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Questionnaire Survey of the Coastal Nova Scotia Herring Fishery, 1998

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Abstract

A questionnaire survey of fixed gear herring fishers from coastal Nova Scotia was conducted in the summer and fall of 1998. Two hundred and forty five fishers from 11 Nova Scotia Counties (28 Statistical Districts) were interviewed. Historical and recent information was collected on a variety of topics including gear, landings, fishing and spawning locations, abundance and biology of herring.

The emergence of fall roe fisheries off Yarmouth, Queens and Cape Breton Counties has led to an increase in landings and changes in the amount and types of gear used. The majority of the herring caught in these fisheries are sold. In contrast, there has been an overall decrease in gear used in the spring and fall non-roe fisheries and most of the fish caught are used as personal bait. With the exception of fishers participating in roe fisheries, the majority of people interviewed have not recently changed their fishing locations and there is an overall perception that the numbers of herring at spawning locations have decreased over time. Two hundred and fifty nine active and 326 historical spawning locations are recorded.

Résumé

Une enquête par questionnaire auprès des pêcheurs de hareng à l'engin fixe de la côte de la Nouvelle-Écosse a été effectuée à l'été et à l'automne de 1998. L'enquête a rejoint 245 pêcheurs de 11 comtés de la Nouvelle-Écosse (28 districts statistiques). Des renseignements de caractère historique et récents ont été recueillis sur divers sujets notamment les engins, les débarquements, les lieux de pêche et de frai ainsi que l'abondance et la biologie du hareng.

L'apparition d'une pêche d'automne visant les harengs rogués au large des comtés de Yarmouth, Queens et Cape Breton a donné lieu à une augmentation des débarquements et à un changement de la quantité et du type d'engins utilisés. La plus grande partie des harengs capturés dans le cadre de ces pêches a été vendue. Comparativement, on a noté une diminution générale de l'utilisation des engins au moment des pêches de printemps et d'automne ne visant pas les harengs rogués et la plupart des poissons capturés l'ont été pour servir d'appâts aux pêcheurs. À l'exception des pêcheurs pratiquant la pêche du hareng rogué, la majorité des personnes interrogées n'avaient pas changé récemment de lieux de pêche et la perception générale était que le nombre de harengs présents sur les frayères avait diminué avec le temps. On a noté l'existence de 259 frayères actives et de 326 frayères ayant déjà été utilisées.

1. Summary

- 245 fixed gear herring fishers from 11 Nova Scotia Counties (28 Statistical Districts) were interviewed. This represents 13% of the total number of licenses issued in 1998.
- There have been changes in the gear used over time mostly as a result of the initiation of roe fisheries and the introduction of new regulations and management plans.
- The majority of fishers have not changed their fishing locations over time.
- The most concentrated fishing efforts are seen in the spring bait fishery in the Bras d'Or Lakes, the late summer roe fishery off Spectacle Buoy and the fall roe fisheries off Glace Bay, the Eastern Shore, Little Hope and Trinity Ledge.
- Overall herring landings have increased significantly since 1996 as a result of the development of roe fisheries.
- With the exception of fish from the roe fisheries, the majority of herring are caught for bait.
- 259 active and 326 historical spawning locations are recorded from coastal Nova Scotia.
- The majority of fishers feel that the numbers of herring at spawning locations have decreased over time. Fishers in Yarmouth Co. are the exception to this, reporting an increase in herring at summer and fall spawning locations.
- It is recommended that this questionnaire survey be extended to include fishers along the Fundy coast and should be modified to include weir fishers in Nova Scotia and New Brunswick.

2. Introduction

In recent years, with the development of specific management objectives to protect spawning components and the advent of in-season management (Anon 1997a), considerable interest has been focused on individual herring spawning components and fisheries in 4VWX. Major spawning locations have been identified for fish that are exploited as part of the mobile fleet fishery and effort has been expended to survey, assess and manage the populations associated with the Southwest Nova Scotia/Bay of Fundy spawning components. With increased interest in roe fisheries in the Little Hope, Eastern Shore and Glace Bay areas, attention has also been drawn to the inshore fixed gear fisheries of the Coastal Nova Scotia (South Shore, Eastern Shore and Cape Breton)

spawning component. Historical spawning areas have been documented for coastal Nova Scotia (Denny *et al.* 1998, Crawford 1979, Sameoto 1971) but much of the inshore herring fishery, particularly the bait fishery, remains undocumented and thus it is likely that other inshore spawning areas exist but are not recorded. A guiding principle of the management of herring in this region is the "preservation of all ... spawning components" (Anon 1997b) and in order to preserve them, it is necessary to first document where these components exist.

In recent years there has been increasing pressure to develop inshore fisheries, particularly for roe. These are being proposed in the absence of knowledge of the present and historical levels of fishing pressure and the status and existence of spawning groups (Stephenson *et al.*, 1998). As a result of this, it was recommended in 1997 that "no coastal spawning area should have a large effort increase until much more information is available on the state of that spawning group." (Anon 1997c).

Prior to 1997, no landings were recorded from the bait fisheries along the Nova Scotia coast and landings from the commercial fixed gear fisheries were unreliable and incomplete. New license conditions were introduced on May 1, 1997 which required bait fishers to complete log records weekly and submit them annually and commercial fishers to complete daily log records and submit them weekly. This has led to the collection of more data and more reliable information on landings from the inshore in 1998 but there is still very little known about specific spawning and fishing locations and the recent history of the inshore fishery.

The improved documentation of the coastal Nova Scotia fisheries has been recognized as an important factor in the evaluation of stock status. In 1998 it was recommended that there be an improvement in the "documentation of the fishery and spawning groups by conducting a questionnaire survey of gillnet fishers ... [and improved] monitoring of existing fisheries" (Stephenson *et al.* 1998). The present study was initiated to document information from the inshore fixed gear herring fisheries for the coast of Nova Scotia by compiling industry information. Information was gathered from fishers on a variety of topics including gear, landings, and fishing and spawning locations. By elucidating the location, timing and intensity of the local inshore fisheries, it is hoped that the information gathered from this survey will provide a basis for future biological studies and in-season management of individual spawning components.

3. Methods

The present survey included herring and mackerel inshore fishers from eleven counties of Nova Scotia (the corresponding statistical districts are shown in brackets): Victoria (1 and 4), Cape Breton (6 and 7), Richmond (8 and 9), Inverness (2 and 3), Guysborough (14, 15, 16 and 17), Halifax (18, 19, 20, 21,

22 and 23), Lunenburg (25, 26 and 27), Queens (28), Shelburne (30, 31 and 32), Yarmouth (33 and 34) and Digby (36) Counties. The mackerel portion of the questionnaire will be analysed separately by DFO personnel from the Laurentian Region.

In most counties, lists of active fishers were provided by fishers' organizations. In addition, as part of the questionnaire, fishers were asked to provide the names and telephone numbers of other herring fishers that could be interviewed. We attempted to interview all of the people who were suggested by organizations and by individuals. In areas where few or no fishers names were provided by these methods, fishers were identified from lists of license holders provided by DFO Area Offices in Bridgewater and Sydney. Two field workers, based in Bridgewater and Sydney, conducted the survey. The majority of interviews were conducted in person by the field samplers who completed the questionnaires with the fishers. In a few rare instances the questionnaires were conducted by telephone.

The total number of herring licenses per county and the number of fishers interviewed is shown in Table 1. Overall, 13% of the total number of license holders were interviewed (minimum of 5% in Shelburne Co. and maximum of 38% in Inverness Co.). In Shelburne Co. 51 fishers were contacted, but only 14 agreed to be interviewed; of the 37 who declined, the majority stated that they were not fishing herring at present because of large numbers of seals and small quantities of fish.

County	Number Interviewed	Total Number of Licenses	Percentage Interviewed
Inverness	5	13	38
Richmond	24	102	24
Cape Breton	27	386	7
Victoria	22	143	15
Guysborough	50	163	31
Halifax	35	281	12
Lunenburg	23	203	11
Queens	11	78	14
Shelburne	14	282	5
Yarmouth	34	276	12
Total	245	1927	13

Table 1. The number of fishers interviewed and the total number of herring licenses by county for 1998.

A copy of the questionnaire is attached in Appendix 1. Large scale maps for the appropriate areas were attached to the questionnaires so that fishers could indicate fishing and spawning locations.

4. Results

A total of 245 herring fishers were interviewed. Individuals who fished predominantly in the Bras d'Or Lakes were assigned to that area, rather than one of the four Cape Breton counties. Five fishermen from Digby Co. were also interviewed. Since they fished mainly on Trinity Ledge and off Spectacle Buoy, their responses were assigned to Yarmouth Co.. The geographic distribution of the individuals interviewed is shown in Table 2 and Figure 1.

Table 2. The number of fishers interviewed by area.

County	Number Interviewed	Percent
Bras d'Or Lakes	26	11
Victoria	20	8
Cape Breton	18	7
Richmond	12	5
Inverness	2	1
Guysborough	50	20
Halifax	35	14
Lunenburg	23	10
Queens	11	4
Shelburne	14	6
Yarmouth	34	14
Total	245	100

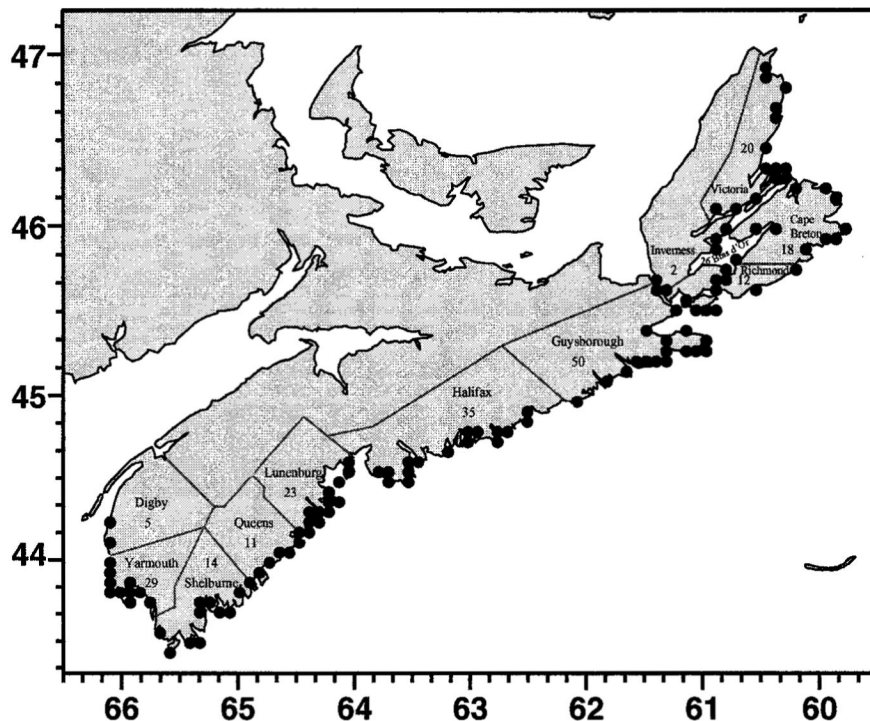


Figure 1. Distribution of fishers interviewed for the questionnaire survey.

The majority of fishers (73%) belonged to a Fishers' organization or association but 27% did not acknowledge membership in any association. Association affiliations are shown in Table 3.

Table 3. Associations to which interviewed fishers belong.

Association	Number
Aspy Bay Fisherman's Assoc.	1
East Cape Breton Fishers Association	1
Eastern Fisherman's Association	1
Eastern Guysborough County Fishermen's Association	1
Eastern Shelburne County Fishermen's Association	1
Eastern Shore Fishermen's Protective Association	30
Eddy Point Marine Park	1
Glace Bay Fishermen's Association	4
Guysborough County Inshore Fishermen's Association	19
Guysborough County Fishermen's Association	3
Guysborough Sea Urchin Association	1
Halifax West Commercial Fishermen's Association	5
Herring Cove Fishermen's Association (inactive)	1
Herring Management Committee	5
Inshore Fishermen's Association	1
Maritime Fishermen's Union	14
North of Smokey Fishermen's Association	4
Northside Fishermen's Association	3
Nova Scotia Mackerel Association	4
Prospect Area Fulltime Fishermen's Association	4
Richmond Co. Fishermen's Association	13
Sambro Fishermen's Association	1
Shelburne County Fixed Gear Quota Group	5
Scotia Fundy Inshore Fishermen's Association	3
Shelburne County Competitive Fishermen's Association	1
Shelburne County Fixed Gear Association	1
Shelburne County Management Group	3
South Shore Gillnetters Association	10
South Shore Independent Fishermen's Association	14
South West Fishermen's Rights Association	1
South West Nova Fixed Gear Association	1
St. Peter's Association	2
West Nova Fishermen's Coalition	17
Yarmouth County Fixed Gear Association	2
None Stated	67
Total	245

The results of the questionnaire have been tabulated according to question number. An analysis of these results is presented in the Discussion section of this paper.

Table 4, **Question 1:** Are you fishing herring this year (1998)?

County	Yes	No	No Comment
Bras d'Or Lakes	18 (69%)	8 (31%)	
Inverness	2 (100%)		
Richmond	6 (50%)	6 (50%)	
Cape Breton	15 (83%)	3 (17%)	
Victoria	14 (70%)	3 (15%)	3 (15%)
Guysborough	18 (36%)	31 (62%)	1 (2%)
Halifax	31 (89%)	4 (11%)	
Lunenburg	17 (74%)	6 (26%)	
Queens	7 (64%)	4 (36%)	
Shelburne	4 (29%)	10 (71%)	
Yarmouth	23 (68%)	11 (32%)	
Total	155 (63%)	86 (35%)	4 (2%)

Table 5. **Question 2:** Did you fish herring last year (1997)?

County	Yes	No	No Comment
Bras d'Or Lakes	18 (69%)	8 (31%)	
Inverness	1 (50%)	1 (50%)	
Richmond	10 (83%)	2 (17%)	
Cape Breton	15 (83%)	3 (17%)	
Victoria	14 (70%)	3 (15%)	3 (15%)
Guysborough	26 (52%)	23 (46%)	1 (2%)
Halifax	28 (80%)	7 (20%)	
Lunenburg	17 (74%)	6 (26%)	
Queens	8 (73%)	3 (27%)	
Shelburne	8 (57%)	6 (43%)	
Yarmouth	29 (85%)	5 (15%)	
Total	174 (71%)	67 (27%)	4 (2%)

Table 6. **Question 3:** How many years have you fished herring?

County	Number Interviewed	Range (years)	Mean (years) ± std
Bras d'Or Lakes	26	3 to 65	25 ± 15
Inverness	2	32 to 55	44 ± 16
Richmond	12	8 to 45	28 ± 12
Cape Breton	18	7 to 55	30 ± 15
Victoria	20	1 to 50	24 ± 14
Guysborough	50	1 to 62	28 ± 15
Halifax	35	8 to 50	27 ± 11
Lunenburg	23	2 to 50	23 ± 13
Queens	11	10 to 44	22 ± 12
Shelburne	14	1 to 50	27 ± 17
Yarmouth	34	1 to 40	15 ± 14
Total	245	1 to 65	24 ± 15

Table 7. **Question 4:** What type of license do you hold?

County	Commercial	Bait	Both	Other	No Comment
Bras d'Or Lakes	20 (77%)	1 (4%)	1 (4%)		4 (15%)
Inverness		2 (100%)			
Richmond	10 (83%)	1 (8%)	1 (8%)		
Cape Breton	6 (33%)	5 (28%)	6 (33%)		1 (6%)
Victoria	8 (40%)	8 (40%)	4 (20%)		
Guysborough	36 (72%)	4 (8%)	4 (8%)	3 (6%)*	3 (6%)
Halifax	34 (97%)	1 (3%)			
Lunenburg	20 (87%)	2 (9%)			1 (4%)
Queens	11 (100%)				
Shelburne	14 (100%)				
Yarmouth	21 (62%)	2 (6%)	11 (32%)		
Total	180 (73%)	26 (11%)	27 (11%)	3 (1%)*	9 (4%)

*mackerel license

Table 8. **Question 5:** Did you fish herring this spring (1998)?

