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Results of studies on herring of the Gulf of St. Lawrence, and Banquereau and Georges Banks

by

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Based on samples taken by the R/V *Cryos* at the same time and fishing locations as in 1972, this study provides complementary information on the state of the different stocks of herring of the southern Gulf of St. Lawrence, in particular on their movements on both sides of the Laurentian Channel and towards Subdiv. 4Vn outside the Gulf of St. Lawrence.

Also studies were samples from the pre-recruit herring survey of Georges Bank.

1. Sampling

Sampling was done using a Lofoten-type bottom trawl and a pelagic trawl in the following regions:

	Locality	Position	Trawl type	Date
Coastal	Bay St. Georges	48°21'3N – 58°57'0W	Lofoten	10-4-73
	Bay St. Georges	48°20'2N – 58°59'0W	Lofoten	10-4-73
	Bay of Islands	49°13'1N – 58°53'7W	Lofoten	16-4-73
	Bonne Bay	49°34'4N – 58°38'4W	Lofoten	18-4-73
	Point Martin	49°45'3N – 58°36'8W	Lofoten	18-4-73
	NW of St. Paul's Island	47°38'2N – 60°31'3W	Pelagic	19-4-73
	N of St. Paul's Island	47°29'5N – 60°12'0W	Pelagic	30-4-73
	Bird Rocks	47°53'5N – 60°50'0W	Pelagic	1-5-73
Offshore	NW of Sable Island	44°12'8N – 60°14'8W	Lofoten	2-3-73
	NW of Sable Island	44°15'5N – 60°15'0W	Lofoten	26-4-73
	NW of Georges Bank	42°03'0N – 68°05'7W	Pelagic	9-9-73
	S Stout Swell	42°04'8N – 67°57'2W	Pelagic	8-9-73
	S Franklin Swell	41°38'0N – 69°06'7W	Pelagic	8-9-73

For each catch of more than 1,000 kg, a sample of 300 fish was taken in the Gulf of St. Lawrence stocks, 200 fish on Georges Bank. The small catches north-west of Sable Island were studied in total.

4,000 herring were examined for the following biological characteristics: length, age, weight, sex and stage of sexual maturity, weight of gonads, gonad-somatic relationships; the following meristic characteristics: number of pectoral fin rays, gillrakers, dorsal fin rays, anal fin rays, keel scales K_2 and vertebrae. The method used to examine these characteristics have been described (Res.Doc. 71/40). Separation of the spring and autumn herring stocks was by the stage of maturity (Res.Doc. 73/37). The reciprocal importance of population studies is given in Table 1.

2. Age composition of the different stocks

a) Gulf of St. Lawrence

In Bay St. Georges, catches were 50% autumn herring and spring herring, whereas, northward, off Bay of Islands, the population is 30% autumn herring. Lengths varied from 20 to 40 cm, with two dominant groups, one at 29-30 cm, the other at 35-36 cm (Fig. 1). Comparison of length composition in April 1972 and

April 1973 show persistence of the 1967 year-class (spring herring 6 years old) and of the 1963 and 1962 year-classes (herring 10 and 11 years). Moreover, a new year-class (1970) of 3-year-old autumn herring appeared.

In the catches from the northwest and north of St. Paul's Island, the population of autumn herring varied from 60 to 77%. The dominant length group (35-36 cm) is the same as in St. Georges Bay (Fig. 1).

By contrast, herring sampled near Bird Rocks were 73% spring herring and were different from those from Div. 4R.

As in St. Georges Bay, there are some immature autumn herring of the 1970 year-class.

b) Sable Island Region

The stock was 93% autumn herring. Sampling in April had 63% juvenile autumn herring of the 1970 year-class.

c) Georges Bank Region

Samples were taken 8 and 9 September from pre-spawning concentrations, stages 4 and 5 of sexual maturity. 80% of the herring were 4 years of age (1969 year-class). A number of immature individuals of the 1970 year-class were still present.

Results approximate those from 1971, where all individuals taken 28 September were spawning (stage 6 of sexual maturity) (Res.Doc. 72/55).

3.   Meristic characteristics

Methods of analysis and presentation of results in Tables 2-7 are identical to those in Res.Doc. 73/37.

Comparison of characteristics of the autumn and spring stocks relying on the greatest actual numbers, has given a high degree of significance.

In the Gulf of St. Lawrence, the averages for pectoral fin rays, gillrakers and anal rays are higher for the autumn than the spring stocks (Tables 3, 4 and 5).

To the northwest of Sable Island, where the number of spring herring is small, there is a single significant characteristic: the number of pectoral fin rays.

