	8	659.89
93	14159.9	30760.7	14158.7	30758.3	8	588.62
94	14200.2	30803.8	14201.5	30800.1	8	885.06
95	14200.7	30821.9	14201.7	30824.9	8	1031.43
96	14220.1	30944.1	14220.9	30948.6	8	845.68
97	14220.8	30961.6	14219.6	30965.4	8	865.40
98	14220.3	30982.4	14220.4	30983.9	4	354.00
99	14191.0	30921.3	14192.3	30924.5	8	674.68
100	14190.5	30941.8	14192.2	30944.9	8	672.68
101	14190.4	30961.9	14190.5	30965.5	9	731.62
102	14190.6	30982.5	14191.6	30986.4	8	707.05
103	14189.8	31001.5	14189.2	31005.1	8	785.92
104	14175.4	31006.5	14172.7	31007.4	8	728.72
105	14180.0	31021.9	14180.0	31023.9	8	452.22
106	14180.4	31040.1	14182.6	31036.7	8	920.25
107	14180.0	31058.9	14179.6	31055.3	8	696.34
108	14180.0	31079.8	14179.1	31075.8	8	727.88
109	14180.0	31099.5	14179.3	31096.9	8	563.27
110	14158.0	31100.3	14154.3	31102.2	8	1009.67
111	14160.4	31078.7	14159.2	31075.0	8	735.91
112	14160.3	31058.9	14160.1	31055.3	8	714.94
113	14139.0	31079.5	14137.9	31076.3	8	658.52
114	14140.2	31060.5	14140.1	31058.0	8	527.10
115	14120.8	30880.9	14121.9	30884.0	8	628.51
116	14120.6	30921.5	14120.6	30924.3	8	582.71
117	14119.7	30960.5	14117.1	30961.2	8	712.53
118	14120.0	31002.0	14120.1	31005.1	8	602.65
119	14120.3	31042.3	14120.3	31045.9	8	708.05
121	14100.4	30975.9	14099.8	30971.8	8	759.24
122	14100.3	30938.7	14100.0	30935.3	8	647.23
123	14100.3	30900.1	14102.5	30898.7	8	645.69
124	14089.2	30921.4	14091.3	30921.3	8	491.61
125	14080.5	30959.9	14082.5	30959.9	8	887.76
126	14080.8	30999.9	14081.9	30996.2	8	848.96

Appendix 1a. (cont'd)

Tow no.	Loran C bearings Start 5930X	Start 5930Y	Finish 5930X	Finish 5930Y	Duration min.	Distance (m)
127	14061.1	30978.1	14062.7	30975.1	8	778.78
128	14221.1	31142.3	14221.2	31145.1	8	580.78
129	14219.8	31120.6	14218.9	31123.0	8	598.96
130	14221.0	31100.0	14221.7	31097.1	8	679.43
131	14220.0	31077.8	14220.5	31074.5	8	703.57
133	14239.6	31058.4	14240.2	31054.4	8	846.62
134	14240.5	31037.2	14241.0	31034.0	8	681.57
135	14239.5	31018.1	14240.1	31014.9	8	663.66
136	14261.0	31019.4	14261.1	31015.0	8	804.38
137	14260.2	30998.8	14261.0	30995.0	8	825.49
138	14259.9	30978.8	14259.0	30975.5	8	658.08
139	14280.1	30979.8	14278.5	30976.1	8	725.38
140	14279.5	30958.9	14279.2	30954.9	8	740.75
141	14280.1	30938.5	14279.3	30935.4	8	638.20
142	14270.9	30940.1	14271.7	30937.6	8	586.36
143	14280.0	30919.3	14282.2	30918.1	8	617.70
144	14291.6	30922.8	14291.5	30926.1	8	642.73
145	14290.7	30941.8	14289.7	30937.2	8	832.87
146	14300.2	30940.0	14300.3	30937.2	8	599.77
147	14250.1	30940.0	14251.7	30937.6	8	715.03
148	14316.6	30960.2	14316.8	30963.3	8	622.59
149	14300.7	30961.3	14302.4	30965.4	8	818.46
150	14301.0	30982.4	14301.9	30985.3	8	594.97
151	14300.5	31000.7	14300.1	31003.9	8	580.06
152	14300.2	31020.9	14301.3	31024.6	8	715.30
153	14297.4	31040.8	14297.1	31043.5	8	600.51
154	14280.3	31080.0	14280.1	31076.7	8	616.93
155	14280.1	31058.1	14279.7	31054.4	8	692.51
156	14280.1	31039.3	14279.5	31035.4	8	720.01
157	14280.4	31019.3	14279.4	31015.3	8	797.87
158	14279.2	30998.4	14276.4	30996.3	8	699.46
159	14260.4	31041.4	14259.5	31044.0	8	618.55
160	14260.4	31062.6	14260.0	31065.8	8	626.11
161	14260.3	31081.4	14259.5	31084.8	8	768.13
162	14259.3	31102.2	14259.0	31106.2	8	772.21
163	14260.5	31124.0	14261.2	31121.4	8	634.28
164	14239.6	31100.2	14238.8	31103.8	8	794.58
165	14240.3	31121.4	14239.7	31124.9	8	745.09
166	14240.4	31141.2	14239.9	31145.1	8	793.27

Appendix 1b. Tow data for northern Bay of Fundy (Area B).

