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The 1982-83, 4Vn Herring Biological Update

by

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Abstract

The purse seine catch during the 1982-83 winter fishery was 3648 t against a TAC of 3000 t. The catch rates from purse seine logs and hail information show an increase from the previous years while the effort decreased this year. In 1982-83 the majority of the catch was again taken off the northeast tip of Cape Breton and over 84% of the catch consisted of 4, 5, 6, and 7 year old fish.

Tagging experiment results indicate that the winter fishery exploits herring which have a strong affinity with Gulf of St. Lawrence stocks, local Cape Breton stocks including those in Bras d'Or Lakes, and a lesser but consistent mixing with 4X stocks. Thus it appears that 4Vn is an overwintering area for components of various east coast stocks which, if not exploited in 4Vn during winter, would still be available to various fisheries during their summer distribution.

Résumé

Durant la pêche d'hiver 1982-83, la prise à la senne coulissante a été de 3 648 t, par comparaison avec un TPA de 3 000 t. D'après le journal de bord des bateaux de pêche à la senne coulissante et les rapports sur les arraisonnements les prises ont augmenté par comparaison aux années précédentes, alors que l'effort de pêche a diminué. En 1982-83, la plus grande partie de la prise provenait de nouveau de la pointe nord-est de l'Ile-du-cap-Breton et plus de 84 % des poissons avaient 4, 5, 6 ou 7 ans.

Les résultats des expériences de marquage indiquent qu'en hiver on pêche un hareng montrant de fortes affinités avec les stocks du golfe Saint-Laurent, les stocks locaux de l'Ile-du-Cap-Breton, dont ceux du lac Bras d'Or, et se mêlant dans une moindre mesure, mais de façon probante, avec les stocks de la zone 4X. Il ressort donc que des éléments de divers stocks de la côte est passent l'hiver dans la zone 4Vn et que s'ils n'y sont pas pêchés durant la saison froide, on les retrouve dans diverses pêches en été.

Introduction

The Sydney Bight (4Vn) herring fishery consists of two components; a small fixed gear (trap and gillnet) fishery in the spring and summer and a large mobile gear (purse seine) fishery over the winter months. Historically the catch from the fixed gear fishery was small (less than 500 t) and has included landings from the Bras d'Or Lakes. The winter fishery prosecutes the overwintering components of several east coast stocks which can vary annually in their relative proportions in the 4Vn winter complex. These overwintering fish have been primarily fall spawners (Sinclair et al. 1979). Tagging studies have been carried out on the spring and overwintering components of the fishery and, even though the relationship between these components and outside regions is not totally clear, the results are helping to clarify these relationships.

Catch and CPUE Trends

The large mobile fishery in 4Vn developed in 1968. It was primarily exploited by foreign fleets for the first two years, but since the 1970-71 season it has been almost exclusively a Canadian purse seine fishery. The temporal distribution of the catches are shown in Table 1 and Figure 1. Canadian catches peaked in the winter of 1972-73 and subsequently declined until 1979-80 and have since stabilized at approximately 3600 t each year, due to quota limitations and herring abundance.

The 1982-83 season saw a slight increase in landings over the 1981-82 season to 3648 t, an overrun of the 3000 t quota. This was entirely caught between November 22 and December 15 (Table 2). For the second successive season, redfeed was reported to be a problem during the first week of the

fishery. This resulted in many vessels releasing fish or not setting their nets.

Several catch per unit effort indices have been estimated from the purse seine logs. Historically the proportion of the total catch accounted for on the logs, has been considered adequate to be descriptive of the fishery as a whole. This year however, the logs accounted for less than 20% of the landings. The hail and delivery note information has been available for the fishery seasons 1979-80 to 1982-83, and accounts for more than 90% of the annual catch. There has been little difference between catch per effort indices estimated from these data and those calculated from the log record method. Since the similarity between the two indices was also observed in 1982-83, this log record catch per effort estimate was considered to be still representative of the fishery. Even though scientific debate continues on the value of CPUE indices estimated from data on log records as indicators of stock abundance, all 1982-83 indices show an increase (Table 3; Figure 1). Fishermen's reports also indicate large concentrations of fish, in deep waters, in the Bird Islands-Aspy Bay area. Furthermore, while the catch remained relatively stable, effort decreased in 1982-83.