Comparison of meristic characteristics of spring stocks. The difference between the means of meristic characteristics from concentrations of spring stocks on both sides of the Laurentian Channel are very marked (Res.Doc. 73/37).

Div. 4T spring herring stocks fall into the following range of means for three meristic characteristics: 13.21 to 13.53 for keel scale count K_2; 46.00 to 46.96 for gillraker count; 55.40 to 55.60 for vertebral count.

Figure 2 diagrams the gillraker (Br) – keel scale (K_2) relationship as revealed from samples collected since 1970 from March to May from different areas numbered from 1 to 22 as follows:

1 -	4T	Cape St. Lawrence	47°10'0N - 60°40'2W	17-4-70
2 -	4T	Cape St. Lawrence	47°11'0N - 60°40'2W	6-5-71
3 -	4Vn	Cape Smoky	46°35'5N - 60°08'0W	11-5-71
4 -	4Vn	Cape Gabarus	45°43'6N - 59°56'6W	12-5-71
5 -	4Vs	Artimon Trench	45°21'0N - 58°00'2W	20-5-71
6 -	4Vs	"Grey Sole" Trench	45°39'0N - 58°50'5W	22-5-71
7 -	4R	Cape St. George	48°23'6N - 59°27'6W	16-4-72
8 -	4R	Cape St. George	48°23'8N - 59°30'8W	19-4-72
9 -	3Pn	Ile aux Morts	47°33'0N - 58°56'7W	20-4-72
10 -	4T	St. Paul's Island	47°11'4N - 60°16'4W	22-4-72
11 -	4Vs	South slope of Banquereau	43°58'0N - 58°36'3W	5-3-72
12 -	4Vs	East slope of Sable Island Gully	44°04'3N - 58°34'5W	24-4-72
13 -	4Vs	South slope of Banquereau	44°10'2N - 58°29'2W	26-4-72
14 -	4Vs	East slope of Sable Island Gully	44°05'5N - 58°54'0W	25-4-72
15 -	4R	Bay St. George	48°21'3N - 58°57'0W	10-4-73
16 -	4R	Bay St. George	48°20'2N - 58°59'0W	10-4-73
17 -	4R	Bay of Islands	49°13'1N - 58°53'7W	16-4-73
18 -	4R	Bonne Bay	49°34'4N - 58°38'4W	18-4-73
19 -	4R	Point Martin	49°45'3N - 58°36'8W	18-4-73

20 – 4T	Northwest of St. Paul's Island	47°38'2N – 60°31'3W	19-4-73
21 – 4T	North of St. Paul's Island	47°29'5N – 60°12'0W	30-4-73
22 – 4T	Bird Rocks	47°53'5N – 60°50'0W	1-5-73

From the Br – K_2 diagram (Fig. 2), one notes the presence of spring stocks of the same type as those from Div. 4T, near Cape Smoky (15% of the catch) as well as off Cape Gabarus (6% of the catch) (Res. Doc. 72/55).

These stocks were found 25 January 1971 on St. Ann Bank (Res.Doc. 72/55), end of November 1972 near Cape Dauphin (Res.Doc. 73/37).

Comparison of meristic characteristics of autumn stocks. Autumn stocks from northwest of St. Paul's Island have averages similar to those from St. Georges Bay:

55,585 against 55,583 for vertebral average
18,517 against 18,500 for pectoral fin ray average
49,091 against 49,422 for gillraker average
18,094 against 18,252 for anal fin ray average
19,436 against 19,483 for dorsal fin ray average
13,873 against 13,889 for keel scale (K_2) average.

Autumn stocks from Banquereau differed from other stocks by their higher number of keel scale (K_2) count (Fig. 2).

Stocks from the northwest of Sable Island taken in March and April 1973 differ from Banquereau stocks in average vertebral count:

55,393 to 55,488 for adults
55,400 for immatures of the 1970 year-class.

Georges Bank concentrations are characterized, as in 1971, by low average vertebral counts (55,332 and 55,382) and a high average for keel scale counts (14,317 and 14,314).

4.   Conclusion

a) In all areas considered from the Gulf of St. Lawrence to Georges Bank, the presence of immature 3-year-old herring (1970 year-class) with meristic characteristics of the autumn type is noted.

b) There is no exchange of spring herring on both sides of the Laurtenial Channel, on the other hand, spring herring from Div. 4T are found in Subdiv. 4Vn.

c) In St. Georges Bay, two years of sampling show persistence of the 1967 year-class of spring herring and of the 1963 and 1962 year-classes of autumn herring.

d) Samplings from Georges Bank of pre-spawning concentrations showed 80% were herring of 4 years of age (1969 year-class).

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Table 1   Herring - Frequency and percentage of autumn and
spring spawners in the various areas.