County	Yes	No
Bras d'Or Lakes	19 (73%)	7 (27%)
Inverness	2 (100%)	
Richmond	7 (58%)	5 (42%)
Cape Breton	15 (83%)	3 (17%)
Victoria	14 (70%)	6 (30%)
Guysborough	18 (36%)	32 (64%)
Halifax	16 (46%)	19 (54%)
Lunenburg	9 (39%)	14 (61%)
Queens	5 (46%)	6 (54%)
Shelburne	1 (7%)	13 (93%)
Yarmouth	23 (68%)	11 (32%)
Total	129 (53%)	116 (47%)

Table 9. Question 6: What gear did you use?

County	Gear used	Number of Nets or Traps			Mesh Size (inches)		Net Length (fathoms)			
		Range	Median	Mean \pm std	Range	Median	Range	Median	Mean \pm std	
Bras d'Or Lakes	Set	16 (84%)	2 to 25	9	11 \pm 7	2 1/2 to 2 7/8	2 1/2	12 to 50	20	23 \pm 10
	Swing	3 (16%)	7 to 13	10	10 \pm 3	2 1/2	2 1/2	12 to 20	12	15 \pm 5
Inverness	Set	2 (100%)	2 to 2	2	2	2 3/8 to 2 1/2	2 3/8	25 to 45	35	35 \pm 14
Richmond	Set	6 (86%)	1 to 12	5	6 \pm 4	2 1/4 to 3	2 5/8	20 to 56	24	30 \pm 15
	Swing	1 (14%)	4	4	4	2 5/8	2 5/8	23	23	23
Cape Breton	Set	6 (40%)	1 to 11	4	4 \pm 4	2 3/8 to 3	2 5/8	20 to 90	29	38 \pm 26
	Swing	9 (60%)	2 to 6	4	4 \pm 1	2 to 2 7/8	2 5/8	10 to 30	21	22 \pm 6
Victoria	Set	9 (64%)	1 to 15	4	5 \pm 4	2 1/2 to 3	2 5/8	10 to 30	18	20 \pm 8
	Swing	1 (7%)	3	3	3	2 1/2 to 3		20 to 20	20	20
	Trap	3 (22%)	2 to 3	3	3 \pm 1					
	Not specified	1 (7%)	3 to 3	3	3	2 1/2	2 1/2	20 to 20	20	20
Guysborough	Set	15 (75%)	2 to 14	6	6 \pm 4	2 1/4 to 3	2 5/8	10 to 50	20	22 \pm 9
	Swing	2 (10%)	2	2	2	2 1/4 to 2 5/8		20 to 21	21	21 \pm 1
	Trap	2 (10%)	1 to 2							
	Other*	1 (5%)	4	4	4	2 5/8	2 5/8	20	20	20
Halifax	Set	13 (81%)	2 to 30	8	11 \pm 7	2 1/2 to 3	2 3/4	15 to 30	20	21 \pm 4
	Trap	3 (19%)	2 to 3	2	2 \pm 1					
Lunenburg	Set	9 (100%)	1 to 10	6	5 \pm 3	2 1/2 to 3	2 3/4	7 to 52	21	22 \pm 12
Queens	Set	5 (100%)	2 to 6	3	4 \pm 2	2 3/8 to 2 5/8	2 1/2	17 to 20	19	19 \pm 1
Shelburne	Set	1 (100%)	3 to 3	3	3	2 5/8 to 2 3/4		18 to 18	18	18
Yarmouth	Set	9 (36%)	2 to 40	4	9 \pm 14	1 1/2 to 3	2 3/8	18 to 25	20	20 \pm 2
	Drift	15 (60%)	3 to 15	3	4	1 1/2 to 3 1/8	2 1/2	18 to 27	20	20 \pm 3
	Trap	1 (4%)	1	1	1					
All Counties	Set	85 (67%)	1 to 40	6	7 \pm 6	1 1/2 to 3	2 5/8	7 to 90	20	23 \pm 11
	Drift	15 (12%)	3 to 15	3	43	1 1/2 to 3 1/8	2 1/2	18 to 27	20	20 \pm 3
	Swing	16 (13%)	2 to 13	4	5 \pm 3	2 to 3	2 1/2	10 to 21	20	20 \pm 5
	Trap	9 (7%)	1 to 3	2	2 \pm 1					
	Other*	1 (1%)	4	4	4	2 5/8	2 5/8	20	20	20

*Other = "Hook" nets

Tables 10a and 10b. Question 7: Where did you fish in 1998?

		1998 Spring and Summer			
10a	County	No. Fishers	No. Fishing Locations	Total No. Days Fished	Mean No. Days per Fisher
	Bras d'Or Lakes	20	24	410	21
	Inverness	2	2	95	48
	Richmond	7	8	129	18
	Cape Breton	16	19	512	32
	Victoria	16	22	535	33
	Guysborough	23	28	537	23
	Halifax	17	19	427	25
	Lunenburg	8	8	46	6
	Queens	2	2	49	25
	Shelburne				
	Yarmouth	22	24	399	18
	Total	133	156	3139	24

10b

1998 Fall

County	No. Fishers	No. Fishing Locations	Total No. Days Fished	Mean No. Days per Fisher
Halifax	2	2	60	30
Lunenburg	2	2	18	9
Queens	3	4	11	4
Shelburne				
Yarmouth	13	20	278	21
Total	20	28	367	18

Note: There is no information on the fall of 1998 from fishers from the Bras d'Or Lakes, Inverness, Richmond, Cape Breton, Victoria and Guysborough Counties since they were interviewed in the summer prior to the fall fishery.

Table 11a and b. **Question 8:** How much herring did you catch in 1998?

11a

Spring and Summer, 1998

County	Number Responded	Catch			
		Total Caught (t)	Range (t)	Median (t)	Mean (t) ± std.
Bras d'Or Lakes	24	110.7	0.2 to 33.7	2	4.6 ± 7.1
Inverness	2	0.2	- to 0.1	-	0.1 ± 0.1
Richmond	6	1.2	0 to 0.7	-	0.2 ± 0.3
Cape Breton	15	10.4	0.1 to 2.3	0.3	0.7 ± 0.8
Victoria	16	23.6	- to 15.7	1.6	1.4 ± 4.0
Guysborough	22	22.3	0 to 11.2	0.2	1 ± 2.3
Halifax	15	31.1	0 to 18	0.9	2.1 ± 4.5
Lunenburg	10	37.8	0 to 18	1.6	3.8 ± 5.7
Queens	3	0.9	0 to 0.9	-	0.3 ± 0.5
Shelburne					
Yarmouth	26	1239.9	0.1 to 134.8	38.2	47.7 ± 46.9
Total	139	1478	0 to 33.7	1	12 ± 30

11b

Fall, 1998

County	Number Responded	Catch			
		Total Caught (t)	Range (t)	Median (t)	Mean (t) ± std.
Halifax	1	19.8	19.8	19.8	19.8
Lunenburg	1	2.7	2.7	2.7	2.7
Queens	2	40.4	0.9 to 30.1	4.7	10.1 +/- 13.7
Yarmouth	13	1245.4	0.3 to 204.9	67.4	73.3 +/- 54.7
Total	17	1308.3	0.3 to 204.9	1	77 ± 56

Table 12a and 12b. **Question 9:** How was the herring used?

Spring and Summer, 1998

12a	County	Total Caught (t)	Amount Sold (t)	Amount Personal Bait (t)	Other (t)
	Bras d'Or Lakes	110.7	46.7 (42%)	59.1 (53%)	4.9 (5%)
	Inverness	0.2	- (18%)	0.2 (82%)	
	Richmond	1.2	0.7 (58%)	0.5 (41%)	- (3%)
	Cape Breton	10.4		10.4 (100%)	
	Victoria	23.8	21.9 (92%)	1.5 (8%)	
	Guysborough	22.3	1.3 (6%)	7.4 (33%)	13.7 (61%)
	Halifax	31.1	2.3 (7%)	10.8 (35%)	18 (58%)
	Lunenburg	37.8	0.5 (1%)	37.3 (99%)	
	Queens	0.9		0.9 (96%)	- (4%)
	Shelburne				
	Yarmouth	1239.9	1203.1 (97%)	36.6 (3%)	0.2 (-%)
	Total	1478	1474 (87%)	182 (11%)	37 (2%)

Fall, 1998

12b	County	Total Caught (t)	Amount Sold (t)	Amount Personal Bait (t)	Other (t)
	Halifax	19.8	19.8 (100%)		
	Lunenburg	2.7		2.7 (100%)	
	Queens	40.4	38.2 (94%)	2.2 (6%)	
	Shelburne				
	Yarmouth	1245.4	1242.1 (99.7%)	3.3 (0.3%)	
	Total	1308.3	1300.1 (99%)	8.2 (1%)	

Table 13a and 13b. **Question 10:** Were there more, less or the same amount of herring in 1998 than in previous years in your fishing area?

Spring and Summer, 1998

13a	County	Much More	Little More	Same	Little Less	Much Less	No Comment
	Bras d'Or Lakes	5 (28%)	2 (11%)	3 (17%)		6 (33%)	2 (11%)
	Inverness			1 (50%)		1 (50%)	
	Richmond			1 (13%)		6 (75%)	1 (13%)
	Cape Breton	2 (13%)	1 (7%)	2 (13%)	4 (27%)	5 (33%)	1 (7%)
	Victoria	2 (13%)		5 (33%)	1 (7%)	4 (27%)	3 (20%)
	Guysborough	1 (5%)		3 (15%)	3 (15%)	11 (55%)	2 (10%)
	Halifax			1 (7%)	2 (13%)	12 (80%)	
	Lunenburg	3 (38%)		1 (12%)	3 (38%)	1 (12%)	
	Queens			1 (33%)	1 (33%)	1 (33%)	
	Shelburne						
	Yarmouth	2 (10%)	6 (30%)	3 (15%)	3 (15%)	4 (20%)	2 (10%)
	Total	15 (12%)	9 (7%)	21 (17%)	17 (14%)	51 (41%)	11 (9%)

Fall 1998

13b	County	Much More	Little More	Same	Little Less	Much Less	No Comment
	Halifax				1 (100%)		
	Lunenburg			1 (100)			
	Queens	2 (50%)		2 (50%)			
	Shelburne						
	Yarmouth	2 (12%)	9 (53%)	2 (12%)		2 (12%)	2 (12%)
	Total	4 (17%)	9 (39%)	5 (22%)	1 (4%)	2 (9%)	2 (9%)

Table 14a and 14b. **Question 11:** Have you had to change your fishing locations in recent years?

1998 All Seasons				
County	Yes	No	No Comment	Total
Bras d'Or Lakes	11 (46%)	13 (54%)		24
Inverness		3 (100%)		3
Richmond	5 (63%)	2 (25%)	1 (13%)	8
Cape Breton	4 (27%)	11 (73%)		15
Victoria	6 (35%)	10 (59%)	1 (6%)	17
Guysborough	6 (26%)	17 (74%)		23
Halifax	3 (19%)	13 (81%)		16
Lunenburg	5 (45%)	6 (55%)		11
Queens		7 (100%)		7
Shelburne				
Yarmouth	5 (18%)	23 (82%)		28
Total	45 (30%)	105 (69%)	2 (1%)	152

If yes, why?

Reason for Moving Fishing Location	Number	Percent
Poor Catches	30	39
Fish Moved	12	15
Involved in a new fishery	6	8
Fishing closer to home	3	4
Seals	2	3
Usual area closed	2	3
Fish more scattered	1	1
Other	1	1
No Comment	20	26
Total	77	100

Tables 15a, 15b and 15c. **Question 12:** Do you have any additional comments on the 1998 spring fishery?

Size of Herring Caught - Spring, 1998				
County	Small	Medium	Large	Mixed
Bras d'Or Lakes			21	
Inverness	1		1	
Richmond	3	2		
Cape Breton	1		10	2
Victoria		1	13	
Guysborough	10	2	4	7
Halifax	5	3	6	
Lunenburg	3		7	
Queens	3		4	
Shelburne				
Yarmouth	2		13	
Total	28	8	79	9

15b

Condition of Herring Caught - Spring, 1998

County	Good	Average	Poor	Fat	Thin
Bras d'Or Lakes	19			1	
Inverness	2				
Richmond	5				
Cape Breton	10				
Victoria	13	1			1
Guysborough	12	2		2	2
Halifax	13			1	
Lunenburg	8				
Queens	4				
Shelburne					
Yarmouth	22				
Total	108	3	0	4	3

15c

Spawning Condition of Herring Caught - Spring, 1998

County	Spawned Out	Spawners	More Female Spawners	More Male Spawners	Fall Spawners
Bras d'Or Lakes	1			1	6
Inverness					
Richmond		1			
Cape Breton	1	2			
Victoria	2	1			
Guysborough		1			
Halifax					
Lunenburg			1		
Queens					
Shelburne					
Yarmouth					
Total	4	5	1	1	6

Table 16. **Question 13:** Did you fish herring last fall (1997)?

County	Yes	No
Bras d'Or Lakes	5 (19%)	21 (81%)
Inverness		2 (100%)
Richmond	5 (42%)	7 (58%)
Cape Breton	2 (11%)	16 (89%)
Victoria	3 (15%)	17 (85%)
Guysborough	17 (34%)	33 (66%)
Halifax	26 (74%)	9 (26%)
Lunenburg	18 (78%)	5 (22%)
Queens	8 (73%)	3 (27%)
Shelburne	6 (43%)	8 (57%)
Yarmouth	28 (82%)	6 (18%)
Total	118 (48%)	127 (52%)

Table 17. **Question 14:** What gear did you use in the fall of 1997?

County	Gear used	Number of Nets or Traps			Mesh Size (inches)		Net Length (fathoms)		
		Range	Median	Mean \pm std	Range	Median	Range	Median	Mean \pm std
Bras d'Or Lakes	Set 5 (100%)	2 to 20	7	8 \pm 7	2 1/2 to 3	2 1/2	16 to 35	20	24 \pm 8
Richmond	Set 5 (100%)	1 to 10	2	4 \pm 4	2 1/2 to 2 7/8	2 5/8	18 to 30	25	24 \pm 6
Cape Breton	Set 2 (67%) Swing 1 (33.3%)	6 to 9		8 \pm 2	2 5/8 to 2 3/4	2 3/4	22	22	22
Victoria	Set 2 (67%) Trap 1 (33.3%)	3	3	3	2 5/8 to 2 3/4	2 3/4	16 to 30	23	23 \pm 10
Guysborough	Set 9 (53%) Drift 1 (6%) Swing 1 (6%) Trap 3 (18%) Handline 1 (6%) Other* 2 (12%)	2 to 16	4	6 \pm 5	2 3/8 to 3	2 5/8	18 to 20	20	19 \pm 1
Halifax	Set 23 (88%) Drift 1 (4%) Trap 2 (8%)	5 to 25	6	9 \pm 4	2 3/8 to 3	2 3/4	15 to 26	19	20 \pm 3
Lunenburg	Set 16 (89%) Trap 2 (11%)	3 to 10	6	6 \pm 3	2 1/2 to 3	2 3/4	15 to 52	20	22 \pm 8
Queens	Set 7 (88%) Drift 1 (13%)	3 to 10	6	6 \pm 3	2 3/8 to 2 3/4	2 1/2	18 to 50	19	23 \pm 12
Shelburne	Set 6 (100%)	1 to 8	4	4 \pm 3	2 3/8 to 2 7/8	2 3/4	17 to 30	20	21 \pm 5
Yarmouth	Set 6 (21%) Drift 21 (75%) Trap 1 (4%)	3 to 40	4	13 \pm 16	1 1/2 to 2 1/2	2 3/8	15 to 20	20	20 \pm 1
		3 to 4	3	3 \pm 0.2	2 1/4 to 2 7/8	2 3/8	18 to 35	20	21 \pm 4
		1	1	1					
All Counties	Set 81 (67%) Drift 24 (20%) Swing 2 (2%) Trap 9 (8%) Other 2 (2%)	1 to 40	6	7 \pm 6	1 1/2 to 3	2 3/4	15 to 52	20	21 \pm 6
		3 to 12	3	4 \pm 3	2 1/4 to 2 7/8	2 3/8	18 to 35	20	21 \pm 4
		1	4	4	2 1/4	2 1/2	20	22	22 \pm 3
		1 to 6							
		2 to 6	5	5 \pm 3	2 5/8	2 5/8	20	20	20

**Shaker" and "Run and Haul" nets

Note: There were no replies to this question from Inverness County fishers

Tables 18a and 18b. **Question 15:** Where did you fish in the fall of 1997?