Tow no.	Loran C bearings Start 5930X	Start 5930Y	Finish 5930X	Finish 5930Y	Duration min.	Distance (m)
1	14078.9	31558.9	14079.2	31562.2	8	703.23
2	14079.6	31517.4	14080.7	31515.3	8	592.58
3	14059.3	31498.6	14060.9	31497.1	8	588.36
4	14080.5	31478.5	14081.7	31477.4	8	522.74
5	14080.3	31458.4	14081.3	31457.0	8	479.03
6	14088.9	31439.7	14088.8	31444.2	8	944.74
7	14080.5	31417.2	14081.1	31415.1	8	576.14
8	14080.3	31377.5	14081.4	31374.8	8	674.30
9	14081.0	31566.8	14082.3	31353.9	8	773.83
10	14081.8	31336.5	14083.6	31332.9	8	938.16
11	14080.0	31319.9	14079.0	31321.3	8	517.83
12	14179.1	31257.1	14180.5	31252.5	8	1069.39
13	14180.0	31236.7	14180.1	31232.0	8	964.14
14	14180.1	31216.8	14181.2	31213.3	8	822.88
15	14179.9	31197.9	14181.3	31194.9	8	776.44
16	14119.3	31121.9	14118.8	31125.2	8	732.39
17	14120.1	31142.8	14119.9	31145.7	8	630.54
18	14119.9	31162.7	14119.2	31166.2	8	775.92
19	14120.3	31308.1	14122.6	31306.9	8	663.12
20	14120.3	31277.2	14121.8	31274.9	8	941.90
21	14119.9	31256.6	14121.9	31253.3	8	906.70
22	14119.7	31238.0	14120.8	31234.8	8	829.52
23	14120.4	31217.3	14121.8	31214.1	8	795.04
24	14119.7	31198.3	14119.2	31194.5	8	735.54
25	14119.0	31177.8	14117.9	31174.7	8	652.38
26	14102.3	31141.6	14103.3	31144.3	8	599.55
27	14100.5	31163.0	14099.5	31165.4	8	618.29
28	14100.2	31181.5	14098.3	31184.3	8	770.96
29	14100.2	31203.5	14099.1	31207.7	8	971.63
30	14100.6	31223.9	14099.1	31227.7	8	930.90
31	14100.2	31242.3	14099.0	31246.4	8	931.85
32	14101.1	31263.4	14099.7	31267.6	8	1011.93
33	14100.1	31280.3	14099.3	31283.8	8	802.47
34	14140.5	31318.8	14142.3	31317.2	8	626.44
35	14139.9	31297.9	14141.4	31294.9	8	830.27
36	14140.9	31277.3	14142.5	31273.9	8	834.40
37	14139.5	31257.1	14140.9	31253.3	8	933.35
38	14141.9	31237.7	14142.4	31233.5	8	869.27
39	14140.5	31221.1	14141.8	31218.5	8	685.47
40	14139.7	31198.2	14138.8	31194.8	8	679.30
41	14139.6	31179.2	14139.6	31176.6	8	557.60
42	14139.7	31160.1	14139.3	31157.4	8	552.83
43	14140.4	31139.4	14140.0	31136.6	8	550.07
44	14140.7	31119.6	14140.0	31117.4	8	493.36
45	14140.0	31100.6	14139.8	31098.3	8	495.61
46	14159.7	31122.2	14158.3	31127.4	8	1119.66
47	14159.5	31143.0	14157.7	31146.8	8	984.80
48	14160.2	31162.7	14158.8	31165.4	8	758.32
49	14160.1	31180.9	14159.4	31184.7	8	830.56
50	14160.2	31200.6	14159.8	31204.7	8	874.50
51	14160.4	31221.3	14160.6	31225.0	8	729.38
52	14080.1	31297.4	14081.4	31295.0	8	645.99
53	14179.8	31277.3	14080.2	31273.6	8	830.77
54	14079.8	31258.1	14079.6	31254.3	8	783.63
55	14080.3	31239.6	14081.6	31236.6	8	777.78
56	14079.6	31219.0	14078.7	31215.9	8	637.10
57	14079.3	31197.6	14078.3	31195.0	8	611.32
58	14081.8	31183.3	14082.3	31187.5	8	839.87
59	14101.4	31302.7	14101.8	31307.1	8	911.13
60	14099.9	31322.1	14098.9	31325.8	8	875.36
61	14140.5	31360.0	14137.4	31360.0	8	701.48
62	14120.6	31360.2	14118.1	31360.9	8	663.53
63	14100.1	31359.9	14097.0	31359.1	8	705.36
64	14100.0	31381.2	14099.3	31383.6	8	577.26
65	14099.9	31403.6	14098.8	31406.8	8	766.52
66	14178.5	31401.0	14075.6	31396.9	8	891.67

Appendix 1b. (cont'd)

Tow no.	Loran C bearings Start 5930X	Start 5930Y	Finish 5930X	Finish 5930Y	Duration min.	Distance (m)
67	14038.8	31401.1	14036.3	31402.9	8	753.73
77	14140.4	31380.0	14143.5	31380.3	8	689.93
78	14161.7	31379.8	14164.6	31380.2	8	645.05
79	14160.7	31359.5	14164.5	31360.2	8	789.68
80	14159.6	31340.8	14160.4	31338.4	8	638.83
81	14160.4	31319.6	14161.4	31316.3	8	788.59
82	14160.6	31299.2	14161.3	31296.3	8	695.17
83	14159.5	31279.9	14158.1	31277.2	8	605.09
84	14160.0	31260.4	14160.5	31258.0	8	526.61
85	14160.2	31240.3	14161.2	31237.2	8	732.95
86	14199.9	31218.2	14201.0	31214.0	8	919.92
87	14201.2	31199.9	14202.7	31196.0	8	950.37
88	14200.5	31176.3	14202.5	31172.2	8	1010.08
89	14199.6	31158.4	14200.5	31153.9	8	999.19
90	14220.6	31160.4	14219.9	31162.4	8	534.67
91	14199.5	31140.0	14197.2	31138.4	8	592.46
92	14180.6	31121.2	14179.4	31123.7	8	659.53
93	14180.1	31141.3	14180.6	31144.3	8	594.06
94	14179.8	31161.8	14179.7	31164.8	8	660.25
95	14179.9	31181.2	14180.0	31183.5	8	540.72
96	14118.2	31322.0	14114.6	31324.7	8	1081.02
97	14140.6	31342.3	14139.9	31346.1	8	848.65
98	14117.0	31339.9	14112.7	31341.1	8	1035.57
99	14098.4	31339.9	14094.5	31340.2	8	876.29
100	14058.5	31342.1	14055.8	31344.7	8	913.36
101	14059.6	31319.3	14059.4	31316.5	8	606.52
102	14060.4	31300.3	14061.5	31298.1	8	595.69
103	14059.4	31278.0	14061.7	31275.2	8	846.78
104	14059.5	31256.8	14061.6	31253.2	8	980.63
105	14060.6	31239.0	14062.6	31235.6	8	1006.04
106	14060.6	31219.7	14062.8	31215.8	8	1027.30
107	14059.8	31197.5	14061.1	31194.2	8	797.56
108	14039.6	31222.4	14038.5	31224.5	8	592.62
109	14040.8	31241.0	14040.7	31244.8	8	793.46
110	14039.7	31283.0	14038.4	31286.1	8	797.81
111	14037.0	31322.1	14034.3	31323.5	8	765.08
112	14040.5	31361.6	14039.3	31365.0	8	825.27
113	14040.3	31441.4	14039.4	31445.1	8	903.13

Appendix 2a. Catch data in whole weights for the upper Bay of Fundy (Area A) (unlined drags).

Tow Number	Live (no.)	Dead (no.)	Actual catch (kg)	Prorated catch (kg)
1	9	0	1.7	3.6
2	2	0	0.1	0.2
3	3	2	0.3	0.6
4	94	2	10.1	24.8
5	60	8	7.1	15.5
6	1	0	0.1	0.2
7	13	0	3.7	18.5
9	24	9	2.6	5.1
10	21	3	1.5	3.5
13	1	0	0.1	0.2
14	20	1	3.6	6.9
15	76	19	10.4	23.5
16	73	8	9.1	24.4
17	21	0	3.6	10.0
18	1	0	0.1	0.2
19	1	0	0.1	0.2
20	7	1	0.5	1.3
28	1	0	0.1	0.4
29	13	2	2.7	5.7
30	104	7	9.5	20.5
33	38	14	3.3	9.0
35	17	2	1.1	2.8
38	1	2	0.1	0.2
39	28	2	5.2	12.6
40	49	6	8.4	17.9
41	2	0	0.1	0.1
44	44	2	6.5	14.3
45	1	0	0.1	0.1
47	4	3	0.3	0.7
50	27	1	6.2	14.6
51	16	6	3.2	9.1
52	36	4	6.4	13.2
55	4	1	0.4	0.8
56	8	1	0.7	1.4
57	1	1	0.1	0.2
58	1	2	0.1	0.3
59	4	3	0.5	1.2
60	5	1	0.3	0.6
68	1	0	0.1	0.2
69	4	1	0.7	2.0
70	6	2	0.4	0.9
71	17	2	1.4	3.0
77	2	1	0.2	0.3
84	43	0	5.0	12.8
85	16	0	3.3	5.2
86	1	0	0.1	0.1
88	55	1	8.6	14.8
90	26	31	4.8	8.5
91	5	2	0.4	0.8
96	33	0	1.3	2.4
97	7	0	0.5	0.9
99	2	0	0.2	0.4
100	17	3	0.6	1.4
101	10	2	1.5	3.2
102	36	6	3.6	8.1
104	12	7	3.2	7.0
106	3	0	0.7	1.2
109	1	0	0.1	0.2
110	2	0	0.2	0.3
113	6	0	0.6	1.4
114	7	0	0.9	2.7
120	9	0	1.8	0.0
121	2	0	0.2	0.4
122	1	0	0.1	0.2
126	1	0	0.1	0.1
127	7	0	1.2	2.4
130	3	2	0.2	0.4