Locality and spawning group		No. of specimens	Percentage		
			Autumn	Spring	Immatures
1. St Georges Bay bottom	Autumn Spring Immatures	116 149 27	40	51	9
2. St Georges Bay bottom	Autumn Spring Immatures	145 134 21	48	45	7
3. Bay of Island bottom	Autumn Spring Immatures	61 137 2	30	69	1
4. Bonne Bay bottom	Autumn Spring Immatures	92 191 16	31 .	64	5
5. Martin Pte bottom	Autumn Spring Immatures	94 173 33	31	58	11
6. N.W St Paul Isl pelagic	Autumn Spring Immatures	181 117 2	60	39	1
7. N. St Paul Isl pelagic	Autumn Spring Immatures	225 66 1	77	22	1
8. Birds Rocks pelagic	Autumn Spring Immatures	43 254 53	12	73	15
9. N.W Sable Isl bottom Mar.	Autumn Spring Immatures	302 40 25	82	11	7
10. N.W Sable Isl bottom Apr.	Autumn Spring Immatures	219 40 440	31	6	63
11. N.W Georges bank pelagic	Autumn Spring Immatures	189 11	95		5
12. South Stout Swell pelagic	Autumn Spring Immatures	184 15	92		8
13. South Francklin Swell pelagic	Autumn Spring Immatures	190 11	95		5
		3 999			

Table n° 2 Herring - Vertebral numbers of autumn and spring spawners and immatures (** indicates significance at 1 o/o level)

Area	Autumn spawners (A)										Spring spawners (S)										$\bar{X}_A - \bar{X}_S$
	53	54	55	56	57	58	N	$\bar{X}^1$	Var^2	SE^3	53	54	55	56	57	58	N	$\bar{X}^1$	Var^2	SE^3	
St Georges Bay (bot)	1	2	47	59	6		115	55.585	0.439	0.062	1	6	46	82	11	2	148	55.689	0.570	0.062	- 0.106
St Georges Bay (bot)		11	55	61	18		145	55.593	0.646	0.067		7	46	61	20		134	55.701	0.617	0.068	- 0.108
Bay of Island (bot)		3	20	35	3		61	55.625	0.438	0.085		4	29	77	24	1	135	55.918	0.539	0.063	- 0.295**
Bonne Bay (bot)		5	34	47	5	1	92	55.598	0.529	0.076		9	69	87	22	2	190	55.677	0.614	0.057	- 0.079
Martin Pte (bot)		2	42	47	2		93	55.527	0.339	0.061		9	56	87	17	1	170	55.676	0.563	0.057	- 0.149
4 R immatures (bot)		4	40	42	8		94	55.574	0.506	0.073											
N.W St Paul Isl. (pel)		9	71	87	14		181	55.585	0.500	0.052		13	39	58	5		115	55.478	0.567	0.070	0.107
N. St Paul Isl. (pel)	1	11	97	97	14	2	222	55.531	0.558	0.050		5	28	28	2		63	55.428	0.475	0.087	0.105
Birds Rocks (pel)			19	20	2	1	42	55.643	0.479	0.108		6	100	132	12		250	55.600	0.385	0.039	0.043
4 T - immatures (pel)		2	23	24	3		52	55.538	0.449	0.094											
N.W Sable Isl. (bot) Mar.	3	25	122	127	21	3	301	55.488	0.677	0.047		2	18	19	1		40	55.475	0.409	0.102	0.013
N.W Sable Isl. (bot) Apr.	1	18	104	81	12		216	55.393	0.547	0.050		4	20	13	2		39	55.333	0.544	0.119	0.060
4 W - immatures (bot)	2	21	228	179	8	2	440	55.400	0.427	0.031											
N.W Georges bank (pel)		14	105	65	4	1	187	55.332	0.449	0.049											
South Stout Swell (pel)		8	95	78	2		181	55.408	0.355	0.044											
South Francklin Swell (pel)		8	105	70	1	1	185	55.362	0.363	0.044											
5 Ze - immatures (pel)	1	2	19	11	3		36	55.361	0.694	0.141											

1   $\bar{X}$ = average vertebral number

2   Var = variance

3   SE   = standard error

bot = bottom

pel = pelagic

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Table no 3 Herring - pectoral fin ray numbers of autumn and spring spawners and immatures (.) indicates significance at 1 o/o level *, 1 o/oo **