		1997 Spring and Summer			
18a	County	No. Fishers	No. Fishing Locations	Total No. Days Fished	No Days per Fisher
	Bras d'Or Lakes	3	5	53	18
	Inverness				
	Richmond	2	2	10	5
	Cape Breton	1	1	6	6
	Victoria	4	4	36	9
	Guysborough	2	2	67	34
	Halifax	2	2	45	23
	Lunenburg	6	6	96	16
	Queens	3	3	42	14
	Shelburne	3	3	67	22
	Yarmouth	24	25	635	26
	Total	50	53	1057	21

18b

1997 Fall

County	No. Fishers	No. Fishing Locations	Total No. Days Fished	No Days per Fisher
Bras d'Or Lakes	2	2	5	3
Inverness				
Richmond	1	2	4	4
Cape Breton	2	2	8	4
Victoria	2	2	9	5
Guysborough	6	6	139	23
Halifax	26	30	552	21
Lunenburg	10	11	296	30
Queens	5	5	96	19
Shelburne	4	4	42	11
Yarmouth	21	26	293	14
Total	79	90	1444	18

Table 19. **Question 16:** How much herring did you catch during the fall fishery?

County	Number Interviewed	Catch			
		Total Caught (t)	Range (t)	Median (t)	Mean (t) \pm std.
Bras d'Or Lakes	6	25	0.1 to 17	0.9	4.2 \pm 6.5
Inverness					
Richmond	1	-	-	-	-
Cape Breton	3	18.6	0.6 to 9	9	6.2 \pm 4.8
Victoria	2	16.2	0.4 to 15.7	8.9	8.4 \pm 7.7
Guysborough	14	157.9	0 to 142.5	0.5	11.3 \pm 37.8
Halifax	30	604.3	0 to 130.3	4.5	20.1 \pm 31.7
Lunenburg	25	381.9	- to 89.9	4.5	15.3 \pm 24.7
Queens	10	24.3	0 to 6.7	1.8	2.4 \pm 2.2
Shelburne	5	15.4	0 to 9	0.4	3.1 \pm 4.1
Yarmouth	27	3071.4	1.3 to 296.6	107.9	113 \pm 93.8
Total	124	4315	0 to 297	5	33 \pm 61

Table 20. **Question 17:** How was the herring used?

County	Total Caught (t)	Amount Sold (t)	Amount Bait (t)	Other (t)
Bras d'Or Lakes	25	23.0 (92%)	0.7 (3%)	1.4 (6%)
Inverness				
Richmond	-		-(15.6%)	-(84.4%)
Cape Breton	18.6	9.6 (52%)	9 (48%)	
Victoria	16.2	16.2 (100%)		
Guysborough	157.90	149.2 (95%)	8.6 (5%)	-
Halifax	604.30	559.1 (93%)	44.7 (7%)	0.5 (0.1%)
Lunenburg	381.9	281.8 (74%)	100.1 (26%)	
Queens	24.30	1.1 (5%)	23.2 (95%)	
Shelburne	15.4	9.0 (58%)	6.4 (42%)	
Yarmouth	3071.4	2985.0 (97%)	86.6 (3%)	
Total	4315	4034 (94%)	279 (6%)	2 (-%)

Table 21. **Question 18:** Were there more, less or the same amount of herring in the fall of 1997 than in previous years in your fishing area?

Fall 1997						
County	Much More	Little More	Same	Little Less	Much Less	No Comment
Bras d'Or Lakes			2 (50%)			2 (50%)
Inverness						
Richmond					2 (67%)	1 (33%)
Cape Breton			1 (50%)			1 (50%)
Victoria				1 (33%)		2 (67%)
Guysborough			2 (17%)		8 (67%)	2 (17%)
Halifax			6 (25%)	4 (17%)	12 (50%)	2 (8%)
Lunenburg	6 (35%)	1 (6%)	5 (29%)	2 (12%)	3 (18%)	
Queens	2 (25%)		1 (13%)	1 (13%)	4 (50%)	
Shelburne	1 (17%)		1 (17%)	1 (17%)	2 (33%)	1 (17%)
Yarmouth	3 (14%)	6 (27%)	6 (27%)	1 (5%)	1 (5%)	5 (23%)
Total	12 (12%)	7 (7%)	24 (24%)	10 (10%)	32 (30%)	16 (15%)

Table 22. **Question 19:** Have you had to change your fishing locations in recent years?

County	Yes	No	No Comment	Total
Bras d'Or Lakes	1 (20%)	2 (40%)	2 (40%)	5
Inverness				
Richmond		2 (100%)		2
Cape Breton			3 (100%)	3
Victoria		3 (100%)		3
Guysborough	4 (27%)	10 (67%)	1 (7%)	15
Halifax	11 (32%)	23 (68%)		34
Lunenburg	5 (24%)	16 (76%)		21
Queens	4 (40%)	6 (60%)		10
Shelburne	2 (33%)	4 (67%)		6
Yarmouth	3 (9%)	30 (91%)		33
Total	30 (23%)	96 (73%)	6 (5%)	132

Table 23a, 23b and 23c. **Question 20:** Do you have any additional comments on the 1997 fall fishery?

Size Herring Caught - Fall, 1997				
County	Small	Medium	Large	Mixed
Bras d'Or Lakes			2	
Inverness				
Richmond				
Cape Breton			2	
Victoria				1
Guysborough		1	5	
Halifax	2		17	1
Lunenburg	2		14	
Queens	4		8	
Shelburne	1		1	1
Yarmouth			18	7
Total	9	1	67	10

Condition of Herring Caught - Fall, 1997

23b

County	Good	Average	Poor	Fat	Thin
Bras d'Or Lakes	2				
Inverness					
Richmond					
Cape Breton	2				
Victoria					
Guysborough	6				
Halifax	20				
Lunenburg	16				
Queens	8				
Shelburne	3				1
Yarmouth	25			1	
Total	82	0	0	1	1

Spawning Condition - Fall, 1997

23c

County	Spawners	Spawning Out
Bras d'Or Lakes		1
Inverness		
Richmond		
Cape Breton		
Victoria		
Guysborough	4	
Halifax	10	
Lunenburg		
Queens		
Shelburne		
Yarmouth		
Total	14	1

Table 24. **Question 21:** Do you have records of your catch from previous years?

County	No	Yes	Total
Bras d'Or Lakes	24 (92%)	2 (8%)	26
Inverness		2 (100%)	2
Richmond	11 (92%)	1 (8%)	12
Cape Breton	16 (89%)	2 (11%)	18
Guysborough	48 (96%)	2 (4%)	50
Halifax	29 (83%)	6 (17%)	35
Lunenburg	21 (91%)	2 (9%)	23
Queens	11 (100%)		11
Shelburne	14 (100%)		14
Victoria	17 (85%)	3 (15%)	20
Yarmouth	22 (65%)	12 (35%)	34
Total	213 (87%)	32 (13%)	245

Table 25. **Question 22:** Please list your herring catch from past years.

County	Season	Average Catch (t)						
		1997	1996	1995	1994	1993	1992	<1992
Bras d'Or Lakes	Spring	114.6	86.5	58.9	26.5	54.8	125.6	101.4
	Summer							
	Fall	25.5	2.2	2.2	0.5	2.3	2.3	0.9
	Total	140.1	88.7	61.1	27	57.1	127.9	102.3
Inverness	Spring			0.3	0.3	0.3	0.3	1.7
	Summer							
	Fall							
	Total			0.3	0.3	0.3	0.3	1.7
Richmond	Spring	1.2	10.2	1.4	0.1	12.6	0.3	9.8
	Summer	-						
	Fall							
	Total	1.2	10.2	1.4	0.1	12.6	0.3	9.8
Cape Breton	Spring	9.7	27.7	26.6	28.1	27.5	29.7	57.9
	Summer							
	Fall	18.6						
	Total	28.3	27.7	26.6	28.1	27.5	29.7	57.9
Victoria	Spring	14.5	18.2	3.8	0.4	-	2.5	2.0
	Summer							
	Fall	16.2						
	Total	30.7	18.2	3.8	0.4	-	2.5	2.0
Guysborough	Spring	71.7	136.3	253.5	130.2	127.7	186.6	395.4
	Summer	45.5	112.4	112.4	112.4	112.4	181.6	292.1
	Fall	157.1	13.5	14.3	14.2	12.1	4.5	17.1
	Total	274.3	262.2	380.2	256.8	252.2	372.7	704.6
Halifax	Spring	27.4	17.5	37.5	37.5	37.5	37.5	151.0
	Summer	10.9		2.0	2.0	65.2	2.0	4.0
	Fall	596.7	567.1	42.7	42.7	2.0	60.7	139.3
	Total	635.0	584.6	82.2	82.2	104.7	100.2	294.3
Lunenburg	Spring	15.7	6.7	44.9	67.4	89.9	123.6	58.4
	Summer	116.4	73.2	215.5	204.7	214.9	247.8	522.5
	Fall	288.0	9.6	140.2	173.9	195.2	240.1	457.8
	Total	420.1	89.5	400.6	446	500.00	611.5	1038.7
Queens	Spring							
	Summer	7.0	5.5	13.8	83.5	85.7	85.7	169.2
	Fall	18.9	14.4	14.8	14.8	13.7	13.7	27.4
	Total	25.9	19.9	28.6	98.3	99.4	99.4	196.6
Shelburne	Spring	0.5	0.5	0.5	0.5	0.5	0.5	0.9
	Summer		3.4	4.4	4.4	5.2	6.8	13.5
	Fall	15.4	5.8	6.4	6.4	8.1	8.8	17.6
	Total	15.9	9.7	11.3	11.3	13.8	16.1	32.0
Yarmouth	Spring	84.5	0.9	0.9	1.8	5.4	5.4	10.8
	Summer	1858.3	1552.8	58.4	58.4	58.4	51.7	103.4
	Fall	1491.5	1546.1					
	Total	3434.3	3099.8	59.3	60.2	63.8	57.1	114.2
Total	Spring	339.8	304.5	428.3	292.8	356.2	512.0	789.4
	Summer	2038.0	1747.2	406.5	465.4	541.8	575.5	1104.7
	Fall	2628.0	2158.7	220.6	252.5	233.4	330.0	660.0
	Total	5005.7	4210.5	1055.4	1010.7	1131.5	1417.7	2554.0

Question 23 asked how a fisher's gear, fishing locations and the duration of fishing at those locations had changed over time. The results are summarised below by area.

Bras d'Or Lakes:

Out of 26 fishers interviewed, 15 said there had been no change in gear, fishing location or the time and duration of the fishery, 3 fishers gave no comment and 8 indicated a change. The changes were as follows:

- 3 fishers indicated changes in the amount of gear they fish. One fished 20 nets before 1993 and now only fishes 3, another decreased his nets from 15 to 12 in 1997 and 1998, and another decreased his nets from 12 or 13 prior to 1996 to 5 or 6; this fisher is planning on changing his fishing location in 1999.
- 2 fishers reported differences in fishing location: one changed from Christmas Island to Benacadie Pond in 1995 and another increased the number of locations at which he fishes from Cape George prior to 1996 to Cape George and Orangedale in 1997.
- 1 fisher stated that the timing of the fishery changes depending on the amount of ice in the Lakes.
- A retired fisher reported that there were years in the 1950s and 1960s when there were no herring. He feels that the herring fishery goes in cycles.

Victoria:

Out of 20 fishers interviewed, 9 said there had been no change in gear, fishing location or the time and duration of the fishery, 9 fishers gave no comment and 2 indicated a change. The changes were as follows:

- 1 fisher changed from 3 nets to 1 net 10 years ago.
- 1 fisher changed from a bait to a commercial license in 1998.

Cape Breton:

Out of 18 fishers interviewed, 5 said there had been no change in gear, fishing location or the time and duration of the fishery, 4 fishers gave no comment and 9 indicated a change. The changes were as follows:

- 3 fishers indicated a change in net mesh size. One fisher has reduced his net mesh size to 2½" from 2 7/8", another increased his mesh size from 2 5/8" before 1994 to 2¾", whilst a third now fishes only 2½" nets whereas prior to 1997, he also fished 2 5/8" nets.
- 3 fishers have changed the number of nets that they fish. One fisher increased the number of nets that he fishes to 4 in 1997, another has decreased the number of nets that he sets from 8 to 10 nets before 1995 to only 3 or 4 nets and a third fisher states that in the 1980s he set 66 nets with two others but now sets only 11 nets by himself.
- 2 fishers reported changes in the timing and duration of the fishery. One fisher said that the fishery is occurring later and is not lasting as long. Another fisher reported that the duration of the fishery has increased from 2 to 3 weeks in 1992 to 7 weeks in 1997 and 1998.

- One fisher used to set nets for May herring in the 1970s. These fish no longer come, although there are still herring in June and July.
- One fisher reported that although he only fishes in June and July there are small herring (8 inches) that stay around until at least August.

Richmond:

Out of 12 fishers interviewed, 6 said there had been no change in gear, fishing location or the time and duration of the fishery and 6 indicated a change. The changes were as follows:

- 2 fishers indicated a change in the number of nets. One fisher has decreased the number of nets that he fishes since 1994 whilst another fisher stated that prior to 1992 he could catch all his bait in the Petit de Grat area with 4 nets but now he fishes 6 and still has to buy bait.
- 4 fishers indicated a change in fishing location. One fisher fished the Bras d'Or Lakes and Chedabucto Bay before 1996 but now fishes only in Arichat Harbour; another fished in the Johnstown area from 1995 to 1996 but switched back to Arichat Harbour in 1997 and 1998, a third fished off Forchu before 1993 but then changed to fishing off Framboise and a fourth indicated that although he has not changed his fishing location in the Little Anse area, he is now only one of two boats fishing this area whereas fourteen boats fished there in the late 1980s.

Inverness:

Out of 2 fishers interviewed, 1 said there had been no change in gear, fishing location or the time and duration of the fishery and 1 indicated a change:

- In the 1950s one fisher set 3" nets off Sand Point and got 1500 lbs per set, but there was no market.

Guysborough:

Out of 50 fishers interviewed, 20 said there had been no change in gear, fishing location or the time and duration of the fishery, 20 fishers gave no comment and 10 indicated a change. The changes were as follows:

- 4 fishers indicated a change in the number of nets. Three fishers have reduced their nets: one from 5 in 1996 to 4 in 1997 and 1998, a second from 7 to 5 in 1993, and a third from 7 in 1994 to 2 in 1997. Another fisher used to set a small number of nets in April before 1988 and then stopped fishing until the fall of 1996 when he fished 4 nets in the fall roe fishery off the Eastern Shore; in 1997 he fished 12 to 14 nets in the roe fishery
- 4 fishers have changed the type of gear that they fish. Two fishers have started to fish gill nets in the 1997 fall roe fishery off the Eastern Shore as well as fishing traps in the spring and summer. Another fisher used to fish 2 gill nets before 1996 but now just fishes a mackerel trap catching herring as a bycatch. Another fisher had three traps prior to 1992 and now fishes 4 to 6 gill nets in the spring and summer for bait.
- 1 fisher has reduced the number of fishing locations from two to one since 1997.