Appendix 2a. (cont'd)

Tow Number	Live (no.)	Dead (no.)	Actual catch (kg)	Prorated catch (kg)
131	10	2	0.3	0.6
132	41	2	4.0	0.0
133	18	1	1.0	1.8
134	1	0	0.1	0.2
135	16	0	0.5	1.2
136	13	0	0.7	1.3
137	6	1	0.2	0.3
138	35	4	4.0	9.7
139	9	0	1.0	2.2
140	22	2	4.3	9.2
141	13	2	2.7	6.7
142	28	6	4.7	12.8
143	4	0	0.1	0.2
144	2	1	0.4	0.9
145	3	1	0.4	0.7
146	3	0	0.7	1.8
147	31	1	7.5	16.7
149	5	2	0.3	0.5
157	1	1	0.1	0.2
158	11	1	1.4	3.2
159	1	0	0.1	0.2
160	5	0	0.1	0.2
161	1	0	0.1	0.2
164	2	0	0.2	0.4

Appendix 2b. Catch data in whole weights for the upper Bay of Fundy (Area A) (lined drags).

Tow Number	Live (no.)	Dead (no.)	Actual catch (kg)	Prorated catch (kg)
1	3	0	0.7	1.5
3	4	1	0.3	0.6
4	40	3	2.9	7.1
5	26	0	4.4	9.6
7	13	2	2.0	10.0
9	8	7	1.0	1.9
10	44	14	1.6	3.8
11	3	0	0.3	0.9
14	3	0	0.3	0.5
15	35	6	4.4	9.9
16	66	14	5.7	15.3
17	6	0	0.6	1.6
18	1	0	0.1	0.2
19	1	0	0.1	0.2
20	7	1	0.5	1.3
29	14	4	3.2	6.8
30	51	3	5.3	11.4
31	1	1	0.1	0.2
32	1	4	0.1	0.3
33	32	14	2.1	5.7
35	12	1	1.3	3.4
38	3	2	0.3	0.7
39	50	7	8.6	20.8
40	31	4	4.6	9.8
44	11	2	2.2	4.8
47	11	3	0.7	1.8
50	27	2	6.0	14.1
51	13	0	2.4	6.8
52	28	0	4.7	9.7
55	3	0	0.3	0.6
56	8	1	0.8	1.6
57	1	1	0.1	0.2
59	3	10	0.7	1.7
60	6	0	0.4	0.8
69	5	3	0.8	2.3
70	12	1	0.9	2.1
71	38	5	3.8	8.3
72	1	0	0.1	0.3
84	40	1	4.6	11.8
85	5	1	0.6	0.9
88	66	1	11.2	19.3
90	14	24	3.6	6.4
91	9	2	0.6	1.2
92	1	0	0.1	0.2
96	27	1	1.3	2.4
97	1	0	0.1	0.1
100	9	1	0.4	0.9
101	33	5	3.5	7.6
102	42	16	1.7	3.8
103	2	1	0.2	0.4
104	7	4	1.4	3.0
106	6	0	1.1	1.9
109	2	0	0.2	0.5
110	1	0	0.1	0.1
112	1	1	0.1	0.2
113	3	0	0.3	0.7
114	1	1	0.1	0.3
120	5	0	0.5	0.0
121	1	0	0.1	0.2
127	4	0	0.5	1.0
130	8	2	0.2	0.4
131	4	1	0.2	0.4
132	34	2	2.5	0.0
133	29	1	2.0	3.7
134	7	0	0.2	0.4
135	5	3	0.3	0.7
136	14	1	0.2	0.3

Appendix 2b. (cont'd)

Tow Number	Live (no.)	Dead (no.)	Actual catch (kg)	Prorated catch (kg)
137	4	1	0.2	0.3
138	37	9	6.1	14.8
139	2	0	0.2	0.4
140	19	4	4.0	8.6
141	6	1	0.9	2.2
142	24	8	5.6	15.2
143	11	1	0.2	0.5
144	1	0	0.1	0.2
145	4	0	0.2	0.3
146	2	0	0.1	0.2
147	28	1	13.0	29.0
149	6	0	0.2	0.3
150	1	0	0.1	0.2
152	2	0	0.1	0.2
153	2	0	0.2	0.5
158	13	0	0.5	1.1
159	4	0	0.2	0.5
161	1	0	0.1	0.2
164	1	0	0.1	0.2

Appendix 2c. Catch data in whole weights for the northern Bay of Fundy (Area B) (unlined drags).

Tow Number	Live (no.)	Dead (no.)	Actual catch (kg)	Prorated catch (kg)
2	1	0	0.1	0.2
4	19	0	3.2	9.7
8	1	0	0.1	0.2
10	8	1	1.3	2.2
11	28	6	4.6	14.2
16	18	6	1.9	4.1
17	3	0	0.2	0.5
18	58	5	11.4	23.5
19	39	31	1.8	4.3
20	20	5	1.8	3.0
21	102	12	11.6	20.4
22	21	0	1.6	3.0
23	10	1	1.8	3.6
24	5	4	0.5	1.0
25	13	2	2.5	6.1
26	124	18	9.2	24.5
27	130	22	8.3	21.4
28	77	8	5.1	10.5
29	51	5	4.2	6.9
30	68	40	10.8	18.5
31	296	16	10.0	17.1
32	7	1	1.0	1.5
33	246	20	10.3	20.5
34	9	2	1.3	3.3
35	59	15	5.3	10.2
36	104	4	11.3	21.6
37	148	11	14.5	24.8
38	70	20	6.4	11.7
39	7	0	0.9	2.1
40	18	0	1.7	4.0
41	3	1	0.3	0.8
42	20	1	3.0	8.6
43	29	4	3.9	11.3
45	4	0	0.2	0.6
46	2	0	0.2	0.2
47	42	6	5.4	8.7
48	101	21	13.0	27.4
49	23	17	1.8	3.4
51	26	14	2.9	6.3
52	169	12	6.7	16.5
53	641	27	22.6	43.5
54	777	56	10.0	20.4
55	39	10	2.0	4.1
56	27	5	1.8	4.5
57	50	5	5.2	13.6
58	77	6	5.8	11.0
59	27	2	5.1	8.9
60	16	0	1.6	2.9
63	1	1	0.5	1.1
66	5	0	1.0	1.7
67	9	3	1.9	4.0
68	1	1	0.2	0.0
79	0	1	0.1	0.2
80	6	0	0.2	0.5
81	7	1	0.6	1.2
84	6	0	0.7	2.1
85	5	2	0.4	0.8
88	1	1	0.1	0.1
91	3	4	0.2	0.5
92	6	0	0.7	1.6
93	8	0	1.4	3.7
94	29	3	4.9	11.8
95	2	0	0.2	0.5
96	22	2	3.6	5.3
99	10	2	2.3	4.2
100	32	4	6.6	11.5
101	31	5	5.5	14.5

Appendix 2c. (cont'd)

Tow Number	Live (no.)	Dead (no.)	Actual catch (kg)	Prorated catch (kg)
102	50	0	8.7	23.3
103	118	8	7.0	13.2
104	200	9	13.7	22.3
105	171	5	7.8	12.4
106	10	1	2.7	4.2
107	478	20	25.4	50.9
108	106	0	12.3	33.2
109	165	2	16.2	32.6
110	85	2	13.5	27.0
111	60	2	9.3	19.4
112	21	4	3.6	6.9

Appendix 2d. Catch data in whole weights for the northern Bay of Fundy (Area B) (lined drags).