Area	Autumn spawners (A)											Spring spawners (S)											$\bar{X}_A - \bar{X}_S$
	15	16	17	18	19	20	21	N	$\bar{X}^1$	Var^2	SE^3	15	16	17	18	19	20	21	N	$\bar{X}^1$	Var^2	SE^3	
St Georges Bay (bot)		4	13	38	55	9		116	18.500	0.687	0.077		11	84	48	5	1		149	17.535	0.481	0.057	1.165**
St Georges Bay (bot)			11	53	62	18		144	18.604	0.647	0.067		8	71	52	3			134	17.373	0.401	0.055	1.231**
Bay of Island (bot)			3	15	34	8	1	61	18.820	0.617	0.101		15	80	32	9	1		137	17.277	0.599	0.066	1.543**
Bonne Bay (bot)		2	22	40	18	10		92	18.130	0.950	0.102	1	6	56	93	31	1		189	17.815	0.673	0.060	0.315**
Martin Pte (bot)			11	41	31	10	1	94	18.457	0.767	0.090		20	98	46	8			173	17.266	0.592	0.059	1.191*
4 R - immatures (bot)			11	34	40	14		99	18.576	0.757	0.088												
N.W St Paul Isl. (pel)		1	18	68	74	18	1	180	18.517	0.721	0.065		16	61	38	2			117	17.222	0.485	0.265	1.295*
N. St Paul Isl. (pel)			29	69	103	24		225	18.542	0.723	0.057		3	43	14	4	2		66	17.379	0.39	0.099	1.163**
Birds Rocks (pel)			3	10	24	6		43	18.767	0.611	0.121		35	155	80	6			254	17.224	0.499	0.044	1.543**
4 T - immatures (pel)			4	14	27	7		53	18.666	0.767	0.121												
N.W Sable Isl. (bot) Mar.		1	28	120	123	30	3	302	18.506	0.656	0.047		1	7	23	9			40	18.009	0.513	0.115	0.506**
N.W Sable Isl. (bot) Apr.			27	87	82	26	1	219	18.521	0.728	0.058		1	7	21	9	2		40	18.100	0.708	0.135	0.421**
4 W - immatures (bot)	1		44	179	170	39	3	440	18.459	0.750	0.041												
N.W Georges bank (pel)	1	2	15	86	72	10	1	187	18.390	0.649	0.066												
South Stout Swell (pel)			20	89	58	15	2	184	18.402	0.690	0.061												
South Francklin Swell (pel)			17	87	74	12		190	18.426	0.563	0.054												
5 Ze - immatures pel			3	17	15	2		37	18.432	0.530	0.121												

1 $\bar{X}$ = average pectoral fin ray number
2 Var = variance
3 SE = standard error

bot = bottom
pel = pelagic

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Table n° 4 Herring - gillraker numbers of autumn and spring spawners and immatures (* indicates significance at 5 o/o level)
(** " " " 1 o/o ")
(*** " " " 1 o/oo ")

Area		Autumn spawners (A) 43 44 45 46 47 48 49 50 51 52 53 54 55 56	N	X̄	Var²	SE³	Spring spawners (S) 43 44 45 46 47 48 49 50 51 52 53 54 55	N	X̄	Var²	SE³	X̄_A − X̄_B
St Georges Bay (bot)		1 1 2 11 21 31 24 13 4 3 · · 2 3	116	49.422	4.194	0.191	1 4 14 26 40 28 22 9 3 1	148	48.311	2.651	0.134	1.111***
St Georges Bay (bot)		1 · · · 19 18 35 33 18 11 2 2 · ·	144	49.305	3.053	0.146	5 6 19 33 35 26 7 1 1	131	48.527	2.252	0.132	0.778***
Bay of Island (bot)		· 1 2 9 11 15 8 6 6 1 · · · ·	59	49.051	3.153	0.233	1 3 9 17 29 40 21 16 1	136	48.662	2.255	0.129	0.389
Bonne Bay (bot)		2 3 12 18 27 20 11 12 6 1 · · · ·	92	48.978	2.791	0.175	3 7 8 32 43 47 29 16 2 1	188	48.452	2.636	0.120	0.526*
Martin Pte (bot)		1 · 5 7 26 20 15 8 8 4 · · · ·	93	49.215	3.041	0.182	1 4 7 23 36 54 29 11 5	170	48.659	2.238	0.115	0.556**
4 R - immatures (bot)		1 5 10 17 15 18 14 8 6 1 · · · ·	95	47.452	3.888	0.203						
N.W St Paul Isl. (pel)		3 0 4 8 16 25 47 32 21 15 3 · · ·	174	49.091	3.645	0.145	1 7 16 24 23 19 16 6 2	114	46.965	2.972	0.162	2.127***
E. St Paul Isl. (pel)		· · 3 18 34 37 44 37 29 17 1 2 · ·	222	48.950	3.414	0.124	6 11 8 25 9 6 1 1	65	46.692	2.467	0.196	2.258***
Birds Rocks (pel)		· · 1 · 10 12 13 5 1 · · · · ·	45	48.256	1.481	0.187	5 23 33 62 69 37 19 5	251	46.526	2.205	0.094	1.730***
4 T - immatures (pel)		2 3 · 5 8 14 4 11 2 3 · · · ·	52	48.173	3.911	0.277						
N.W Sable Isl. (bot) Mar.		4 · 7 17 44 64 77 54 25 9 2 · · ·	298	49.658	2.577	0.095	1 2 7 5 8 6 2 2 3 1	40	49.000	4.718	0.348	0.658*
N.W Sable Isl. (bot) Apr.		1 · 4 13 20 47 52 36 24 18 2 1 · ·	218	49.841	3.312	0.123	3 6 9 8 8 6 6 1	39	48.974	3.711	0.312	0.067
4 W - immatures (bot)		1 · 11 21 82 101 85 80 43 4 4 1 · ·	431	48.585	2.635	0.078						
N.W Georges Bank (pel)		8 1 7 21 90 44 33 17 11 1 1 · · ·	189	48.878	2.554	0.116						
South Stout Swell (pel)		3 · 8 14 38 44 39 21 11 1 · · · ·	180	49.116	2.691	0.122						
South Franklin Swell (pel)		1 · 9 25 32 40 44 25 6 2 2 · · ·	186	49.091	2.744	0.122						
5 Ze - immatures (pel)		· · · 1 4 5 12 8 6 1 · · · ·	57	49.189	1.936	0.292						