- Two fishers began participating in the fall roe fishery off Eastern Passage in 1996 .
- 2 fishers indicated changes in the timing of their fishing effort. Fifteen years ago one fisher put his nets out May 1st. but now the fish are not there until mid-May. Another fisher used to fish from July to September but now he fishes until mid-August since the fish in late August are not fat enough for food.

Halifax:

Out of 35 fishers interviewed, 19 said there had been no change in gear, fishing location or the time and duration of the fishery, 2 fishers gave no comment and 14 indicated a change. The changes were as follows:

- 13 fishers began participating in the fall roe fishery off the Eastern Shore in 1996 and 1997. As a result they have increased the number of nets that they fish, the mesh size of their nets (2 $\frac{3}{4}$ " for the roe fishery) and many have invested in drums. Prior to the advent of the roe fishery most fished in the spring for bait.
- 1 fisher has decreased the number of nets that he fishes from 24 in 1980 to 12 in 1998. He no longer sells any herring since the price is too low.
- 3 fishers used to fish from spring to mid-December prior to the 1980s. One fisher reports that there are no longer any summer or winter herring and the other two fishers fish only in the fall.

Lunenburg:

Out of 23 fishers interviewed, 13 said there had been no change in gear, fishing location or the time and duration of the fishery, 2 fishers gave no comment and 8 indicated a change. The changes were as follows:

- 2 fishers have changed the number of nets that they fish. One has changed from 2 to between 3 and 9 nets in 1995 because of his participation in the Port Mouton fall roe fishery. Another fisher has reduced from 10 to 12 nets to 6 nets in 1997.
- 2 fishers have increased the mesh size of their nets: one from 2 $\frac{3}{8}$ " to 2 $\frac{3}{4}$ " in 1993.
- 2 fishers have changed from nylon to monofilament nets, one in 1992 and another in 1998 and 1 fisher purchased a hydraulic drum roller for the fall roe fishery.
- 3 fishers have changed their fishing location. One changed in 1982 from Shad Bay to Betty's Island, a second now fishes Green Bay as well as Little Harbour since 1997 and a third changed from LaHave to Petite Bay in 1995.
- 1 fisher began fishing in the spring in 1997 as well as in the fall.

Queens:

Out of 11 fishers interviewed, 5 said there had been no change in gear, fishing location or the time and duration of the fishery and 6 indicated a change. The changes were as follows:

- 3 fishers have changed the number of nets that they fish. One fisher decreased the number of nets that he fishes from 8 to 2 in 1996, another has reduced his nets from 7 to 3, whilst another has increased his nets from 1 to 6 because he is now fishing off Port Mouton in the fall.
- 3 fishers indicated changes in location. Two fishers have moved further offshore (one in 1992 and another in 1994), and a third stopped fishing Liverpool Harbour in 1994.

Shelburne:

Out of 14 fishers interviewed, 5 said there had been no change in gear, fishing location or the time and duration of the fishery, 6 fishers gave no comment and 3 indicated a change. The changes were as follows:

- 1 fisher has decreased the number of nets he fishes because there are no fish.
- 1 fisher has fished on Dogget's Ledge except for 1993 when he fished in Liverpool Harbour and off Western Head.
- 1 fisher used to fish from June to August seventeen years ago but now fishes for 7 days in the fall.

Yarmouth:

Out of 34 fishers interviewed, 19 said there had been no change in gear, fishing location or the time and duration of the fishery, 5 fishers gave no comment and 10 indicated a change. The changes were as follows:

- 9 fishers have changed their net mesh sizes. 7 fishers who are involved in the Port Mouton fishery have started to fish with $2\frac{5}{8}$ " mesh since 1996 and 1997. Prior to 1996 they fished with $2\frac{3}{8}$ " and $2\frac{1}{4}$ " mesh. One fisher has changed from $2\frac{3}{8}$ " to $2\frac{1}{2}$ " in 1998 whilst another switched to a smaller mesh in 1997.
- Since 1996 eight fishers have begun to fish off Port Mouton, Spectacle Buoy and Trinity Ledge.
- One fisher reported that he used to fish for roe herring in 1984 and 1985.

Question 24 asked fishers to identify areas of known herring spawning on a map. Spawning areas were divided into active spawning sites (1997 and 1998) and historical spawning sites (<1997). Figures 2 and 3 show the distribution of spawning sites along the Nova Scotia coast.

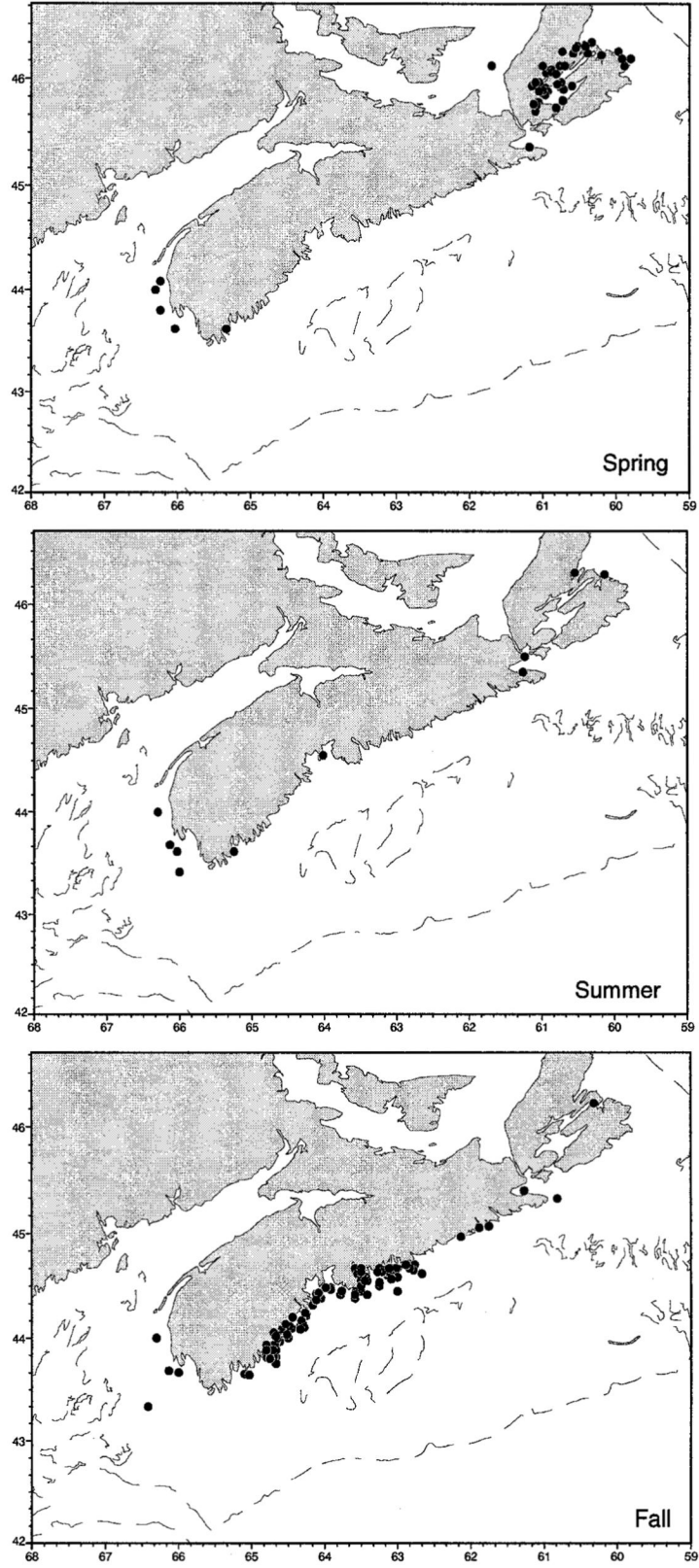


Figure 2. Active Spawning Locations (1997 and 1998)

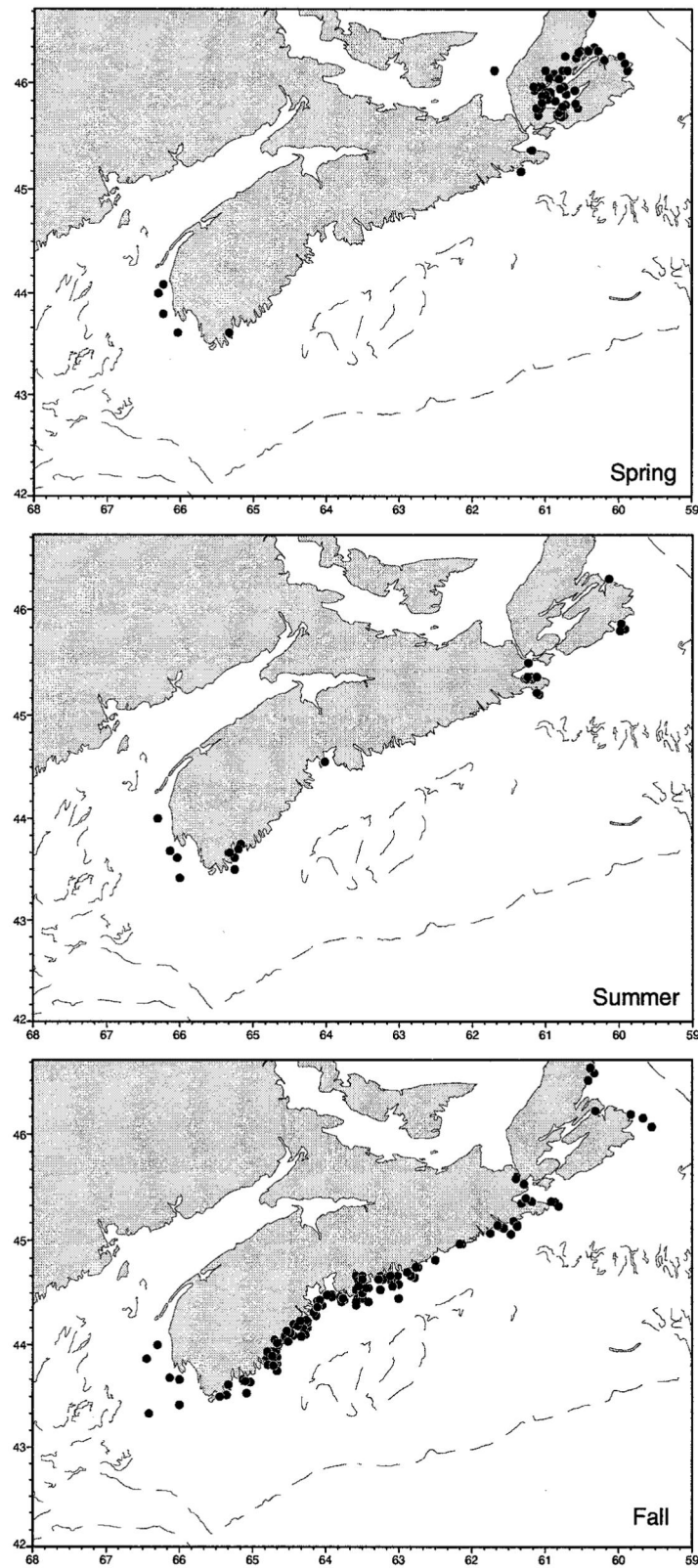


Figure 3. Historical Spawning Locations (before 1997).

Table 26a, 26b and 26c. **Question 25:** Details of spawning locations.**Number of Fish at Spring Spawning Locations**

26a	County	No of Sites	No. of Years Seen	Decreased	Same	Increased	Varied	No Comment /Not Sure
	Bras d'Or Lakes	40	1 to 50	15 (38%)	6 (15%)	4 (10%)	1 (3%)	14 (35%)
	Inverness							
	Richmond	8	2 to 30	4 (50%)				4 (50%)
	Cape Breton	8	1 to 85	5 (63%)		1 (13%)		2 (25%)
	Victoria	15	1 to 20	2 (13%)	4 (27%)	2 (13%)		7 (47%)
	Guysborough	4	3 to 15	3 (75%)				1 (25%)
	Halifax							
	Lunenburg							
	Queens							
	Shelburne	1	5	1 (100%)				
	Yarmouth	8	2 to 10	3 (38%)	1 (13%)	2 (25%)		2 (25%)
	Total	84	1 to 85	33 (39%)	11 (13%)	9 (11%)	1 (1%)	30 (36%)

Number of Fish at Summer Spawning Locations

26b	County	No of Sites	No. of Years Seen	Decreased	Same	Increased	Varied	No Comment /Not Sure
	Bras d'Or Lakes							
	Inverness							
	Richmond							
	Cape Breton	5	1 to 10	1 (20%)				4 (80%)
	Victoria	3	1 to 15	1 (33%)	1 (33%)			1 (33%)
	Guysborough	9	1 to 40	5 (56%)				4 (44%)
	Halifax							
	Lunenburg	1	Many	1 (100%)				
	Queens							
	Shelburne	7	15 to 30	7 (100%)				
	Yarmouth	23	1 to 30	4 (17%)	6 (26%)	7 (30%)		6 (26%)
	Total	48	1 to 40	19 (40%)	7 (15%)	7 (15%)		15 (31%)

Number of Fish at Fall Spawning Locations

26c	County	No. of Sites	No. of Years Seen	Decreased	Same	Increased	Varied	No Comment /Not Sure
	Bras d'Or Lakes	1	12			1 (100%)		
	Inverness	1	Many				1 (100%)	
	Richmond	0						
	Cape Breton	2	15	1 (50%)				1 (50%)
	Victoria	2	1 to Many	1 (50%)				1 (50%)
	Guysborough	23	1 to 50	13 (57%)			1 (4%)	9 (39%)
	Halifax	49	1 to 50	31 (63%)	5 (10%)		3 (6%)	10 (20%)
	Lunenburg	32	1 to 100	18 (56%)	6 (19%)	1 (3%)	4 (13%)	3 (9%)
	Queens	17	2 to 44	15 (88%)	1 (6%)			1 (6%)
	Shelburne	15	16 to 40	9 (60%)	2 (13%)	3 (20%)		1 (7%)
	Yarmouth	42	2 to 50	12 (29%)	8 (19%)	16 (38%)	3 (7%)	3 (7%)
	Total	184	1 to 100	100 (54%)	22 (12%)	21 (11%)	12 (7%)	29 (16%)

Table 27. How was spawning observed?

How Spawning was Observed	Number	Percent
Milt in the Water	50	13
Eggs on Gear	147	38
Eggs in Fish Stomachs	23	6
Eggs on Seaweed	6	2
Catches of Spawning Fish	117	31
Fish on the Bottom	9	2
Survey was Done	3	1
Fish Spawning Out	1	-
Gulls	3	1
Other	7	2
No Comment	16	5

Table 28. **Question 26:** Does spawning occur at these locations every year?