Tow Number	Live (no.)	Dead (no.)	Actual catch (kg)	Prorated catch (kg)
4	14	1	2.4	7.3
10	3	0	0.2	0.3
11	25	21	1.0	3.0
16	7	1	0.6	1.3
17	7	2	0.3	0.7
18	19	9	4.4	9.0
19	38	30	1.0	2.4
20	42	60	2.1	3.5
21	129	41	7.1	12.5
22	10	0	0.4	0.7
23	3	0	0.3	0.6
24	5	0	0.5	1.0
25	12	2	1.4	3.4
26	26	3	1.5	4.0
27	110	26	3.1	8.0
28	50	6	1.3	2.6
29	21	2	0.4	0.6
30	220	29	5.1	8.7
31	235	37	7.1	12.1
32	7	5	0.7	1.1
33	848	152	14.7	29.3
34	6	3	0.8	2.0
35	24	28	2.3	4.4
36	185	228	13.3	25.5
37	253	168	15.8	27.0
38	49	19	3.1	5.7
39	2	1	0.2	0.4
40	33	9	1.2	2.8
41	5	3	0.4	1.1
42	12	2	1.5	4.3
43	22	3	2.6	7.5
44	6	1	0.7	2.2
45	7	0	0.4	1.2
46	4	0	0.5	0.7
47	14	3	2.1	3.4
48	21	7	2.4	5.0
49	8	15	0.8	1.5
51	13	13	1.5	3.2
52	93	21	1.9	4.7
53	709	48	12.0	23.1
54	777	56	8.8	17.9
55	137	33	3.2	6.5
56	16	0	1.0	2.5
57	54	16	2.9	7.5
58	24	2	2.5	4.7
59	20	19	1.3	2.2
60	6	4	0.4	0.7
80	6	1	0.2	0.5
81	17	3	0.4	0.8
84	8	14	0.4	1.2
85	3	1	0.2	0.4
88	1	3	0.1	0.1
91	3	0	0.1	0.2
92	7	0	0.3	0.7
93	6	3	0.7	1.8
94	10	3	2.6	6.3
96	1	0	0.1	0.1
98	1	1	0.1	0.1
99	3	0	0.4	0.7
100	13	0	1.7	2.9

Appendix 2d. (cont'd)

Tow Number	Live (no.)	Dead (no.)	Actual catch (kg)	Prorated catch (kg)
101	29	10	2.5	6.5
102	127	36	7.5	20.1
103	604	209	16.4	30.9
104	408	88	13.4	21.8
105	395	52	11.5	18.2
106	8	3	0.7	1.0
107	242	23	10.5	21.0
108	369	37	12.3	33.2
109	35	7	2.6	5.2
110	136	73	11.8	23.6
111	73	5	7.9	16.5
112	12	1	1.8	3.4
113	1	0	0.1	0.1

Appendix 3a. Scallop height frequency - Cape Chignecto Bed

Ht. range (mm)	Lined drags				Unlined drags			
	Live		Dead		Live		Dead	
	Percent freq.	No.	Percent freq.	No.	Percent freq.	No.	Percent freq.	No.
0- 5	0.00	0	0.00	0	0.18	1	0.00	0
5- 10	0.00	0	0.00	0	0.00	0	0.00	0
10- 15	0.00	0	0.00	0	0.35	2	0.00	0
15- 20	1.35	5	3.33	2	0.18	1	0.00	0
20- 25	4.31	16	6.67	4	1.40	8	3.03	2
25- 30	5.12	19	1.67	1	1.40	8	4.55	3
30- 35	3.23	12	1.67	1	1.23	7	0.00	0
35- 40	3.23	12	1.67	1	1.40	8	1.52	2
40- 45	5.39	20	0.00	0	4.56	26	6.06	4
45- 50	9.16	34	6.67	4	7.72	44	7.58	5
50- 55	11.86	44	18.33	11	10.53	60	9.09	6
55- 60	9.70	36	5.00	3	8.60	49	7.58	5
60- 65	5.66	21	1.67	1	4.74	27	3.03	2
65- 70	4.58	17	0.00	0	3.68	21	0.00	0
70- 75	1.62	6	0.00	0	3.51	20	4.55	3
75- 80	1.35	5	3.33	2	3.33	19	0.00	0
80- 85	1.62	6	8.33	5	1.93	11	3.03	2
85- 90	2.43	9	1.67	1	1.23	7	1.52	1
90- 95	1.89	7	0.00	0	2.28	13	0.00	0
95-100	1.35	5	0.00	0	3.33	19	6.06	4
100-105	2.16	8	5.00	3	4.39	25	3.03	2
105-110	4.04	15	3.33	2	6.84	39	4.55	3
110-115	7.28	27	8.33	5	8.95	51	12.12	8
115-120	6.47	24	16.67	10	10.00	57	12.12	8
120-125	4.31	16	5.00	3	6.67	38	10.61	7
125-130	1.35	5	1.67	1	1.40	8	0.00	0
130-135	0.54	2	0.00	0	0.18	1	0.00	0
135-140	0.00	0	0.00	0	0.00	0	0.00	0
140-145	0.00	0	0.00	0	0.00	0	0.00	0
145-150	0.00	0	0.00	0	0.00	0	0.00	0
150-155	0.00	0	0.00	0	0.00	0	0.00	0
Total No.		371		60		570		66
Total No. prerecruits		242			Total No. recruits	288		

Appendix 3b. Scallop height frequency - Advocate Bay Bed

Ht. range (mm)	Lined drags				Unlined drags			
	Live		Dead		Live		Dead	
	Percent freq.	No.	Percent freq.	No.	Percent freq.	No.	Percent freq.	No.
0- 5	0.00	0	0.00	0	0.00	0	0.00	0
5- 10	0.00	0	0.00	0	0.00	0	0.00	0
10- 15	0.00	0	0.00	0	0.00	0	0.00	0
15- 20	1.96	1	0.00	0	0.00	0	0.00	0
20- 25	1.96	1	0.00	0	0.95	1	14.29	1
25- 30	0.00	0	0.00	0	2.86	3	0.00	0
30- 35	1.96	1	0.00	0	0.95	1	0.00	0
35- 40	0.00	0	0.00	0	1.90	2	0.00	0
40- 45	0.00	0	0.00	0	1.90	2	0.00	0
45- 50	0.00	0	0.00	0	0.00	0	14.29	1
50- 55	7.84	4	0.00	0	10.48	11	0.00	0
55- 60	19.61	10	50.00	1	26.67	28	28.57	2
60- 65	17.65	9	0.00	0	25.71	27	0.00	0
65- 70	7.84	4	0.00	0	4.76	5	14.29	1
70- 75	15.69	8	0.00	0	0.95	1	0.00	0
75- 80	3.92	2	0.00	0	0.00	0	0.00	0
80- 85	1.96	1	0.00	0	2.86	3	0.00	0
85- 90	0.00	0	0.00	0	1.90	2	0.00	0
90- 95	0.00	0	0.00	0	0.00	0	0.00	0
95-100	0.00	0	0.00	0	0.00	0	0.00	0
100-105	0.00	0	0.00	0	0.95	1	0.00	0
105-110	1.96	1	0.00	0	1.90	2	0.00	0
110-115	3.92	2	0.00	0	5.71	6	0.00	0
115-120	3.92	2	0.00	0	5.71	6	0.00	0
120-125	3.92	2	0.00	0	3.81	4	28.57	2
125-130	5.88	3	0.00	0	0.00	0	0.00	0
130-135	0.00	0	50.00	1	0.00	0	0.00	0
135-140	0.00	0	0.00	0	0.00	0	0.00	0
140-145	0.00	0	0.00	0	0.00	0	0.00	0
145-150	0.00	0	0.00	0	0.00	0	0.00	0
150-155	0.00	0	0.00	0	0.00	0	0.00	0
Total No.		51		2		105		7
Total No. prerecruits		38			Total No. recruits		24	