1 X̄ = average gillraker number
2 Var = variance
3 SE = standard error

bot = bottom
pel = pelagic

Table n° 5 Herring - Anal fin ray numbers of autumn and spring spawners and immatures   (* indicates significance at 0,5 o/o level)
(** " " = 0,1 o/o =)
(*** " " = 0,1 o/oo =)

Area	Autumn spawners (A)											Spring spawners (S)											$\bar{X}_A - \bar{X}_S$
	15	16	17	18	19	20	21	N	$\bar{X}$[1]	Var[2]	SE[3]	15	16	17	18	19	20	21	N	$\bar{X}$[1]	Var[2]	SE[3]	
St Georges Bay (bot)		1	17	60	29	5	3	115	18.252	0.787	0.083		8	40	70	26	3		147	17.837	0.727	0.070	0.415***
St Georges Bay (bot)		2	29	63	34	14	2	144	18.243	0.954	0.082		5	30	63	34	2		134	17.985	0.692	0.072	0.258*
Bay of Island (bot)		1	11	21	22	4	2	61	18.377	1.039	0.132		7	46	57	23	3		136	17.772	0.755	0.075	0.605***
Bonne Bay (bot)		2	22	40	18	10		92	18.130	0.950	0.102	1	6	56	93	31	1	1	189	17.815	0.673	0.060	0.315**
Martin Pte (bot)		1	14	38	32	9		94	18.361	0.792	0.092		7	48	76	33	3		167	17.862	0.710	0.065	0.499***
4 R - immatures (bot)		2	17	37	32	7		95	18.263	0.834	0.094												
N.W St Paul Isl. (pel)	1	1	44	83	38	14		181	18.094	0.830	0.068		4	42	53	15	1	1	116	17.690	0.651	0.075	0.404***
N. St Paul Isl. (pel)		5	38	104	66	9	1	223	18.175	0.731	0.057		1	20	26	15	1		64	17.891	0.893	0.119	0.284*
Birds Rocks (pel)		1	10	13	15	2		41	18.171	0.895	0.149		12	80	115	34	2		243	17.728	0.628	0.051	0.443**
4 T - immatures (pel)	3	3	7	20	18	1	1	50	18.200	0.979	0.141												
N.W Sable Isl. Mar. (bot)		9	61	133	80	16	1	300	18.120	0.822	0.052		1	12	16	8	2		39	17.950	0.840	0.149	0.170
N.W Sable Isl. Apr. (bot)		1	42	101	65	7		216	18.162	0.620	0.054		1	6	27	6			40	17.950	0.407	0.102	0.212
4 W - immatures (bot)	15	15	91	203	94	26	1	430	18.065	0.830	0.044												
N.W Georges bank (pel)		1	31	69	71	15	1	188	18.383	0.826	0.066												
South Stout Swell (pel)		1	25	72	67	17	1	183	18.421	0.773	0.065												
South Francklin Swell (pel)	1	1	30	82	62	11	1	188	18.276	0.768	0.064												
5 Ze - immatures (pel)		2	5	19	10	1		57	18.081	0.743	0.144												