County	Yes	No	Not Sure/ No Comment
Bras d'Or Lakes	18 (39%)	14 (30%)	14 (30%)
Inverness		1 (50%)	1 (50%)
Richmond	3 (18%)	4 (24%)	10 (59%)
Cape Breton	5 (22%)	5 (22%)	13 (57%)
Victoria	22 (63%)	1 (3%)	12 (34%)
Guysborough	8 (14%)	18 (31%)	32 (55%)
Halifax	31 (58%)	18 (34%)	4 (8%)
Lunenburg	27 (82%)	1 (3%)	5 (15%)
Queens	27 (100%)		
Shelburne	20 (54%)	9 (24%)	8 (22%)
Yarmouth	64 (88%)		9 (12%)
All Areas	225 (56%)	71 (18%)	108 (27%)

Table 29. **Question 27:** Have the number of spawning locations increased, decreased or stayed the same over time?**Number of Spawning Locations**

County	Decreased	Same	Increased	Varied	No Comment	Total
Bras d'Or Lakes	6 (30%)	7 (35%)	1 (5%)		6 (30%)	20
Inverness	15 (43%)	15 (43%)	1 (3%)	2 (6%)	2 (6%)	35
Richmond	5 (17%)	3 (10%)			21 (72%)	29
Cape Breton	1 (20%)	1 (20%)	2 (40%)	1 (20%)		5
Victoria	1 (11%)	2 (22%)			6 (67%)	9
Guysborough					1 (100%)	1
Halifax	6 (32%)	11 (58%)			2 (11%)	19
Lunenburg	1 (9%)	9 (82%)			1 (9%)	11
Queens	1 (20%)	1 (20%)			3 (60%)	5
Shelburne	7 (58%)	2 (17%)	1 (8%)		2 (17%)	12
Yarmouth	10 (22%)	16 (36%)	3 (7%)	1 (2%)	15 (33%)	45
Total	53 (28%)	67 (35%)	8 (4%)	4 (2%)	59 (31%)	191

5. Discussion

5.1 Background Statistics

The 245 fishers who were interviewed for this survey had fished for an average of 24 years (± 15 years) while the overall number of years fishing ranged from 1 to 65 (Table 6 - Question 3). Thus, not only did this questionnaire cover a wide geographic area, but also a wide range of experience. Of the 245 fishers interviewed, there was an overall increase in reported herring fishing activity from 63% who said they fished in 1997 to 71% in 1998 (Table 4 - Question 1, Table 5 - Question 2). Richmond Co. fishers reported the highest percentage decrease in fishing activity from 83% in 1997 to 50% in 1998. Other areas where fishers reported significant decreases in fishing activity from 1997 to 1998 are Shelburne, Yarmouth and Guysborough Counties with decreases of 28, 17 and 16 percentage points, respectively. In Queens Co. 73% of the fishers interviewed reported fishing herring in 1997, compared to 64% in 1998. There was no change in the number of fishers actively fishing herring from 1997 to 1998 in the Bras d'Or Lakes region as well as, Cape Breton, Victoria and Lunenburg Counties. In Halifax Co. fishing activity reportedly increased from 80% in 1997 to 89% in 1998. The 2 fishers interviewed from Inverness Co. both fished herring in 1998 but only 1 fished in 1997.

In all areas, most fishers interviewed reported holding a commercial license (84%), while a much smaller percentage held a pelagic bait license (22%)(Table 7 - Question 4). Eleven percent of fishers interviewed reported holding both commercial and bait licenses and 4% of those interviewed had no comment. In Guysborough Co., 3 fishers held commercial mackerel licenses only, catching herring as a bycatch. Pelagic bait licenses were more commonly held by fishers from Cape Breton Island (Victoria, Cape Breton, Inverness and Richmond Counties) than by the mainland fishers interviewed. With the exception of Yarmouth and Guysborough Counties, only fishers from Cape Breton Island reported holding both commercial and bait licenses. Among the other mainland counties of Halifax, Lunenburg, Queens and Shelburne, only 3 out of a total of 83 fishers interviewed reported holding only a pelagic bait license.

5.2 Gear

In 1998, set nets were cited as the most commonly used gear in all areas with the exception of Cape Breton and Yarmouth Counties where the majority of fishers used swing nets and drift nets respectively. Swing nets (modified set nets) were used only by fishers from Cape Breton Island and Guysborough Co. and drift nets were used only by fishers from Yarmouth Co. who were involved in the herring roe fisheries off the Eastern Shore, Port Mouton, Spectacle Buoy and on Trinity Ledge (Table 9 - Question 6).

Herring fishers from Cape Breton Island reported an overall longer average net length than mainland fishers and on average, fishers from the Bras d'Or Lakes region used more nets than did fishers from other parts of the province in 1998. Yarmouth Co. had the widest range of mesh sizes in 1998 ($1\frac{1}{2}$ " to $3\frac{1}{8}$ ") whilst the narrowest range was reported from Inverness and Shelburne Counties ($2\frac{3}{8}$ " to $2\frac{1}{2}$ " and $2\frac{5}{8}$ " to $2\frac{3}{4}$ " respectively)(Table 9 - Question 6). The mesh sizes reported from Queens Co. are those that are used in the fall roe fisheries.

Similarly in the fall of 1997, set nets were more commonly used in all areas except Yarmouth Co. where drift nets were used by 75% of the fishers interviewed. Overall net lengths reported in the fall 1997 fishery were longer in Lunenburg and Queens Counties and fishers in Halifax and Yarmouth Counties used more nets, on average, than elsewhere in the province. Mesh size ranges in 1997 were similar to those reported for 1998 with Yarmouth Co. having the widest range ($1\frac{1}{2}$ " to $2\frac{7}{8}$ ") and Cape Breton and Victoria Counties having the narrowest ($2\frac{5}{8}$ " to $2\frac{3}{4}$ ")(Table 17 - Question 14).

Over time there has been an overall reduction in the number of nets used by fishers on Cape Breton Island whereas on the mainland, the trend is reversed due to recent local roe fisheries being established. Mesh sizes used by mainland fishers have increased over time primarily due to roe fishery regulations and the requirements of management plans (Question 23).

5.3 Fishing Locations

Fishing occurs along the entire coast of Nova Scotia from Cape Breton to Yarmouth Co.. There are a number of areas of concentrated effort including the Bras d'Or Lakes spring fishery and the fall roe fisheries off Glace Bay and Halifax and in the area of Trinity Ledge, Spectacle Buoy and Little Hope.

In the questionnaire survey, spring and summer herring fisheries were reported from all counties except Shelburne in 1998 (Table 10 - Question 7) (Figure 4a and 4b). These fisheries were conducted exclusively for bait either for personal use or for sale. In 1998 a total of 3,139 days of fishing were reported for spring and summer fisheries. The largest effort was expended in the spring and summer fisheries in three of the four Cape Breton Island counties (Inverness: 48 days per fisher, Victoria: 33 days per fisher and Cape Breton Co.: 32 days per fisher). The landings for Victoria Co. (238t) reflect this effort but in the two other counties relatively small tonnages are recorded (Inverness: 0.2t, Cape Breton Co.: 10.4t).

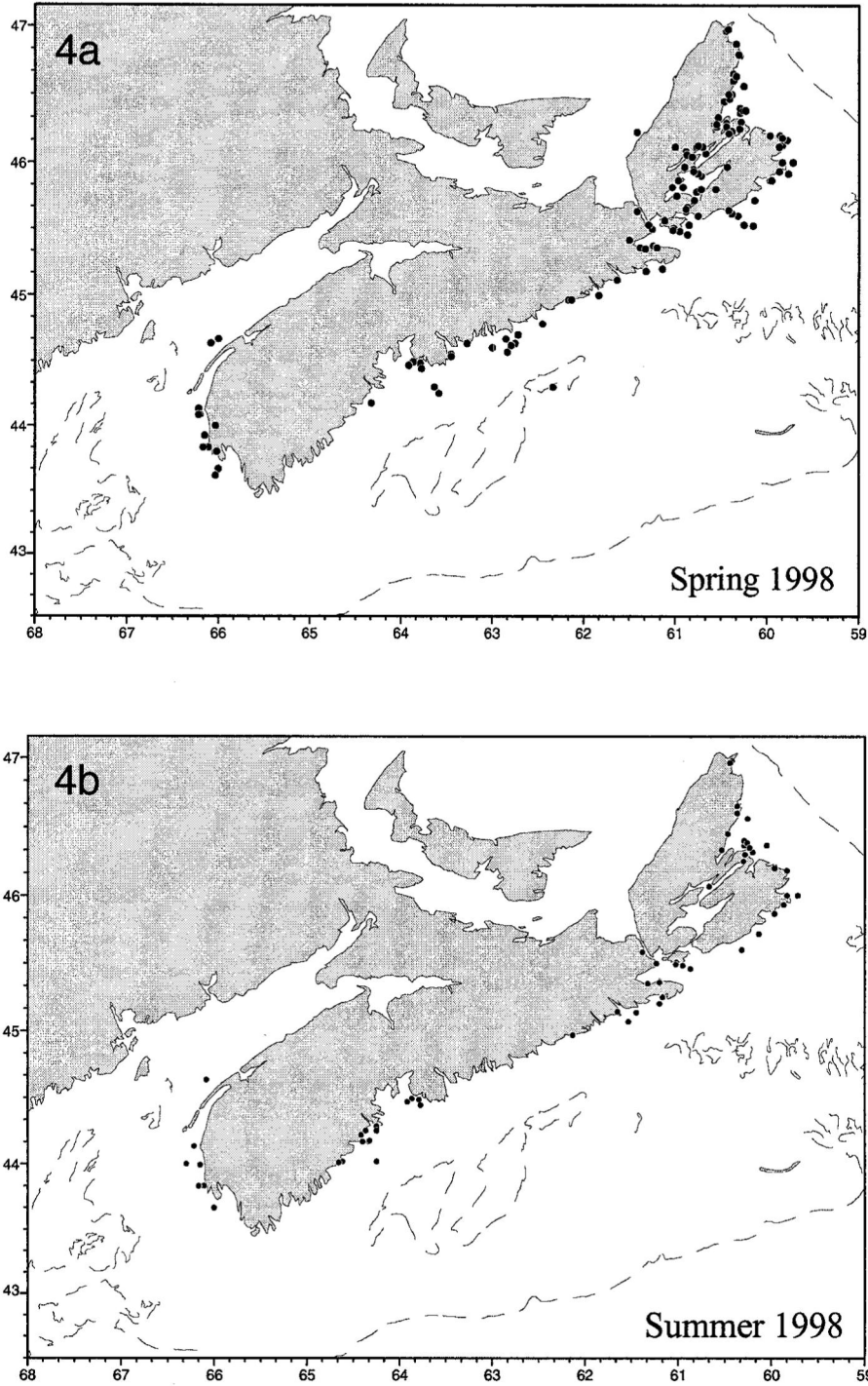


Figure 4. Spring (a - April, May and June) and summer (b - July and August) fishing locations in 1998

In 1997 spring and summer fisheries are reported from all counties except Inverness (Table 18a - Question 15, Figure 5). A total of 1,057 days of fishing were reported and the largest effort per fisherman was expended in

Guysborough (34 days per fisher) and Yarmouth (26 days per fisher) Counties where landings were 0.5t and 107.9t respectively.

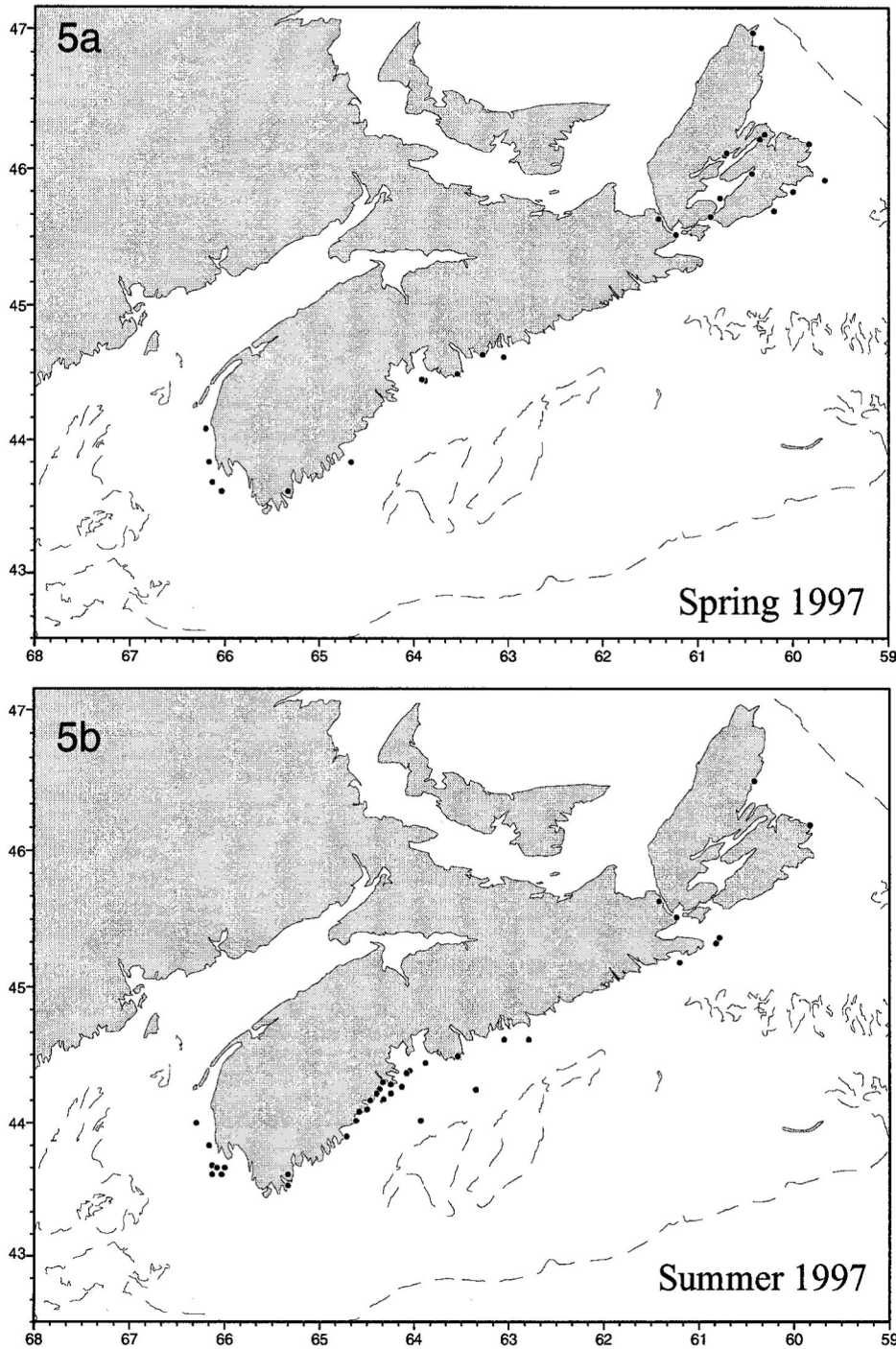


Figure 5. Spring (a - April, May and June) and summer (b - July and August) fishing locations in 1997

In 1998 fall fisheries were reported from 4 counties: Halifax, Lunenburg, Queens and Yarmouth (Table 10b - Question 7, Figure 6). There is no information from

the fall 1998 fishery from Cape Breton Island and Guysborough Co. since the fishers from these areas were interviewed in the summer of 1998. A total of 367 fishing days are recorded from Halifax, Lunenburg, Queens and Yarmouth Counties for the fall 1998 fishery. The highest number of days per fisher are recorded from Halifax Co. (60 – 19.8t) and Yarmouth Co. (278 – 1245.4t) where there are fall roe fisheries (Table 10b - Question 7, Table 11b - Question 8).

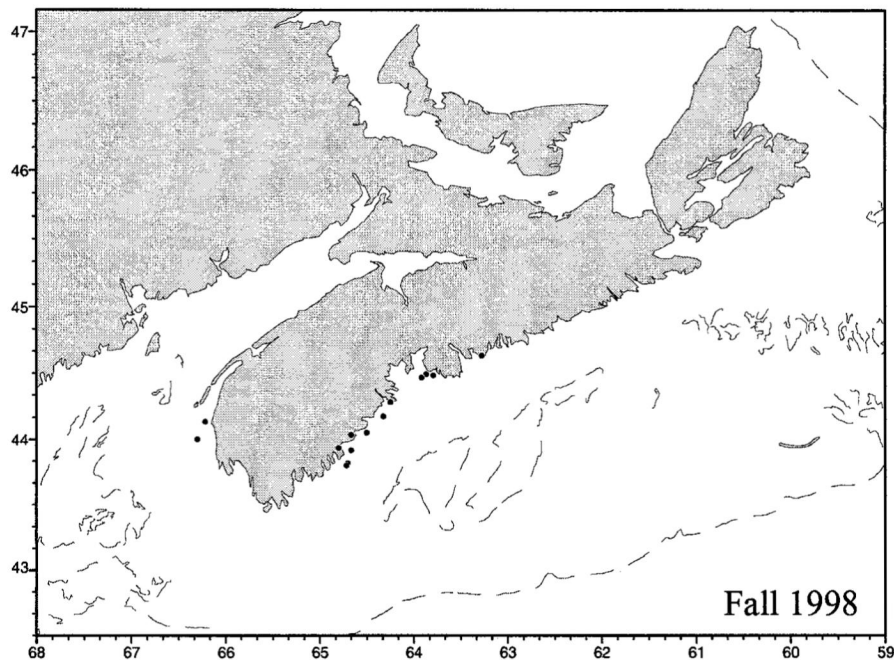


Figure 6. 1998 fall fishing locations.