Appendix 3c. Scallop height frequency - Scots Bay Bed

Ht. range (mm)	Lined drags				Unlined drags			
	Live		Dead		Live		Dead	
	Percent freq.	No.	Percent freq.	No.	Percent freq.	No.	Percent freq.	No.
0- 5	0.00	0	0.00	0	2.06	2	0.00	0
5- 10	0.00	0	0.00	0	1.03	1	0.00	0
10- 15	0.00	0	0.00	0	3.09	3	0.00	0
15- 20	0.00	0	0.00	0	1.03	1	0.00	0
20- 25	0.00	0	0.00	0	0.00	0	0.00	0
25- 30	0.00	0	0.00	0	0.00	0	0.00	0
30- 35	0.00	0	0.00	0	0.00	0	0.00	0
35- 40	0.00	0	0.00	0	0.00	0	0.00	0
40- 45	0.00	0	0.00	0	0.00	0	0.00	0
45- 50	1.19	1	4.00	1	0.00	0	0.00	0
50- 55	0.00	0	0.00	0	0.00	0	0.00	0
55- 60	0.00	0	0.00	0	0.00	0	0.00	0
60- 65	0.00	0	0.00	0	0.00	0	0.00	0
65- 70	1.19	1	0.00	0	0.00	0	0.00	0
70- 75	0.00	0	0.00	0	0.00	0	3.23	1
75- 80	2.38	2	0.00	0	1.03	1	9.68	3
80- 85	2.38	2	4.00	1	8.25	8	16.13	5
85- 90	2.38	2	8.00	2	9.28	9	9.68	3
90- 95	11.90	10	16.00	4	16.49	16	9.68	3
95-100	29.76	25	48.00	12	32.99	32	25.81	8
100-105	30.95	26	16.00	4	18.56	18	12.90	4
105-110	15.48	13	0.00	0	3.09	3	12.90	4
110-115	1.19	1	4.00	1	3.09	3	0.00	0
115-120	1.19	1	0.00	0	0.00	0	0.00	0
120-125	0.00	0	0.00	0	0.00	0	0.00	0
125-130	0.00	0	0.00	0	0.00	0	0.00	0
130-135	0.00	0	0.00	0	0.00	0	0.00	0
135-140	0.00	0	0.00	0	0.00	0	0.00	0
140-145	0.00	0	0.00	0	0.00	0	0.00	0
145-150	0.00	0	0.00	0	0.00	0	0.00	0
150-155	0.00	0	0.00	0	0.00	0	0.00	0
Total No.		84		25		97		31
Total No. prerecruits		2			Total No. recruits		90	

Appendix 3d. Scallop height frequency - Ile Haute Bed

Ht. range (mm)	Lined drags				Unlined drags			
	Live		Dead		Live		Dead	
	Percent freq.	No.	Percent freq.	No.	Percent freq.	No.	Percent freq.	No.
0- 5	0.00	0	0.00	0	0.00	0	0.00	0
5- 10	0.00	0	0.00	0	0.00	0	0.00	0
10- 15	0.00	0	0.00	0	0.00	0	0.00	0
15- 20	0.00	0	0.00	0	1.65	2	0.00	0
20- 25	0.00	0	0.00	0	1.65	2	0.00	0
25- 30	0.00	0	0.00	0	0.00	0	7.69	1
30- 35	1.30	1	0.00	0	1.65	2	0.00	0
35- 40	0.00	0	0.00	0	0.83	1	0.00	0
40- 45	1.30	1	20.00	1	4.13	5	0.00	0
45- 50	1.30	1	20.00	1	0.83	1	0.00	0
50- 55	0.00	0	0.00	0	2.48	3	0.00	0
55- 60	0.00	0	0.00	0	0.00	0	0.00	0
60- 65	0.00	0	0.00	0	0.83	1	0.00	0
65- 70	1.30	1	0.00	0	1.65	2	7.69	1
70- 75	1.30	1	0.00	0	1.65	2	0.00	0
75- 80	1.30	1	0.00	0	0.00	0	0.00	0
80- 85	1.30	1	0.00	0	0.00	0	7.69	1
85- 90	0.00	0	0.00	0	1.65	2	7.69	1
90- 95	1.30	1	20.00	1	3.31	4	0.00	0
95-100	5.19	4	0.00	0	5.79	7	0.00	0
100-105	9.09	7	0.00	0	12.40	15	15.38	2
105-110	22.08	17	0.00	0	9.09	11	7.69	1
110-115	12.99	10	0.00	0	12.40	15	7.69	1
115-120	12.99	10	20.00	1	17.36	21	15.38	2
120-125	19.48	15	0.00	0	11.57	14	15.38	2
125-130	7.79	6	0.00	0	8.26	10	7.69	1
130-135	0.00	0	20.00	1	0.83	1	0.00	0
135-140	0.00	0	0.00	0	0.00	0	0.00	0
140-145	0.00	0	0.00	0	0.00	0	0.00	0
145-150	0.00	0	0.00	0	0.00	0	0.00	0
150-155	0.00	0	0.00	0	0.00	0	0.00	0
Total No.		77		5		121		13
Total No. prerecruits		5			Total No. recruits		100	

Appendix 3e. Scallop height frequency - East Quaco Bed

Ht. range (mm)	Lined drags				Unlined drags			
	Live		Dead		Live		Dead	
	Percent freq.	No.	Percent freq.	No.	Percent freq.	No.	Percent freq.	No.
0- 5	0.00	0	0.00	0	0.00	0	0.00	0
5- 10	0.00	0	0.00	0	0.00	0	0.00	0
10- 15	0.00	0	3.23	1	0.00	0	0.00	0
15- 20	3.08	4	6.45	2	0.00	0	4.76	1
20- 25	3.85	5	12.90	4	0.80	1	14.29	3
25- 30	6.15	8	19.35	6	0.80	1	19.52	2
30- 35	0.77	1	6.45	2	0.00	0	0.00	0
35- 40	1.54	2	0.00	0	0.00	0	0.00	0
40- 45	1.54	2	3.23	1	0.80	1	0.00	0
45- 50	3.08	4	3.23	1	2.40	3	9.52	2
50- 55	10.77	14	6.45	2	4.80	6	9.52	2
55- 60	11.54	15	0.00	0	5.60	7	4.76	1
60- 65	3.08	4	3.23	1	2.40	3	0.00	0
65- 70	0.77	1	0.00	0	0.00	0	0.00	0
70- 75	0.77	1	0.00	0	1.60	2	0.00	0
75- 80	0.77	1	0.00	0	1.60	2	0.00	0
80- 85	0.00	0	0.00	0	1.60	2	4.76	1
85- 90	0.00	0	0.00	0	4.00	5	0.00	0
90- 95	3.85	5	0.00	0	2.40	3	0.00	0
95-100	3.08	4	0.00	0	3.20	4	0.00	0
100-105	4.62	6	0.00	0	7.20	9	0.00	0
105-110	6.92	9	3.23	1	4.80	6	0.00	0
110-115	6.92	9	6.45	2	10.40	13	0.00	0
115-120	8.46	11	6.45	2	18.40	23	4.76	1
120-125	11.54	15	9.68	3	16.00	20	9.52	2
125-130	6.92	9	9.68	3	10.40	13	23.81	5
130-135	0.00	0	0.00	0	0.00	0	4.76	1
135-140	0.00	0	0.00	0	0.80	1	0.00	0
140-145	0.00	0	0.00	0	0.00	0	0.00	0
145-150	0.00	0	0.00	0	0.00	0	0.00	0
150-155	0.00	0	0.00	0	0.00	0	0.00	0
Total No.		130		31		125		21
Total No. prerecruits		61			Total No. recruits		101	