1 $\bar{X}$ = average anal fin ray number
2 Var = variance
3 SE = standard error

bot = bottom
pel = pelagic

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Table n° 6   Herring - dorsal fin ray numbers of autumn and spring spawners and immatures

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* indicates significance at 0,5 o/o level)
**         "          "        1 o/o   "   )
***        "          "        1 o/oo  "   )
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Area	Autumn spawners (A)										Spring spawners (S)										$\bar{X}_A - \bar{X}_S$
	17	18	19	20	21	22	N	X̄	Var²	SE³	17	18	19	20	21	22	N	X̄	Var²	SE³	
St Georges Bay (bot)		9	47	56	3	1	116	19.483	0.513	0.067	2	18	89	36	2		147	19.122	0.465	0.056	0.361***
St Georges Bay (bot)		10	61	63	10		144	19.507	0.532	0.061		11	79	41	3		134	19.268	0.408	0.055	0.239**
Bay of Island (bot)		2	31	24	3	1	61	19.508	0.521	0.093		8	76	49	4		137	19.357	0.408	0.054	0.151
Bonne Bay (bot)		7	47	37	1		92	19.348	0.405	0.066		23	114	51	2		190	19.168	0.405	0.046	0.180*
Martin Pte (bot)		4	37	48	5		94	19.574	0.441	0.069		29	93	46	3		171	19.134	0.494	0.054	0.440***
4 R - immatures (bot)		2	35	52	8		97	19.680	0.428	0.067											
N.W St Paul Isl. (pel)	1	10	88	77	6		181	19.436	0.425	0.048	1	13	76	23	3		116	19.121	0.438	0.062	0.315***
N. St Paul Isl. (pel)		6	96	117	6		225	19.547	0.356	0.040		5	23	34	2		64	19.515	0.476	0.086	0.032
Birds Rocks (pel)		1	20	18	4		43	19.581	0.487	0.108		36	132	78	3		249	19.193	0.471	0.043	0.388***
4 T - immatures (pel)	2	3	17	25	4	1	52	19.558	0.879	0.131											
N.W Sable Isl. (bot) Mar.		17	156	134	14		301	19.482	0.457	0.059		2	17	19	1		39	19.487	0.415	0.104	- 0.005
N.W Sable Isl. (bot) Apr.		10	99	101	9		219	19.498	0.426	0.044		4	23	12	1		40	19.250	0.448	0.107	0.248*
4 V - immatures (bot)	1	17	175	213	27		433	19.577	0.463	0.033											
N.W Georges bank (pel)		8	69	104	7		188	19.585	0.405	0.046											
South Stout Swell (pel)		5	77	93	9		184	19.576	0.399	0.047											
South Franclin Swell (pel)	1	6	79	92	10		188	19.553	0.452	0.049											
5 Ze - immatures (pel)	1	3	15	14	4		57	19.459	0.811	0.150											

bot = bottom
pel = pelagic

1 X̄ = dorsal fin ray number
2 Var = variance
3 SE = standard error

Table n° 7   Herring - Keeled scales K$_2$ numbers of autumn and spring spawners and immatures (*** indicates significance at 1 o/oo level)

Area	Autumn spawners (A)											Spring spawners (S)										$\bar{X}_A - \bar{X}_S$
	12	13	14	15	16	17	18	N	$\bar{X}$	Var²	SE³	11	12	13	14	15	16	N	$\bar{X}$	Var²	SE³	
St Georges Bay (bot)		36	58	21	1			116	13.889	0.518	0.067		4	53	76	13		149	13.718	0.555	0.061	0.171
St Georges Bay (bot)	4	38	73	28	2			145	13.903	0.616	0.065		2	41	78	13		134	13.761	0.408	0.055	0.142
Bay of Island (bot)		18	35	8				61	13.836	0.406	0.082		2	38	79	18		137	13.825	0.439	0.057	0.011
Bonne Bay (bot)		25	51	13	2			91	13.912	0.503	0.075		3	61	101	26		191	13.785	0.475	0.050	0.127
Martin Pie (bot)	3	25	48	17	1			94	13.872	0.607	0.080		5	49	94	24	1	175	13.809	0.528	0.055	0.063
4 R - immatures (bot)	3	29	40	24	1			97	13.907	0.710	0.086											
N.W St Paul Isl. (Pel)	3	50	98	27	3	2		181	13.873	0.545	0.055	1	17	59	36	4		117	13.214	0.585	0.071	0.659 ***
N. St Paul Isl. (Pel)	5	61	95	54	9			224	14.004	0.767	0.059	2	2	27	29	6		66	13.530	0.684	0.102	0.474 ***
Birds Rocks (Pel)	2	10	21	9	1			43	13.953	0.855	0.143	1	23	139	85	5		253	13.277	0.447	0.042	0.676 ***
4 T immatures (Pel)	1	16	25	11				53	13.868	0.578	0.105											
N.W Sable Isl. (bot) Mar.	3	63	158	65	11	2		302	14.079	0.665	0.047		12	17	7	4		40	14.075	0.892	0.151	0.004
N.W Sable Isl. (bot) Apr.	5	48	122	33	9	1		218	13.982	0.672	0.056			10	24	6		40	13.900	0.400	0.101	0.082
4 V immatures (bot)	10	101	204	99	20	2		436	14.055	0.774	0.042											
N.W Georges bank (Pel)	3	25	88	57	14	2		189	14.317	0.792	0.064											
South Stent Swell (Pel)	1	27	93	50	10	2		184	14.277	0.770	0.065											
South Francklin Swell (Pel)	1	19	75	80	13		1	189	14.466	0.655	0.059											
5 Ze immatures (Pel)		4	19	11	3			37	14.351	0.625	0.131											