A total of 1444 fishing days are reported for the fall 1997 fishery from all counties except Inverness (Figure 7). The largest effort, measured as the number of days fished per fisher, is recorded from Lunenburg (30 days, 382t landed), Guysborough (23 days, 158t landed) and Halifax (21 days, 604t landed) Counties.

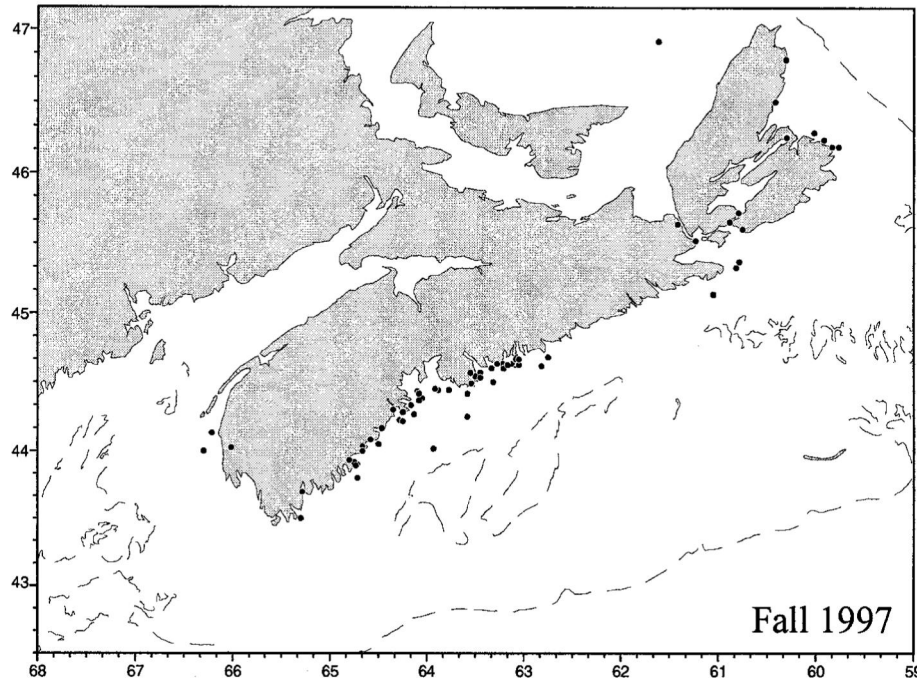


Figure 7. 1997 fall fishing locations.

Questions 11 and 19 (Tables 14a and 22) asked if fishers had changed their fishing location in recent years. In retrospect, this question was poorly worded since some fishers may have interpreted “recent years” as the past two years, whilst others may have taken a more long term view. Bearing this in mind, the majority of fishers who participated in the 1998 spring and summer fisheries stated that they had not changed their fishing locations in recent years (69% overall). The lowest percentages of change were recorded from Halifax (19%) and Yarmouth (18%) Counties. The percentages of change were relatively high (27% to 63%) in the Cape Breton Counties where concern has been expressed over the status of some of the spawning components.

The results for the 1997 fall fishery were similar to those for the 1998 spring fishery in that the majority of fishers stated that they had not changed their fishing location in recent years (73%) (Table 22, Question 19). The lowest percentage of change was recorded from Yarmouth (9%) where fishers participate in the fall roe fishery off Spectacle Buoy and on Trinity Ledge. The highest percentage of change is recorded from Queens Co. (40%) where many fishers have begun participating in the roe fishery off Little Hope in the past three years.

Poor catch was by far the most common reason given for changing fishing location (39%). Other reasons included fish moving to new locations (15%) and involvement in a new fishery (8%)(Table 14b - Question 11).

5.4 Landings

Landings records for 1997 and 1998 were extracted from DFO's statistical database which records the landings from log records (Tables 30 and 31). The submission of log records became a condition of license on May 1, 1997, midway through the spring fishery, but due to organizational difficulties, many fishers did not complete and submit their logs. As a result, landings statistics from 1997 are likely to be unreliable. By 1998, the system of log records was established and the landings for that year are likely more accurate.

County	Spring	Summer	Fall	Total
Inverness	116			116
Richmond	19		1	21
Cape Breton	9	1	205	215
Victoria	16			16
Guysborough	1		9	9
Halifax	10	19	1576	1605
Lunenburg	1	183	73	257
Queens		13	476	489
Shelburne	2	5		7
Yarmouth	1539	2485	1973	5998
Total	1713	2706	4313	8733

Table 30. 1997 landings (t) from DFO's statistical database for all counties involved in the questionnaire survey. Bras d'Or Lakes landings (about 164t) could not be separated out and are included in the spring landings for Cape Breton, Inverness, Richmond and Victoria Counties.

County	Spring	Summer	Fall	Total
Bras d'Or Lakes	122			122
Inverness	3			3
Richmond	4			4
Cape Breton	13	192	1544	1749
Victoria	22	1		23
Guysborough	-	-		1
Halifax	-	-	1105	1105
Lunenburg	-	22	45	68
Queens		2	1116	1119
Shelburne				
Yarmouth	208	441	1503	2152
Total	372	658	5313	6346

Table 31. 1998 landings (t) from DFO's statistical database for all counties involved in the questionnaire survey. Bras d'Or Lakes landings were extracted directly from log records and removed from the spring landings reported in Inverness, Richmond, Cape Breton and Victoria Counties. Dashes (-) refer to landings that were less than 0.5t.

In 1997, landings of 8,732t were reported with the bulk of the landings (5,998t) coming from Yarmouth Co. (Table 30). In 1998, with apparently more accurate reporting, landings were down to 6,345t (Table 31). The largest landings in 1998 were still in Yarmouth Co. but they were reduced to 2,152t overall (Table 31).

According to the landings recorded in the DFO database, the largest spring and summer fisheries in 1998 occurred out of Cape Breton and Yarmouth Counties and in the Bras d'Or Lakes. The landings reported as part of this survey in Question 8a (Table 11a) show a similar trend. In four counties (Victoria, Guysborough, Halifax and Queens), the landings reported in this survey are greater than those in the DFO database. This discrepancy is likely the result of fishers claiming not to keep records and therefore estimating amounts for the questionnaire. It is also possible that the log record system still does not accurately capture all the landings, particularly from bait fishers who are not individually landing large quantities of herring.

Fishers interviewed for the questionnaire caught 1478t in the 1998 spring/summer fishery and of this amount, 87% was sold, 11% was used for bait and the remaining 2% fell into the category "other" (usually releases from mackerel traps or personal consumption). Of the 1478t caught overall, 81% was landed in Yarmouth Co.. This large percentage can be attributed to the summer roe fishery around the Spectacle Buoy area, as only 3% of the reported landings from this area were kept for bait. Excluding the herring sold from the roe fishery in Yarmouth Co. and the 21.9t caught from mackerel traps and sold in Victoria Co., the majority of herring landed from all regions was used for bait.

Questions 10 and 18 (Tables 13 and 21) were ambiguously worded and as a result when asked to compare current herring abundance to "previous years" many fishers questioned whether this meant the previous 2 or 20 years. Some fishers responded to this question by saying that, for example, there are more fish this year than last, but overall much less than 10 years ago. Observations similar to this example would have been categorised under the overall comment of "much less".

Herring abundance in the spring/summer of 1998 was reported as "much less" by 41% of all fishers interviewed, while 17% reported the abundance to be the "same". Overall, abundance was reported to be a "little less" by 14%, "much more" by 12%, 9% gave no comment, and 7% reported a "little more". Regionally, 47% of fishers from Cape Breton Island reported there were less herring than previous years, 21% reported more, 21% claimed the abundance was the same and 14% gave no comment. More than 60% of mainland fishers reported that herring abundance was less than previous years, 8% claimed it was more abundant, 12% reported the same abundance and 6% gave no comment. Yarmouth Co. had a higher percentage (40%) of fishers reporting that

herring was currently more abundant, followed closely by the Bras d'Or Lakes region at 39% and Lunenburg Co. at 38%. Halifax Co. had the highest percentage (93%) of fishers claiming that abundance was less, followed by Richmond Co. at 75% (Table 13a - Question 10).

This survey covered the 1997 fall fishery in all areas and the 1998 fall fishery in Queens, Shelburne and Yarmouth Counties. A few Halifax and Lunenburg Co. fishers are included in the results from the fall of 1998 because they were interviewed after the fall fishery had occurred. In 1997 and 1998 the landings statistics from the DFO database show the largest landings in Cape Breton, Halifax, Queens and Yarmouth Counties. This is to be expected since all four areas have fall roe fisheries. Overall, fishers who were interviewed reported 1308t landed in the fall of 1998 and with the exception of the fisher from Lunenburg Co., almost 100% of the landings were sold (Table 12b - Question 9). Again this result is expected because of the prominence of the fall roe fisheries in these areas. In the fall of 1998, abundance was reported as more by 57%, the same by 22%, less by 13%, and 9% had no comment (Table 13b - Question 10).

Questions 16, 17 and 18 (Tables 19, 20 and 21) cover landings, usage and relative abundance of herring reported for late summer/fall of 1997. Overall, fishers that were interviewed reported 4315t landed, of which 94% was sold and 6% was used for bait. As in 1998, Yarmouth Co. landings were the highest at 71% of the overall total and can be attributed to the roe fisheries on Trinity Ledge and at Port Mouton (Little Hope). The roe fishery off the Eastern Shore accounts for a large percentage of the 559t sold by fishers in Halifax Co.. Collectively, all areas of Cape Breton Island had lower landings than any mainland County, with the exception of Queens and Shelburne and overall, accounted for less than 1% of all reported landings for the fall of 1997. This is not unexpected since the spring fishery is much more prominent than the fall fishery in most areas of Cape Breton Island, with the exception of the developing roe fishery off Glace Bay.

Overall, 40% of fishers reported herring abundance to be less in the fall 1997 than in previous years, whereas 24% reported abundance to be the same. Relative abundance was reported to be more than previous years by 20% of all fishers interviewed and 15% had no comment. Of the 12 fishers from Cape Breton Island that responded to question 18, 50% gave no comment on abundance, 25% reported abundance to be the same and 25% claimed that abundance was less than previous years. Out of the 36 fishers who responded to question 18 from Guysborough and Halifax Counties, none reported abundance to be more in the summer/fall of 1997 than in previous years and 67% in each County reported abundance to be less. In both Yarmouth and Lunenburg Counties, abundance was reported as more than previous years by 41% of respondents.

Question 22 (Table 25) asked fishers to list their herring catches from previous years and as shown in Table 24 (Question 21), 87% of all respondents did not

have or did not provide records of their catches from previous years. Some of these fishers were willing to estimate their recent catch history, consequently, the results presented from question 22 may not accurately reproduce historical catch data, although they may reveal general trends.

Overall, landings from 1996 and 1997 were 4 to 5 times greater than landings reported from earlier in the 1990's. This data coincides with the establishment of new herring roe fisheries in the areas of Eastern Shore/Eastern Passage, Port Mouton, Spectacle buoy and Trinity Ledge, areas fished mostly by fishers from Halifax, Queens and Yarmouth Counties.

Fishers from the Bras d'Or Lakes region that responded to Question 22 reported spring landings to be largest in 1992. Landings from Richmond Co. fluctuated from 1992 until 1997 with the highest landings of nearly 13t reported in the spring of 1993. Cape Breton Co. fishers reported fairly constant landings from 1992 until 1997 ranging between 27t to 30t, however the spring landings decreased significantly in 1997 to 10t, down from almost 30t annually since 1992. Landings reported from Victoria Co. were less than 4t from 1992 until 1995, approximately 18t for 1996 and 30t in 1997. No landings were reported for 1996 and 1997 by Inverness Co. fishers and landings were less than 0.5t from 1992 until 1995.

Prior to 1996, all mainland county fishers with the exception of Guysborough reported their largest landings in 1992 or 1993. Fishers from Guysborough Co. reported their highest annual landings in 1994. Lunenburg Co. fishers reported a steady decline in landings from 1992 to 1995, then a considerable decrease was reported from 400t in 1995 to less than 90t in 1996, however, in 1997 landings were up again to 420t. Fishers from Queens and Shelburne counties also reported a steady decline in landings from 1992 until 1996 but landings increased again in 1997 in both counties.

In summary, overall herring landings have increased significantly since 1996 as a result of the establishment of roe fisheries in several areas. Prior to 1996, landings were largest in the early 1990's and the lowest landings were reported in the mid 1990's. Excluding the roe fisheries, the majority of herring landed in most areas is used as bait. Generally, most fishers interviewed feel that herring abundance is currently less than in previous years.

5.5 Spawning Locations

Spawning sites are recorded along the entire eastern shore of coastal Nova Scotia from northern Cape Breton to Yarmouth (Figures 2 and 3 - Question 24, Figures 8 to 12). Overall more spawning locations are recorded in this survey than in those of Crawford (1979) and Sameoto (1971). The exception to this occurred in the northern portion of Halifax Co. and the southern portion of Guysborough Co.. This area was not as heavily sampled as most others and perhaps, as a result of this, the spawning locations reported around the Brother and Tuffin Islands (Crawford 1979, Sameoto 1971) and Phoenix Island and some areas south of Liscomb Point (Sameoto 1971) are not reported in this survey. Crawford (1979) also reported spawning locations which were not found in this survey around Isle Madame in Richmond Co. and Gabarus Bay in Cape Breton Co..

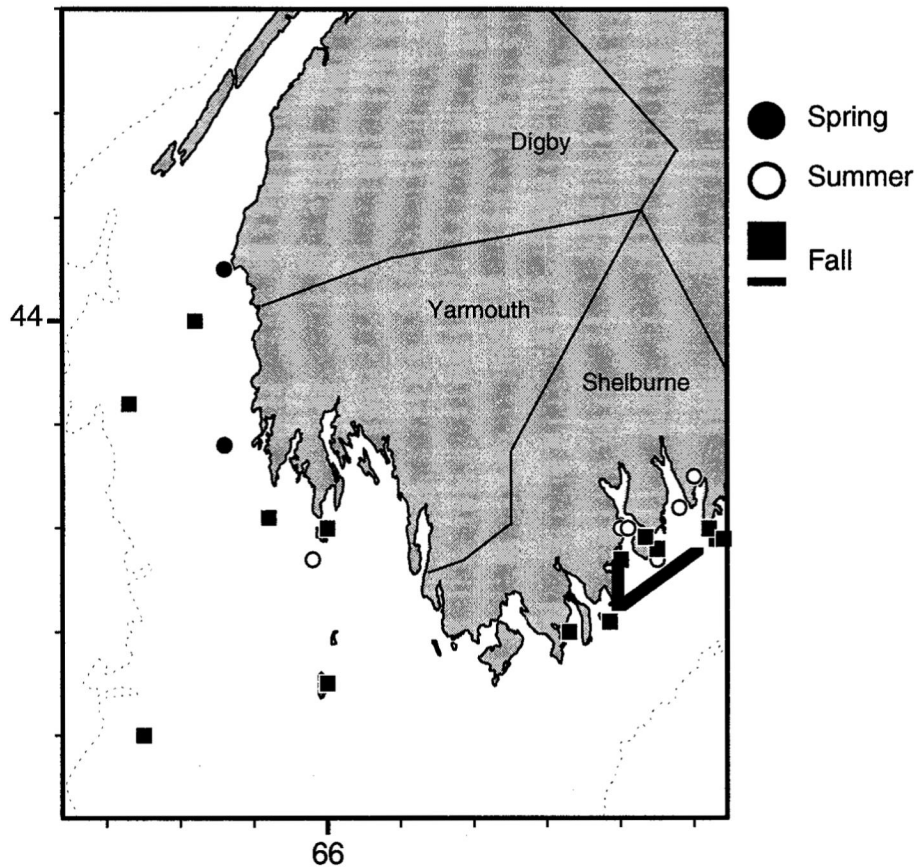


Figure 8. Spawning locations from Yarmouth and Shelburne Counties (Statistical Districts 30, 31, 32, 33 and 34).