Appendix 3f. Scallop height frequency - West Quaco Bed

Ht. range (mm)	Lined drags				Unlined drags			
	Live		Dead		Live		Dead	
	Percent freq.	No.	Percent freq.	No.	Percent freq.	No.	Percent freq.	No.
0- 5	0.00	0	0.00	0	0.00	0	0.00	0
5- 10	0.00	0	0.00	0	0.00	0	0.00	0
10- 15	0.00	0	0.00	0	0.00	0	0.00	0
15- 20	0.00	0	6.25	1	0.00	0	0.00	0
20- 25	0.00	0	0.00	0	0.44	1	11.43	4
25- 30	0.00	0	6.25	1	1.75	4	5.71	2
30- 35	5.68	5	12.50	2	0.44	1	8.57	3
35- 40	6.82	6	18.75	3	2.18	5	20.00	7
40- 45	9.09	8	25.00	4	0.87	2	22.86	8
45- 50	7.95	7	6.25	1	2.18	5	14.29	5
50- 55	7.95	7	12.50	2	3.93	9	5.71	2
55- 60	2.27	2	0.00	0	9.17	21	2.86	1
60- 65	7.95	7	0.00	0	5.24	12	2.86	1
65- 70	1.14	1	6.25	1	6.99	16	0.00	0
70- 75	2.27	2	0.00	0	3.93	9	0.00	0
75- 80	0.00	0	0.00	0	1.31	3	0.00	0
80- 85	1.14	1	6.25	1	1.75	4	2.86	1
85- 90	0.00	0	0.00	0	2.62	6	0.00	0
90- 95	3.41	3	0.00	0	5.68	13	2.86	1
95-100	7.95	7	0.00	0	5.24	12	0.00	0
100-105	9.09	8	0.00	0	9.61	22	0.00	0
105-110	5.68	5	0.00	0	16.59	38	0.00	0
110-115	13.64	12	0.00	0	8.73	20	0.00	0
115-120	5.68	5	0.00	0	6.55	15	0.00	0
120-125	2.27	2	0.00	0	3.93	9	0.00	0
125-130	0.00	0	0.00	0	0.87	2	0.00	0
130-135	0.00	0	0.00	0	0.00	0	0.00	0
135-140	0.00	0	0.00	0	0.00	0	0.00	0
140-145	0.00	0	0.00	0	0.00	0	0.00	0
145-150	0.00	0	0.00	0	0.00	0	0.00	0
150-155	0.00	0	0.00	0	0.00	0	0.00	0
Total No.		88		16		229		35
Total No. prerecruits		45			Total No. recruits		144	

Appendix 3g. Scallop height frequency - Cape Spencer Inshore Bed

Ht. range (mm)	Lined drags				Unlined drags			
	Live		Dead		Live		Dead	
	Percent freq.	No.	Percent freq.	No.	Percent freq.	No.	Percent freq.	No.
0- 5	0.00	0	0.00	0	0.00	0	0.00	0
5- 10	0.00	0	0.00	0	0.00	0	0.00	0
10- 15	0.15	1	0.41	2	0.00	0	0.00	0
15- 20	1.19	8	0.62	3	0.22	1	0.00	0
20- 25	1.63	11	0.62	3	0.22	1	1.61	1
25- 30	1.19	8	3.31	16	0.44	2	0.00	0
30- 35	1.04	7	16.94	82	0.88	4	14.52	9
35- 40	2.67	18	35.54	172	0.22	1	20.97	13
40- 45	7.58	51	25.41	123	0.44	2	19.35	12
45- 50	15.45	104	7.23	35	2.41	11	14.52	9
50- 55	9.51	64	2.48	12	4.17	19	9.68	6
55- 60	2.82	19	3.51	17	2.63	12	11.29	7
60- 65	3.57	24	2.48	12	2.63	12	0.00	0
65- 70	12.48	84	1.03	5	7.02	32	3.23	2
70- 75	2.53	17	0.00	0	3.29	15	0.00	0
75- 80	4.01	27	0.41	2	7.02	32	0.00	0
80- 85	4.75	32	0.00	0	9.43	43	0.00	0
85- 90	5.05	34	0.00	0	11.40	52	1.61	1
90- 95	6.54	44	0.00	0	10.31	47	0.00	0
95-100	5.50	37	0.00	0	11.40	52	0.00	0
100-105	4.31	29	0.00	0	9.87	45	3.23	2
105-110	5.20	35	0.00	0	9.43	43	0.00	0
110-115	1.78	12	0.00	0	5.70	26	0.00	0
115-120	0.74	5	0.00	0	0.88	4	0.00	0
120-125	0.30	2	0.00	0	0.00	0	0.00	0
125-130	0.00	0	0.00	0	0.00	0	0.00	0
130-135	0.00	0	0.00	0	0.00	0	0.00	0
135-140	0.00	0	0.00	0	0.00	0	0.00	0
140-145	0.00	0	0.00	0	0.00	0	0.00	0
145-150	0.00	0	0.00	0	0.00	0	0.00	0
150-155	0.00	0	0.00	0	0.00	0	0.00	0
Total No.		673		484		456		62
Total No. prerecruits		416			Total No. recruits		344	

Appendix 3h. Scallop height frequency - Cape Spencer Offshore Bed

Ht. range (mm)	Lined drags				Unlined drags			
	Live		Dead		Live		Dead	
	Percent freq.	No.	Percent freq.	No.	Percent freq.	No.	Percent freq.	No.
0- 5	0.00	0	0.10	1	0.00	0	0.00	0
5- 10	0.00	0	0.00	0	0.00	0	0.00	0
10- 15	0.06	3	0.10	1	0.03	1	0.27	1
15- 20	0.48	23	1.64	16	0.32	12	0.27	1
20- 25	1.43	68	2.16	21	0.95	35	0.80	3
25- 30	2.17	103	5.34	52	1.27	47	0.53	2
30- 35	1.48	70	19.20	187	1.00	37	14.27	16
35- 40	3.86	183	24.74	241	1.51	56	12.53	47
40- 45	15.03	713	24.02	234	8.40	311	19.73	74
45- 50	32.94	1563	9.03	88	21.45	794	12.27	46
50- 55	21.94	1041	2.77	27	18.69	692	1.60	6
55- 60	4.53	215	0.92	9	4.27	158	1.60	6
60- 65	3.01	143	0.31	3	1.97	73	2.67	10
65- 70	1.45	69	0.31	3	2.70	100	2.13	8
70- 75	0.91	43	0.21	2	1.70	63	0.27	1
75- 80	0.57	27	0.21	2	1.78	66	0.80	3
80- 85	0.67	32	0.10	1	2.19	81	0.00	0
85- 90	0.80	38	0.41	4	3.81	141	1.60	6
90- 95	0.86	41	0.21	2	3.81	141	1.07	4
95-100	1.54	73	0.21	2	5.40	200	3.20	12
100-105	1.45	69	0.10	1	5.59	207	1.07	4
105-110	1.90	90	0.00	0	5.59	207	1.60	6
110-115	1.75	83	0.31	3	4.57	169	30.40	14
115-120	0.78	37	0.31	3	2.16	80	1.33	5
120-125	0.32	15	0.51	5	0.65	24	0.00	0
125-130	0.04	2	0.21	2	0.19	7	0.00	0
130-135	0.02	1	0.92	9	0.00	0	0.00	0
135-140	0.00	0	2.77	27	0.00	0	0.00	0
140-145	0.00	0	2.26	22	0.00	0	0.00	0
145-150	0.00	0	0.51	5	0.00	0	0.00	0
150-155	0.00	0	0.10	1	0.00	0	0.00	0
Total No.		4745		974		3702		275
Total No. prerecruits		4237			Total No. recruits		1323	