bet = bottom
pel = pelagic

1 $\bar{X}$ = keeled scales K$_2$ number

2 Var = variance
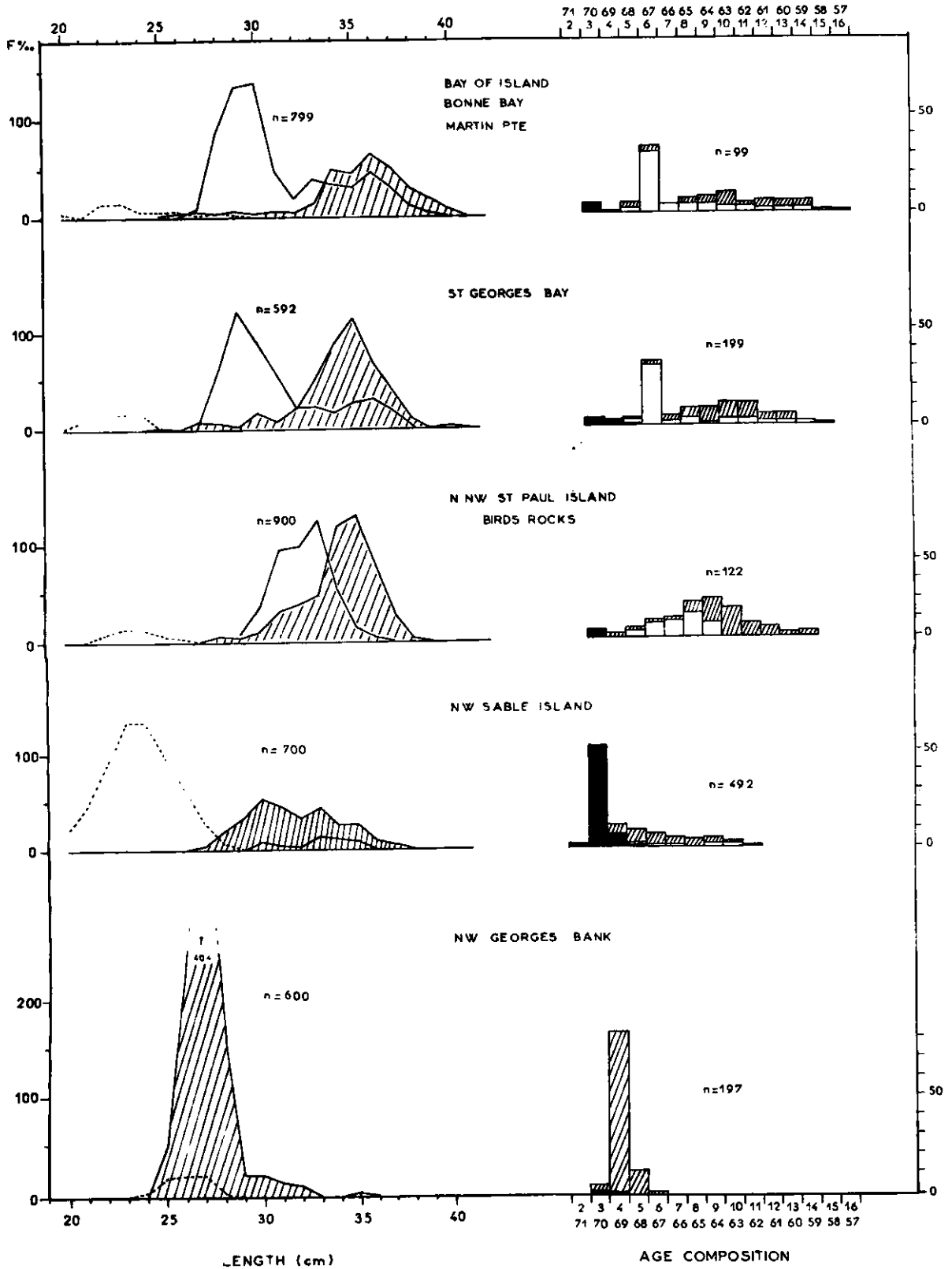
3 SE = standard error

C 11

Fig. 1. Length frequencies and age composition of herring