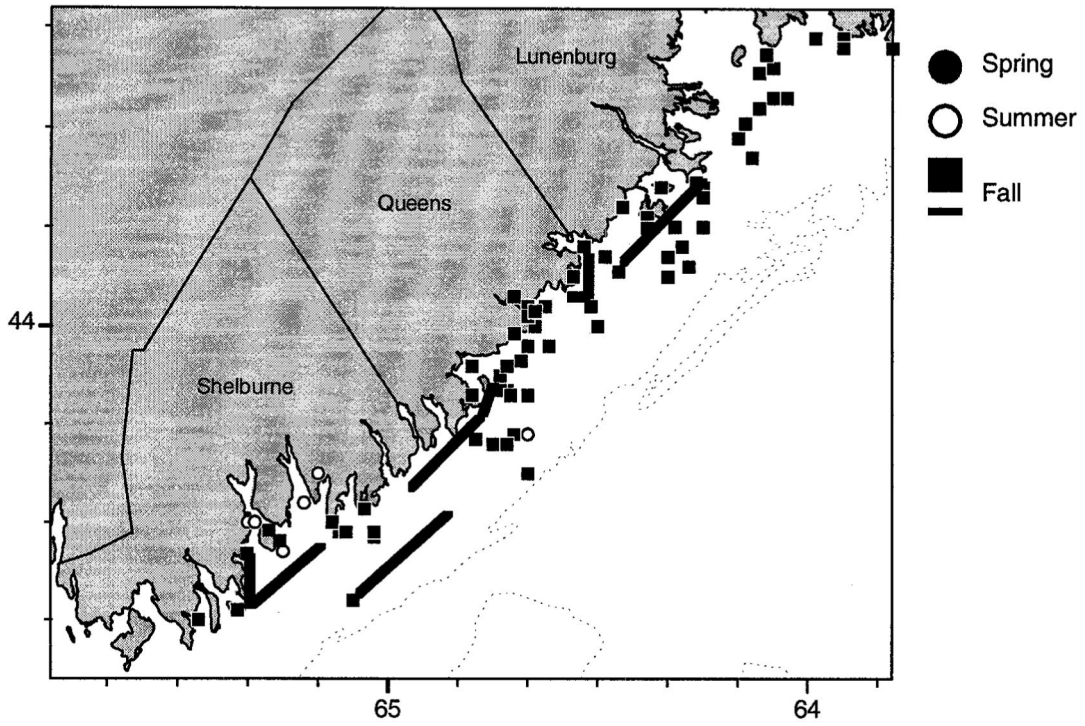


Figure 9. Spawning locations from Shelburne, Queens and Lunenburg Counties (Statistical Districts 26, 27, 28, 30, 31 and 32).

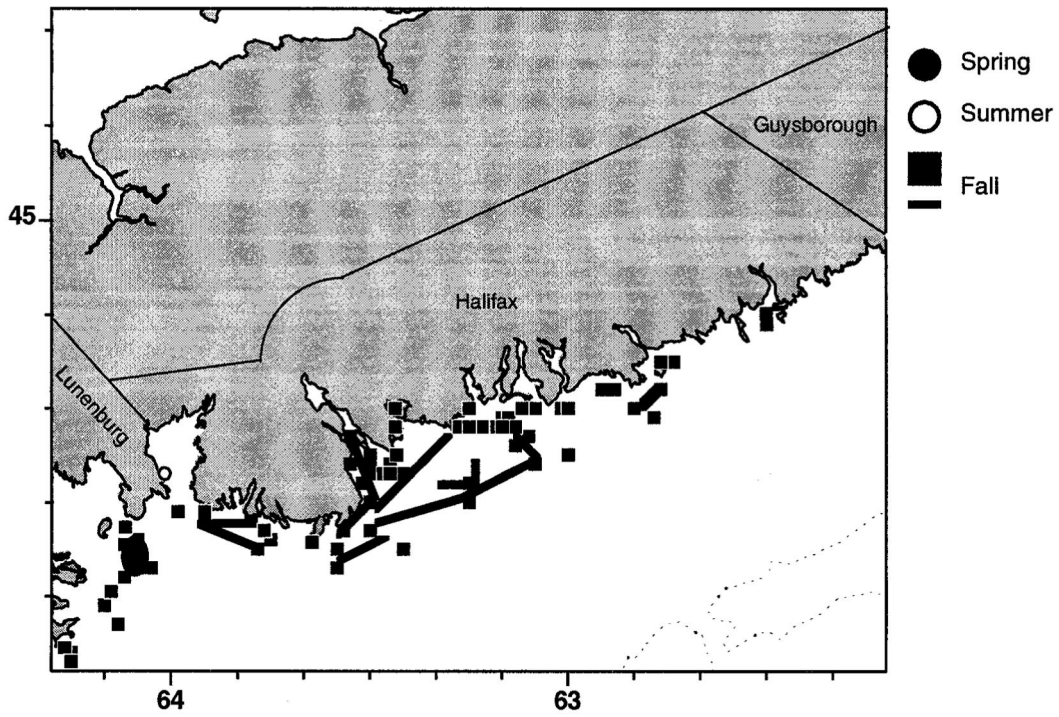


Figure 10. Spawning locations from Lunenburg and Halifax Counties (Statistical Districts 18, 19, 20, 21, 22, 23 and 25).

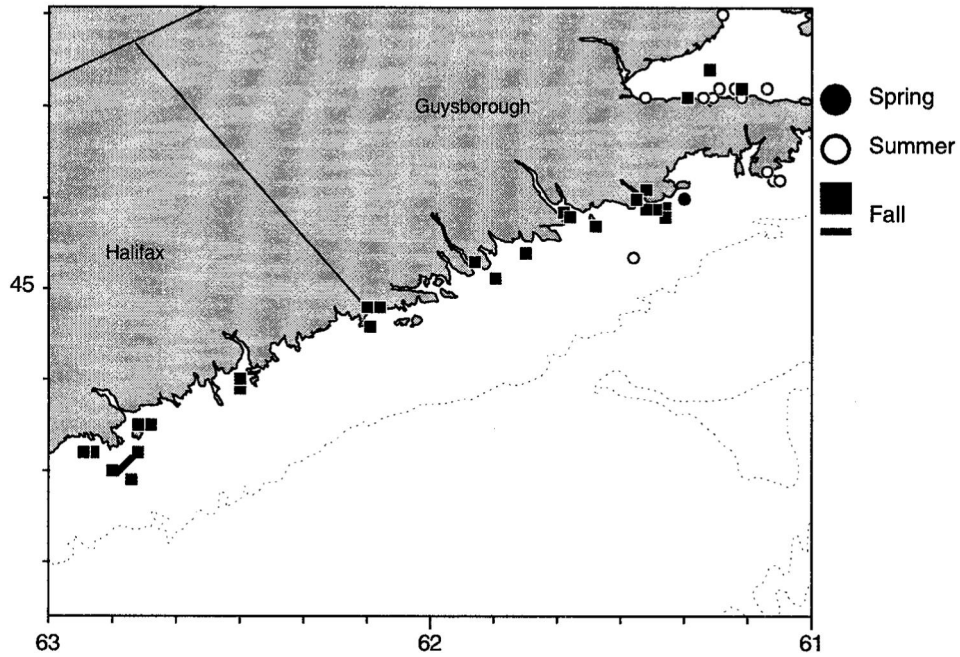


Figure 11. Spawning locations from Halifax and Guysborough Counties (Statistical Districts 15, 16, 17, 19, and 20).

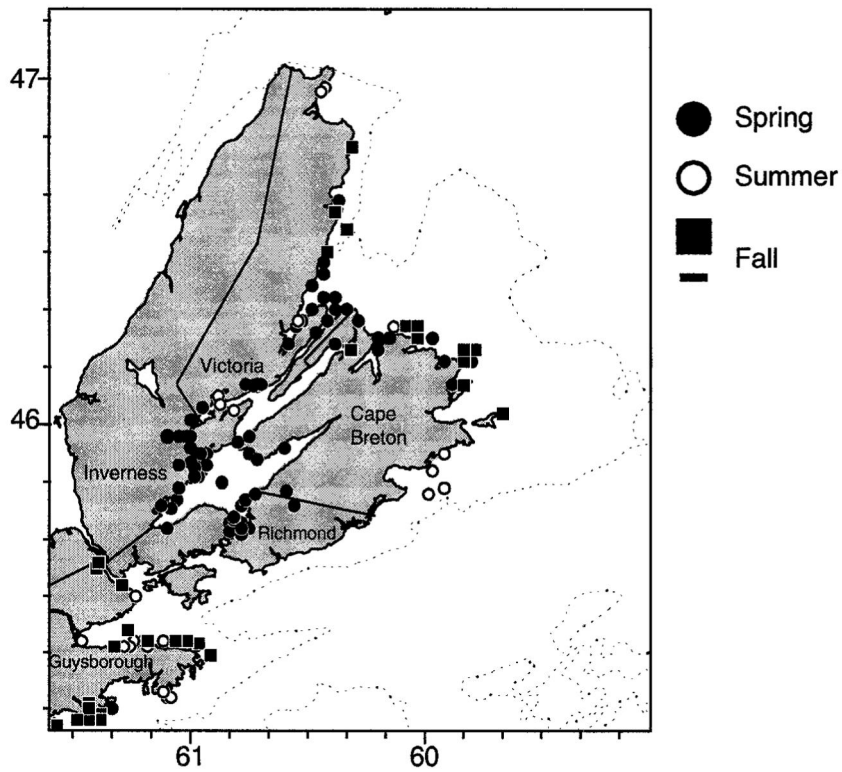


Figure 12. Spawning locations from the Bras d'Or Lakes, Cape Breton, Victoria, Inverness, Richmond and Guysborough Counties (Statistical Districts 1, 3, 4, 6, 7, 8, 9, 14 and 15).

Overall 21% of the historical spawning sites reported by fishers were not presently active (Table 32). The difference between the numbers of active and historical spawning locations was greatest in the spring and summer fisheries (30% and 34% respectively). This is supported by comments made by fishers, particularly those from Halifax Co., that there has been a decrease in the spring and summer fisheries. Fishers were asked if they had noticed any changes in the number of spawning locations over time (Table 29 - Question 27) and most (35% overall) felt that the numbers had stayed the same, although 28% reported a decrease. In Cape Breton Co., where a fall roe fishery has developed over the past two years, 2 out of 5 fishers reported an increase in the number of spawning locations. An increase was also reported by one fisher from the Bras d'Or Lakes, one from Inverness Co., one from Shelburne Co. and 3 from Yarmouth Co., although in all cases these individuals were outnumbered by the numbers who felt that spawning locations had stayed the same or decreased.

Season	No. of Spawning Locations		Difference	
	Active	Historical	Number	Percent
Spring	59	84	25	30%
Summer	31	47	16	34%
Fall	169	195	26	13%
Total	259	326	67	21%

Table 32. Numbers of active and historical spawning locations reported by fishers.

As part of question 25, fishers were asked if the number of herring at the spawning locations that they had reported had changed over time (Tables 26a, b and c - Question 25). Overall most fishers felt that the number of herring at the spawning locations had changed over time (51% for the spring locations, 55% for summer locations and 72% for fall locations). Of those who reported changes, most felt that the numbers of fish had decreased (39% in the spring, 40% in the summer and 54% in the fall) with the largest percentage decreases from Guysborough and Cape Breton Counties in the spring, Shelburne, Lunenburg and Guysborough Counties in the summer and Queens Co. in the fall. The response from Queens Co. is a little unexpected since many fishers from this area have recently begun to participate in the Little Hope roe fishery. In most areas, few or no fishers reported seeing an increase in the numbers of fish at the spawning sites. The exceptions to this were Yarmouth Co. fishers, 30% of whom reported an increase in the summer spawners and 38% of whom reported an increase in fall spawners. This perception of an increase in spawning is likely a reflection of the recent increase in fishing activity off Spectacle Buoy and Trinity Ledge.

Fishers were asked how they identified spawning areas (Table 27 - Question 25b) and the most common indication was eggs on their gear and catches of

spawning fish (38% and 31%). Milt in the water was another indication reported by 13% of fishers who responded to the question.

Herring aggregate to spawn in discrete locations to which they are presumed to home (Anon, 1998). Fishers differ in their opinions as to whether herring return to specific locations in the inshore, such as a particular cove, or more general areas, such as a portion of the coastline or a large gravel shoal. Those who hold the latter belief state that spawning does not occur at every spawning location every year. As part of this survey, fishers were asked if spawning occurred every year at the spawning locations that they had listed and the majority said yes (56%), although 27% were unsure or had no comment. When the responses are divided by area, the fishers from 7 areas (Bras d'Or Lakes, Victoria, Halifax, Lunenburg, Queens, Shelburne and Yarmouth) indicated that spawning occurred every year at the spawning sites in their areas. More fishers from Richmond and Guysborough Counties felt that spawning did not occur at the listed sites every year and equal numbers in Cape Breton Co. answered yes and no to the question.

5.6 Further Comments

At the end of the questionnaire, fishers were asked if they had any further comments. A number of issues and topics were raised including the affect of other gear types, observations on herring biology, management regimes, scientific studies, seals, weather and pollution.

Affect of Other Gear Types:

By far the most common sentiment, expressed in all counties, was that seiners have a detrimental effect on the local herring populations and fisheries. Two fishers from the Bras d'Or Lakes area also indicated that draggers adversely affect the local herring populations.

A general distrust of seiners was also evident with concern being expressed about the catch amounts reported by seiners (Victoria Co.). Another comment, common to most areas (except the Bras d'Or Lakes, Cape Breton Co. and Inverness Co.) was that seiners should fish offshore and be excluded from the coastal fishing areas. In Richmond Co. it was suggested that seiners should fish outside Green Island and Grand Shoal buoy. In areas where a 25 mile exclusion zone exists (Halifax, Lunenburg, Queens, Shelburne and Yarmouth Counties), it was felt that this zone should be maintained or even expanded to include all spawning grounds or up to 50 miles offshore. One fisher from Lunenburg Co. felt that the 25 mile exclusion zone was not being adequately enforced.

It was felt that all conservation measures must include seiners as well as inshore fishers (Richmond, Halifax and Yarmouth Counties) and there was an impression that most of the quota is given to the seiners and that this should be limited

(Guysborough) or lessened (Halifax). One fisher from Yarmouth Co. felt that seiners should use a larger mesh size.

Herring Abundance:

Many fishers commented on the amount of herring in their areas. A decline in the numbers of herring in the inshore was indicated by fishers from 8 areas (Bras d'Or Lakes, Richmond, Victoria, Guysborough, Halifax, Lunenburg, Queens and Shelburne Counties), whilst a gradual increase in herring over the last 3 years was reported by 3 fishers from Yarmouth Co.

Two fishers from the Bras d'Or Lakes reported abundant herring in Indian Bay in 1996, and in Baddeck in 1998. A fisher from Cape Breton Co. saw lots of fish on the sounder during the spring 1998 lobster season.