Geographical Distribution of Catch

Stobo and Simon (1982) noted that the centre of fishing activity has been shifting northward over the historical period of the fishery, and these changes in the distribution of catch continued in 1982-83. In the early 1970's fishing ranged from Fourchu Island to Bird Islands. The centre of activity changed to the area between Scatarie Island and Bird

Islands in the mid-1970's and by the late 1970's had shifted to between Ingonish Island and Bird Islands. In 1981-82, fishing activity was noted as far north as Aspy Bay and in the 1982-83 fishing year the majority of fishing was between Ingonish and Aspy Bay (Figure 2). Although the data in Figure 2 represents only 20% of the total catch, as discussed above, these data are considered representative of the overall fishing activity.

Age Composition

Biological sampling of the purse seine fishery has been generally good, until last year when a limited number of samples made the age composition and weights-at-age generated for 1981-82, suspect. This year, sampling of the winter fishery was good (15 samples); the age composition of the catch is given in Table 4. Over 84% of the total catch-by-weight consisted of 4, 5, 6, and 7 year olds (year classes 1979-76 respectively; birth date set at November 1).

The historical numbers-at-age and weights-at-age are given in Tables 5 and 6, and Figure 3. The derived 1982-83 weights-at-age returned to more historical values and suggest that the limited data for the 1981-82 assessment probably biased those values upwards. The derived catch-at-age for the 1982-83 fishery however also suggests that the 1981-82 derived numbers-at-age are reasonable and reflect appropriate year class dominance. The 1977 year class (age 6) continues to support the major part of the catch but the 1976, and 1978-80 year classes, all make significant contributions, by numbers, to the fishery. The 1980 year class (age 3) appears stronger than the previous two years. The 1970 year class which supported the fishery for many years (Figure 3) is no longer important.

Tagging Studies

The relationship of overwintering 4Vn herring with the migrating portions of adjacent and local stocks has continued to pose difficulties for fisheries management and catch allocation, therefore a number of tagging experiments have been conducted since 1977 to address the question. A total of 21,132 fish were tagged in 4Vn between 1977 and 1981. These results have been previously summarized (Sinclair et al. 1981; Stobo and Simon 1982) and are revised and updated in this document. In addition, two tagging experiments in Souris, P.E.I. (October 1978, 1981) totalling 18,289 fish were analysed.

The results of the 3 winter tagging experiments in 4Vn are summarized in Tables 7, 8, and 9, and Figures 4, 5, and 6. Each experiment shows quite dissimilar results. The majority of the tag returns during the year subsequent to tagging from the 1977 experiment (Table 7; Figure 4) come from the 4Wa winter fishery and 4Xa summer fisheries with a lesser movement into the Gulf. Subsequently no recoveries have been made in 4Xa. The 1978 tagging experiment (Table 8; Figure 5) was conducted further north and the resultant recoveries showed greater movement into the Gulf. Three fish also turned up in the 4Vn spring fixed gear fishery. The 1979-80 tagging experiments (Table 9; Figure 6) were conducted even further north in 4Vn and the resultant recoveries showed a widespread movement into the Gulf. A large number of these returns were from the "edge" fishery which has been closed since 1981; thus recoveries from subsequent experiments do not show similar spring movement. Local recoveries in 4Vn in the spring were substantial and there were three recoveries from the Bras d'Or Lakes. Returns from the St. Ann's Bay tagging (Apr.-May, 1981) (Table 10; Figure 7)

suggests that the fixed gear fishery primarily exploits local stocks with a mixture of late migrating fish from the Gulf. There was one recovery from within the lakes in May and one from Pt. Aconi in June of 1981. The following spring seven recoveries were made inside the Bras d'Or Lakes. The four recoveries from the Gulf show that there is some mixing of Gulf fish with local stocks as late as May and the timing of their movement into the Gulf cannot be determined. The majority of returns though were from the 4Vn winter fishery; these recoveries confirm that the winter 4Vn fishery exploits local stocks.

Due to the number of recoveries in Northumberland Strait from the 4Vn experiments, the results of the two Souris, P.E.I., tagging experiments were analysed (Table 11a, 11b; Figures 8, 9). Both juvenile and adult fish were tagged during these experiments, and both showed similar results. Recoveries were made within the Gulf and a few in 4Wa, but the majority of recoveries were made in Sydney Bight. The tag recoveries made in the Gulf from these experiments deserve some special consideration. The lack of tag recoveries from the "edge" fishery for the Sydney Bight and Souris experiments in 1981 and 1982 is related to the closure of that fishery in 1981. As a result no recoveries were possible of fish migrating into the Gulf in the second quarter. Further, the traditional "edge" fishery which existed for many years in the area between St. Paul's Island and Bird Rocks in 4T, became more localized along the north and west coasts of Cape Breton in 1978-80, thus increasing the chance of catching fish moving from Sydney Bight to the Northumberland Strait area. Any interpretation of tag recovery information from this area must consider these changes in the fishery and fishing patterns.