from areas (hatched portion : autumn spawners; solid portion and dashed live : immatures).
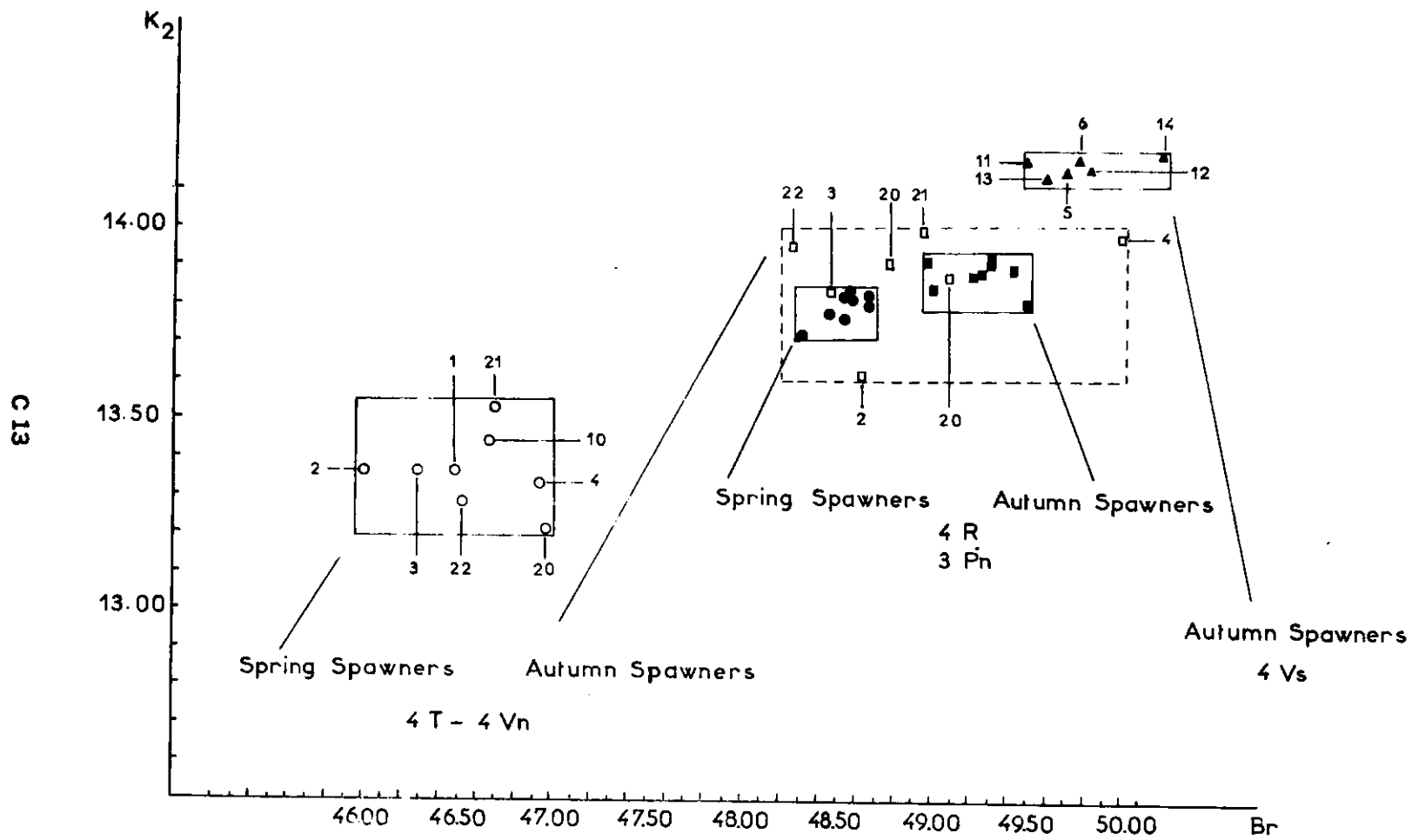
Fig. 2. Herring diagram of gillraker - keeled scales K_2 of autumn and spring spawners.