In Victoria Co. 3 fishers stated that the fishery began to decline 15 to 20 years ago and one stated that there had not been much herring for the past 5 years. In Guysborough Co. 6 fishers had witnessed a decline over the last 15 years and in Halifax Co. 10 fishers described a steady decline in herring populations from 5 to 25 years ago, although one fisher had seen lots of small herring in the harbours in recent years. A fisher from Halifax Co. indicated that 10 years ago it was possible to fish herring year round, but that this was no longer the case. Three fishers from Shelburne Co. stated that there had been a decline in the herring fishery since the early 1990s.

Several fishers who were interviewed were not currently fishing herring. The most common reason given for this was a lack of herring, although poor markets and seals were also cited as reasons.

Management:

A number of comments and suggestions were made for management measures. Dockside monitoring was criticised by several fishers as being expensive and encouraging dishonesty (Bras d'Or Lakes). The log book system used for lobster was considered better than the current dockside monitoring system (Bras d'Or Lakes, Richmond and Guysborough Counties).

Mesh size restrictions were mentioned in 3 counties. A fisher from Guysborough Co. felt that there should be a minimum mesh size of 2½" whilst one from Queens Co. suggested 2⁵/₈". There was a suggestion of a larger mesh size for seiners and bait fishers from one individual in Yarmouth Co.

A concern that juveniles should not be fished was raised by fishers from Halifax, Lunenburg, Shelburne and Yarmouth Counties with the suggestion of size restrictions being raised by one fisher and a low limit for juveniles by another.

There was some concern expressed over roe fisheries by fishers from Shelburne, Lunenburg and Halifax Counties. It was suggested that there should

be no fishing in spawning areas or that the quota should be lowered for roe fisheries. In Yarmouth Co. the roe fishery was considered extremely important for local fishermen and it was felt that it was essential that this fishery be well managed and monitored. One fisher from Halifax Co. thought that the current roe fishery guidelines were good whereas one from Yarmouth Co. commented that the roe and bait fisheries are too tightly controlled. There was a call for more quota for the gill net fishery from one fisher from Yarmouth Co.

There is a conception held by some fishers that a gill net fishery has a limited impact on a population of fish and therefore cannot adversely affect groups of herring (Halifax and Yarmouth Counties)

One fisher from Lunenburg Co. was concerned that some form of quota system might be instigated in the herring fishery based on personal histories. He felt that such a move would be unfair since many fishers have no personal history due to a poor market for herring.

Specific concerns were mentioned in many areas. Many fishers from the Bras d'Or Lakes felt that the Lakes should be a distinct statistical district so that fishers either fished in the Lakes or outside, but not in both areas. It was also felt that the Lakes should not be open to everyone and that there are currently too many licences for the area. There was a feeling that the rules for fishing the Lakes should be made by the people who fish and understand the area. One fisher from the Bras d'Or Lakes felt that gill netters and seiners should fish on alternate years whilst another stated that the Lakes should be closed to fishing for 1 or 2 years to allow the herring stock to rebuild.

In Cape Breton Co. one fisher wanted to be guaranteed a minimum of 1,500t for the fall fishery. In Queens Co., it was suggested by one fisher that all herring fishing should be cut in half or stopped for at least 5 years to allow the stock to rebuild. In Shelburne one fisher wanted the quotas to be reduced to allow the local herring populations to rebuild. A fisher from Yarmouth Co. felt strongly that the total catch from the roe fishery reflects the regulations that are in effect rather than the abundance of the fish.

Science:

A number of suggestions for scientific studies, particularly tagging, were made. Tagging was recommended by fishers from Halifax, Lunenburg and Yarmouth Counties. In Halifax Co., fishers felt that herring should be tagged around "The Patch", an area on the offshore Scotian Shelf. In Lunenburg Co. it was thought that more information was needed on the migration patterns and over-wintering locations of inshore herring and that this could be accomplished by tagging. In Yarmouth Co. it was felt that there was a need for more studies and tagging on inshore spring spawners. Also in Yarmouth Co., it was suggested by one individual that more surveys were needed to assess the biomass of herring.

Herring Biology:

A variety of biological observations were made by fishers. Bras d'Or Lakes fishers had a number of ideas about the origin of the herring in the Lakes. Several fishers expressed the idea that there is just one population of fish, instead of separate lake and ocean populations. Some fishers indicated that all the herring within the Lakes belong to one spawning group, whereas others point out the existence of spring and fall spawning herring, the fall herring being smaller than those that spawn in the spring. One fisher stated that there is no "Lake fish" population which is resident in the Lakes year round, but another fisher believes that there were Lake herring year round in 1997 and 1998. These Lake herring could reportedly be distinguished from the ocean population which is "bright" in appearance. Overall there appears to be no consensus on the existence of any, one or several Bras d'Or Lakes herring populations.

In Victoria Co. one fisher observed that the herring in his catch are now smaller than in the past. In Guysborough Co. lots of small (5" to 6") herring have been observed by 8 fishers.

Several hypotheses are expressed by Halifax Co. fishers regarding the herring found on the offshore Scotian Shelf in the area called "The Patch". Several felt that the herring in The Patch are from local shore stocks and one fisher observed that herring from The Patch appear to be the same as those from Emerald Basin.

Two fishers from Halifax Co. made observations on the migration patterns of herring: one felt that these patterns had changed in recent years and another felt that herring populations are localised and do not migrate far. A fisher from Guysborough Co. noted that the Canso Causeway has affected the migration patterns of all fish.

Fishers from the Bras d'Or Lakes and Cape Breton Co. expressed the idea that stock decline is a cyclic event whereas a fisher from Richmond Co. felt strongly that this was not the case.

Weather:

The effect of weather on herring behaviour was mentioned by several individuals. One fisher stated that strong easterly winds drive herring into the Bras d'Or Lakes whilst another felt that when and where herring spawn in the Lakes is dependent on the wind and the water temperature. A fisher from Victoria Co. reported that herring go against the wind and one from Queens Co. suggested that weather affects the upward movement of herring in the water column.

Seals:

Seals were cited as a serious problem for inshore herring fishers in 7 of the 11 areas covered by this survey (Cape Breton, Richmond, Victoria, Guysborough,

Halifax, Lunenburg and Shelburne Counties). Seals reportedly break up herring schools, eat the catch and ruin fishing gear. In Shelburne Co. only 14 fishers were interviewed, although 51 were contacted. Many of those who declined an interview stated that they were not fishing herring as a result of the large number of seals in the area. Of the 14 that were interviewed, 5 stated that seals were a problem and one noted that they were more abundant now than in the past 45 years. Five fishers from Guysborough Co. said they had stopped fishing because of seals, and one fisher noted that there had been an increase in the seal population since the 1980s.

Other Species:

An increase in the amount of jellyfish in the Bras d'Or Lakes was reported by two fishers whilst another, from Inverness Co., said that there were lots of red jellyfish in 1998.

In Halifax Co. it was noted by one fisher that no dogfish are coming inshore. A fisher from Lunenburg Co. was concerned that the roe fishery off Port Mouton interferes with the migration of groundfish into the inshore. The importance of herring as a forage species for groundfish was also mentioned by a fisher from Queens Co.

Pollution:

Pollution in the bays was cited as a problem by 3 fishers from 3 different counties (Cape Breton, Victoria and Halifax Counties). One fisher felt that the pollution in Sydney harbour might deter spawning whilst another was concerned that the pollution from Halifax Harbour was adversely affecting the local herring fishery.

6. Conclusion

This questionnaire survey was an ambitious project which attempted to summarise fishers' extensive knowledge of inshore herring populations. A large quantity of information was garnered in interviews with 245 fishers from 11 counties (28 statistical districts). Some of this information is difficult to summarise but some general trends can be observed.

Gear:

Set nets are the most commonly used gear except in the mainland Nova Scotia roe fisheries where drift nets are used and in Cape Breton Island where swing nets (modified set nets) are favoured. Over time there has been an overall reduction in the number of nets used by fishers in Cape Breton Island whereas on the mainland this trend is reversed as a result of the recent development of the roe fisheries. Mesh sizes used by fishers have increased over time primarily due to roe fishery regulations and the requirements of management plans.

Fishing Locations:

The most concentrated fishing efforts are seen in spring in the Bras d'Or Lakes, the late summer roe fishery off Spectacle Buoy, and the fall roe fisheries off Glace Bay, the Eastern Shore, Little Hope and Trinity Ledge. The majority of fishers have not changed their fishing locations in recent years.

Landings:

Overall herring landings have increased significantly since 1996 as a result of the development of roe fisheries. Prior to 1996, the landings were highest in the early 1990s and the lowest landings were in the mid 1990s. Generally most fishers interviewed feel that the abundance of herring is lower currently than in previous years.

With the exception of the roe fisheries, the majority of herring are caught for bait.

Spawning Locations:

Two hundred and fifty nine active and 326 historical spawning locations are recorded for coastal Nova Scotia. Most fishers felt that spawning occurs at spawning sites every year and that the number of spawning sites have stayed the same (35%), although some (28%) do report a decrease. The number of herring at these spawning locations were thought by most fishers to have changed over time with the majority feeling that the numbers had decreased. The exception to this was Yarmouth Co. fishers who reported an increase in the number of fish at summer and fall spawning locations (Spectacle Buoy and Trinity Ledge).

Comments:

Comments were made by fishers regarding herring seiners, herring abundance and biology, management, science, seals and pollution.

7. Recommendations

In order to complete our knowledge of inshore herring stocks, it is recommended that this questionnaire survey should be continued along the Fundy coast and should be modified to include weir fishers in Nova Scotia and New Brunswick.

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Appendix 1**Inshore Herring Fishers' Questionnaire**

THIS QUESTIONNAIRE IS TO BE USED WITH THE HELP OF ASSOCIATIONS, TO DOCUMENT ASPECTS OF THE HERRING AND MACKEREL FISHERY AND BIOLOGY.

Name: _____ Phone No.: _____

Vessel (name and CFV #): _____ Association: _____

License No.: _____ Port: _____

SECTION 1 - HERRING FISHERY

1. Are you fishing herring this year (1998)? Yes _____ No _____
2. Did you fish herring last year (1997)? Yes _____ No _____
3. How many years have you fished herring? _____ years
4. What type of license(s) do you hold? _____
(bait, commercial)

1998 Spring Fishery (before June 30)

5. Did you fish herring this spring (1998)? Yes _____
No _____ (If no, go to question 13)
6. What gear did you use? (Note: a set gillnet is anchored to the ground at both ends whilst a modified one is anchored to the boat at one end).
Gillnet: Yes _____ No _____ Trap: Yes _____ No _____
Type: Set _____ Modified _____ Type: _____
Number of Nets: _____ Number of Traps: _____
Mesh Size: _____
Length: _____ fathoms
7. Where did you fish? (Fill in locations below or number approximate locations on the attached map and fill in the # of nights fished and amount caught below)
 1. Place name _____ Lat _____ Long _____
nights _____ Amt caught _____
 2. Place name _____ Lat _____ Long _____
nights _____ Amt caught _____

3. Place name _____ Lat _____ Long _____
nights _____ Amt caught _____

4. Place name _____ Lat _____ Long _____
nights _____ Amt caught _____

5. Place name _____ Lat _____ Long _____
nights _____ Amt caught _____

8. How much herring did you catch during the spring? _____

9. Approximately how much of your herring catch did you:

- keep for personal bait? _____ (amount) _____ (percent)
- sell to processors? _____ (amount) _____ (percent)
- have to dump? _____ (amount) _____ (percent)

10. Were there more, less or the same amount of herring in the spring of 1998 than in previous years in your fishing area?

More abundant: Much more _____ A little more _____

About the same: _____

Less abundant: Much less _____ A little less _____

11. Have you had to change your fishing locations in recent years? Yes _____ No _____
If yes, why?

12. Do you have any additional comments on the 1998 spring fishery?

Fish Size: _____

Fish Condition: _____

Other: _____

1997 Fall Fishery (after June 30)

13. Did you fish herring last fall (1997)? Yes _____ No _____ (If no, go to question 21)

14. What gear did you use? (Note: a set gillnet is anchored to the ground at both ends whilst a modified one is anchored to the boat at one end).

Gillnet: Yes _____ No _____ **Trap:** Yes _____ No _____
 Type: Set _____ Modified _____ Type: _____
 No. of Nets: _____ No. of Traps: _____
 Mesh Size: _____
 Length: _____ fathoms

15. Where did you fish? (Fill in locations below or number approximate locations on the attached map and fill in the # of nights fished and amount caught below)

1. Place name _____	Lat _____	Long _____
# nights _____	Amt caught _____	
2. Place name _____	Lat _____	Long _____
# nights _____	Amt caught _____	
3. Place name _____	Lat _____	Long _____
# nights _____	Amt caught _____	
4. Place name _____	Lat _____	Long _____
# nights _____	Amt caught _____	
5. Place name _____	Lat _____	Long _____
# nights _____	Amt caught _____	

16. How much herring did you catch during the fall fishery? _____

17. Approximately how much of your herring catch did you:

- keep for personal bait? _____ (amount) _____ (percent)
- sell to processors? _____ (amount) _____ (percent)
- have to dump? _____ (amount) _____ (percent)

18. Were there more, less or the same amount of herring in the fall of 1997 than in previous years in your fishing area?

More abundant: Much more _____ A little more _____
 About the same: _____
 Less abundant: Much less _____ A little less _____

19. Have you had to change your fishing locations in recent years? Yes _____ No _____

If yes, why? _____

20. Do you have any additional comments on the 1997 fall fishery?

Fish Size: _____

Fish Condition: _____

Other: _____

Fishery in Previous Years (before June 30, 1997)

21. Do you have records of your catch from previous years (before June 30, 1997)?

Yes ____ No ____

22. If yes, please list your herring catch from past years:

Year	Spring		Fall	
	Catch	Location	Catch	Location
1997				
1996				
1995				
1994				
1993				
1992				
1991				
1990				

23. How has your gear changed over time?

	1997	1996	1995	1994	1993	1992⇒
#Nets/ Type of Trap						
Mesh Size						
Fishing Area						
Time and Duration of Fishery						

Herring Biology

24. Please identify areas of known herring spawning on the attached map

- a. For 1998 (mark with an X)
- b. For previous years (mark with a 0)

25. For each spawning area, please record the following:

Spawning Area 1:

Location: _____ Lat. _____ Long. _____

Date of spawning (week, month): _____

How spawning was observed (e.g. eggs on gear, catches of spawning herring, milt in the water, eggs in cod stomachs etc.): _____

Years that spawning was observed at this location: _____

Has the number of **spawning fish** at this location increased, decreased or stayed the same over time?

Increased _____ Stayed the same _____ Decreased _____

Spawning Area 2:

Location: _____ Lat. _____ Long. _____

Date of spawning (week, month): _____

How spawning was observed (e.g. eggs on gear, catches of spawning herring, milt in the water, eggs in cod stomachs etc.): _____

Years that spawning was observed at this location: _____

Has the number of **spawning fish** at this location increased, decreased or stayed the same over time?

Increased _____ Stayed the same _____ Decreased _____

Spawning Area 3:

Location: _____ Lat. _____ Long. _____

Date of spawning (week, month): _____

How spawning was observed (e.g. eggs on gear, catches of spawning herring, milt in the water, eggs in cod stomachs etc.): _____

Years that spawning was observed at this location: _____

Has the number of **spawning fish** at this location increased, decreased or stayed the same over time?

Increased _____ Stayed the same _____ Decreased _____

26. Does spawning occur at these locations every year? Yes _____ No _____

27. Have the number of **spawning locations** that you have seen increased, decreased or stayed the same over time?

Increased _____ Stayed the same _____ Decreased _____

Comments: _____

_____**Other Information**

26. Who else should we interview regarding the inshore herring fishery?

Name: _____ Phone Number: _____

Name: _____ Phone Number: _____

Name: _____ Phone Number: _____

Name: _____ Phone Number: _____

Name: _____ Phone Number: _____

27. Other comments?

Interviewer: _____

Date: _____