Appendix 3i. Scallop height frequency - Small scallops off Cape Spencer

Ht. range (mm)	Lined drags Live Percent freq.	Live No.	Dead Percent freq.	Dead No.
0- 5	0.00	0	0.00	0
5- 10	0.00	0	0.00	0
10- 15	0.09	3	0.15	1
15- 20	0.33	11	1.24	8
20- 25	0.89	30	1.08	7
25- 30	0.98	33	4.48	29
30- 35	0.83	28	21.79	141
35- 40	4.25	143	23.03	149
40- 45	16.51	555	23.03	149
45- 50	38.35	1289	9.74	63
50- 55	24.37	819	2.94	19
55- 60	3.60	121	0.46	3
60- 65	3.03	102	0.15	1
65- 70	1.04	35	0.15	1
70- 75	0.42	14	0.00	0
75- 80	0.33	11	0.15	1
80- 85	0.36	12	0.00	0
85- 90	0.33	11	0.00	0
90- 95	0.27	9	0.15	1
95-100	0.71	24	0.00	0
100-105	0.51	17	0.00	0
105-110	0.98	33	0.00	0
110-115	0.98	33	0.15	1
115-120	0.54	18	0.31	2
120-125	0.24	85	0.77	5
125-130	0.06	2	0.31	2
130-135	0.00	0	1.39	9
135-140	0.00	0	4.17	27
140-145	0.00	0	3.40	22
145-150	0.00	0	0.77	5
150-155	0.00	0	0.15	1
Total No.		3361		647
Total No. prerecruits		3183		

Appendix 4a. Measurement of shell annulii heights (mm) area A.

Tow/date	Annulus 1	2	3	4	5	6	7	8	9	10	11	12	13
15													
30/04/85	23	53	69										
	21	51	67										
	32	57	72										
	29	54	72										
	28	56	77										
	20	43	69	85	98	106	111	115	118				
	22	45	69	84	95	102	107	111					
	19	44	63	79	89	97	104	110	114				
	16	46	62	80	92	100	107	112	116	118			
	22	50	72	83	92	99	106	111	113	118			
	16	46	65	75	87	97	107	112	118				
	18	40	66	82	95	104	110	116	120	123			
	23	52	74	88	95	101	106	112	116	118	120		
	23	50	70	86	99	107	114	119	124	126	127	128	
	31	51	70	84	98	104	108	112	114	116	118		
	28	57	78										
	30	61	80										
	21	53	76	90									
	21	56	78	89									
	18	55	78	88									
	23	53	74	87	94								
	26	55	78	89	96								
	19	53	70	82	92	99							
	30	61	82	95									
	14	46	69	85	94	98	100						
	37	59	80	89	96	103	106	109					
	15	43	71	90	100	107	112						
	18	40	63	80	93	102	108	12	114				
	20	44	64	75	85	93	103	106	108				
	15	40	61	77	87	97	105	108	113				
4													
09/04/86	26	56	75	87	95	99							
	19	50	71	87	97	106							
	19	54	71										
	28	59	79										
	26	58	77										
	32	62	77										
	46												
	29	58											
	29	58											
	27	57											
	27	58	61										
	34	62											
	25	55	77	90	98								
	26	63	84	95	101								
	29	60	81	95	103								
	35	61	88	99	106	108							
	34	68	85	97	104	107							
	20	46	68	84	96	105	111	115					
	23	53	76	89	99	105	109	114					
	39	65	81	92	101	108	113	118					
	38	63	81	95	103	109	115						
	20	50	70	87	97	106	113						
	26	54	76	86	92	99	102	106	109	113	114		
	24	51	71	82	91	96	102	107	113	115			
	21	46	70	89	103	109	114	120	124				
	25	54	73	87	97	104	110	116	120	123			
	24	48	70	82	94	102	108	112	118	120	123	125	
	18	46	68	83	96	105	112	116	121	124			
	28	58	77	90	103	110	114	117	120				
	21	51	73	87	97	108	112	116	118	120			

Appendix 4a. (cont'd)

	Annulus												
Tow/date	1	2	3	4	5	6	7	8	9	10	11	12	13
10													
29/04/86	32	61											
	33	63											
	40	65	80										
	33	64	83										
	20	53	78										
	18	50	74										
	20	52	78										
	28	61	85	96									
	33	61	81	94									
	26	55	80	96									
	18	43	69	86	95								
	18	45	67	82	95								
	21	53	76	90	99								
	22	57	80	93	100								
	20	55	76	87	96								
	20	50	70	86	95								
	24	57	79	90	99								
	24	57	81	96	106								
	24	50	73	87	96	103							
	27	62	77	88	98	106							
	15	45	72	88	97	104							
	34	63	83	95	102	108							
	24	55	75	92	100	105	109						
	21	51	79	99	110	115							
	19	49	71	83	95	104	109						
	18	50	70	84	96	102	108						
	23	47	70	84	95	104	109						
	24	53	79	95	104	114	119	122	125				
	23	49	70	86	95	103	109	113	115				
	31	60	80	94	105	111	115	118					
30													
01/05/8	27	61											
	33	68											
	34	70											
	46	75											
	26	59	82										
	28	64	85										
	34	69	87										
	30	67	88										
	27	62	83										
	25	61	80										
	44	69	90	102									
	28	61	86	98									
	26	63	75	85	100	107							
	40	67	85	98	106								
	27	57	80	100	109	114							
	21	48	63	79	88	95	104	110	114	119			
	27	53	76	90	96	102	106	109	111				
	25	52	75	89	97	103	108	111					
	20	51	70	87	96	104	109	112	115	117			
	19	57	75	89	101	108	113						
	42	69	92	100	106	110							
	23	56	82	96	105	114	119	122	124				
	22	50	73	83	93	98	105	110	114	117	120		
	23	47	72	88	97	103	109	113	116	119			
	27	53	73	87	96	104	113	119					
	28	52	72	87	100	106	112	117	121				
	24	52	73	86	97	105	113	119	123	125			
	25	57	71	87	96	104	108	112	115	118	120	123	125
	20	54	81	94	106	113	117	119					
	19	49	70	86	96	102	108	114	117				

Appendix 4a. (cont'd)

Tow/date	Annulus 1	2	3	4	5	6	7	8	9	10	11	12	13
52													
02/05/86	23	56	77	88									
	20	51	75	89									
	26	55	77	91	103								
	19	50	75	88	97								
	22	54	78	94	102								
	13	50	77	91	97								
	26	56	81	94	101								
	24	58	81	92	99								
	25	54	76	89	99								
	26	55	76	87	94								
	20	52	77	91	101								
	18	51	76	91	100								
	21	55	78	95	105	113							
	14	46	72	89	99	110	114						
	34	59	79	94	103	108							
	25	51	74	92	102	108							
	44	68	88	100	105								
	22	50	74	95	103	109							
	20	50	77	96	106	111							
	30	57	77	93	101	109	114	117					
	17	49	71	85	99	107	112	115					
	37	65	81	92	98	103	105						
	19	49	73	88	97	104	109	111					
	23	48	65	81	93	98	103	106					
	29	58	79	92	100	106	112	115	117				
	16	49	72	90	100	106	108						
	34	65	82	97	106	112	116	120	123	125			
	32	58	72	87	98	105	112	115	119	121	123		
	22	49	67	79	91	97	103	109	113	117	119	121	
	24	53	72	84	93	103	110	115	118	122	126		
101													
07/05/86	27	60											
	26	59											
	20	51	75										
	16	49	75										
	26	55	78										
	31	59	82										
	32	62	86										
	36	64	85										
	29	61	86										
	22	56	79	92	100								
	11	46	73	87									
	22	41	69	87	96								
	18	48	73	92									
	28	61	83	94									
	24	56	84	96	105								
	30	63	85	100	106	110							
	22	60	81	91	103	110							
	26	53	74	90	97	103	108	111	113				
	23	57	80	93	105	113	117						
	15	44	66	86	97	106	113	118	120				
	22	53	76	87	95	105	113	120	122				
	17	48	67	82	95	104	111	116	119				
	29	62	83	92	99	105	110	115	120	125	129		
	22	53	77	86	93	100	105	109	113	116	119	123	
	20	52	81	96	105	114	118	121	123				
	20	49	67	82	91	98	104	110	115	119			
	20	52	74	85	93	98	103	107	112	116	119	123	
	11	37	60	78	92	98	102	107	110	113	115	118	
	28	59	82	92	100	107	112	117	121	125			
	19	52	76	95	106	114	122	126	128	130			

Appendix 4a. (cont'd)

	Annulus												
Tow/date	1	2	3	4	5	6	7	8	9	10	11	12	13
88													
06/05/86	19	39	59	76	83	87							
	17	39	65	80	86	89							
	11	34	53	67	75	82	84						
	11	34	57	69	77	84	90	94					
	17	42	57	72	80	86	91						
	19	40	61	75	86	91	93						
	15	41	63	76	81								
	17	44	66	80	85								
	19	39	55	69	76	82	86	91	95	98	101		
	15	39	60	77	84	87	91	96	98	99			
	18	44	64	79	86	92	95	98					
	19	43	65	76	84	90	94	96					
	12	33	56	71	78	84	90	95					
	13	35	53	69	81	86	92	96					
	16	39	61	78	92	98	101	104	108				
	14	39	62	76	89	100	106	111	113	115			
	20	45	64	79	89	95	98	101					
	25	43	60	76	88	95	102	107	110	113	115	117	
	11	33	53	71	82	91	95	98	101	103			
	16	36	57	72	85	90	93	95					
	19	36	55	70	84	95	97	102	105	109	111		
	17	41	65	82	90	95	99	102	104	106			
	13	35	55	73	84	93	98	102	105	108	110		
	22	45	66	79	86	91	97	103	106				

Appendix 4b. Measurement of shell annulii heights (mm) area B.

Tow/date	Annulus 1	2	3	4	5	6	7	8	9	10	11	12	13
37													
26/06/87	19	44	68	81	88	98	103	107					
	13	37	59										
	15	41	63										
	16	41	66										
	19	44	66										
	21	45	64	75									
	16	43	64	77									
	15	41	61	76									
	18	41	62	75									
	20	46	66	81									
	14	41	61	74	81								
	13	38	56	71	81								
	12	33	59	74	82								
	13	39	58	74	84								
	16	44	67	80	88	92							
	17	45	67	81	89	94							
	14	43	66	80	87	92	95						
	11	36	61	83	95	100	102						
	17	46	69	82	91								
	12	37	57	74	84	90	95	98	101				
	24	48	71	85	92	99	103	106					
	22	48	63	81	90	97	102	107	110	113			
	12	35	57	72	80	88	94	100	103				
	14	39	63	79	88	96	101	106					
	26	50	72	84	92	101	104	107	109				
	12	36	56	71	83	89	95	99	102	105	108		
	15	32	57	72	84	92	98	101					
	11	38	60	77	87	101	107	110					
	16	42	67	81	91	100	104	109	112				
	19	43	71	87	95	101	107	110	112	114			
20													
25/06/87	17	47											
	14	47											
	19	45											
	18	47											
	16	45											
	11	36	61										
	13	39	62										
	15	44	68										
	18	45	66	80									
	12	39	58	72	80								
	15	40	63	78									
	12	44	65	79									
	15	40	59	73	80								
	20	45	66	79									
	17	41	67	81									
	11	32	54	73	85								
	18	43	63	80									
	15	35	58	72	79	86	89						
	12	33	55	71	82	86							
	6	32	55	69	80	84							
	12	32	54	70	82	91							
	14	38	60	75	86	93							
	16	42	64	76	86	90							
	16	45	66	80	90								
	13	41	60	73	82	88							
	16	43	64	80	91								
	16	42	62	76	87	94							
	15	48	70	81	89	93							
	13	40	62	75	86	91	94						
	20	47	67	80	91	98	102						

Appendix 4b. (cont'd)

	Annulus												
Tow/date	1	2	3	4	5	6	7	8	9	10	11	12	13
58													
27/06/87	13	40	60										
	13	39	64										
	12	38	62										
	12	43	64										
	10	38	62										
	12	37	61										
	14	39	59	73									
	15	42	64	75									
	10	30	51	68	74	79							
	11	34	52	66	78	81							
	11	32	52	67	80	86							
	10	34	52	64	75	81	87						
	9	31	54	69	78	83	87						
	19	44	61	75	86	90							
	16	41	60	75	82	87							
	16	36	55	70	76	81	85	88					
	11	30	47	62	71	78	87	88					
	13	36	55	72	82	88							
	11	35	53	71	80	88	91						
	11	32	59	71	78	83	88	92					
	13	34	52	66	76	83	89						
	11	28	49	67	75	82	87	89					
	12	35	55	72	87	92							
	10	28	52	55	79	84	88	93	96				
	8	23	44	62	73	81	87	93	96				
	17	35	54	68	78	83	88	92	95				
	9	30	52	67	77	86	90	94					
	12	35	56	71	79	87	92	96					
	10	36	58	71	78	86	92	95					
	18	46	60	70	80	87	92						
54													
27/06/87	12	37	61										
	13	42	61										
	17	44	65										
	14	36	52	69									
	7	31	57	73									
	14	40	60	74									
	17	38	63	78									
	20	44	63	76	81								
	17	42	59	73	82								
	22	45	64	81	89								
	26	51	69	89	95								
	18	49	74	84	93	97							
	26	53	78	88	94	100							
	18	46	67	82	92	98	103						
	16	44	67	79	91	98	103						
	15	44	68	81	94	102	106						
	15	44	69	84	95	102	105						
	19	45	77	92	101	109	111						
	9	40	65	81	90	98	102	106	108				
	9	37	64	82	95	103	108	113	116	118			
	15	45	73	86	100	106	109	110					
	15	44	69	83	95	103	107	111	114	116			
	14	42	69	89	101	108	112	115					
	19	47	74	86	101	107	111	113	115				
	20	40	65	86	97	104	109	112	115	120	122		
	10	34	54	76	90	100	106	110	114	117	119		
	23	44	60	81	98	105	113	118	122	125	128		
	16	46	68	83	93	102	108	114	118	121			
	20	47	68	88	99	107	110	115	117	119			
	12	40	62										