Summary

The available biological information indicates that the winter fishery prosecutes a stock mixture which probably varies with time, and for which some of the components are being managed during other phases of their migration. It appears certain that the winter fishery exploits both overwintering components of 4T and 4WX as well as local "stocks" in 4Vn and 4W.

If fishing activity continues in the northern part of 4Vn it is almost certain that the 4T component will be exploited. The limited recovery of the 4T stock complex is mirrored by the increase in catch rates seen in the 4Vn fishery.

Acknowledgements

We would like to thank Jacques Gagné for his help with the tagging results.

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Table 1. Annual (Oct-Oct) herring landings (t) in 4Vn.

	62-63	63-64	64-65	65-66	66-67	67-68	68-69	69-70	70-71	71-72	72-73	73-74	74-75	75-76	76-77	77-78	78-79	79-80	80-81	81-82	82-83
Can. Fixed Gear	492	407	252	91	296	235	225	74	142	162	116	212	226	74	120	310	327	261	328	248	-
Can. Mobile Gear	-	-	-	-	-	2	2044	5335	2917	10681	17537	16285	14297	5546	12831	7078	3332	2865	3952	3552	3648
Foreign Mobile Gear	-	-	18	-	17	-	11465	11050	344	1	10	578	270	188	-	-	-	-	-	-	-
Total Mobile Gear	-	-	18	-	17	2	13509	16385	3261	10682	17547	16863	14567	5734	12831	7078	3332	2865	3952	3552	3648
TAC																11000	8000	3000	4500	3000	3000

Table 2. Seasonal distribution of herring catch (t) by gear type in 4Vn

	1981		1982											
	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Purse Seine	2623	929							.3				267	3381
Inshore Gear Traps							73.9		35.6					
Drift Gillnets						10.6	17.2	54.9				11.5		
Set Gillnets						25.1	18.9	.6						

Table 3. CPUE indices for the 4Vn herring purse seine fishery

YEAR	¹ Catch(t) per Successful Night	² Catch(t) per Successful Night	Catch(t) per night	Catch(t) per set
71-72	115 ³	-	-	-
72-73	90.8	-	88.7	45.4
73-74	82.0	-	64.6	43.2
74-75	85.8	-	70.6	37.8
75-76	52.4	-	34.7	33.5
76-77	78.1	-	62.0	37.7
77-78	70.4	-	39.6	35.0
78-79	23.6	-	10.8	12.8
79-80	77.5	75.4	61.4	33.7
80-81	45.6	44.9	31.4	20.6
81-82	31.3	34.6	27.1	17.4
82-83	58.6	55.3	30.8	22.5

¹From log information only

²From hails, delivery notes and log information

³From previous assessment

Table 4. 4Vn herring catch-at-age (numbers $\times 10^{-3}$) for the 1982-83 purse seine fishery (fish aged as if birthday on November 1st).

AGE	2	3	4	5	6	7	8	9	10	11+	TOTAL
November & December	82	2308	2733	3359	5722	1798	816	37	15	150	17020
% Number	.5	13.6	16.1	19.7	33.6	10.6	4.8	.2	.09	.9	
% Weight	<1	6.8	12.5	19.1	38.8	13.8	6.8	.4	.2	1.7	

Table 5. 4Vn herring catch-at-age matrix.

Age*	73-74	74-75	75-76	76-77	77-78	78-79	79-80	80-81	81-82	82-83
2	43	116	1	0	0	0	0	43	104	82
3	3798	5116	671	16	7	26	3172	518	945	2308
4	43737	4156	1544	2986	110	441	3427	3791	1965	2733
5	14264	33189	1848	5103	2377	1413	1671	3946	7192	3359
6	4435	6430	7846	4136	2800	1443	741	1060	2982	5722
7	2955	2417	2571	17602	1442	878	1004	645	844	1798
8	3176	2304	1123	8379	7622	847	607	614	-	816
9	2841	2242	892	3401	4056	1701	873	717	77	37
10	3842	2842	1006	2431	1202	1838	879	1192	77	15
11+	4969	5401	3461	5451	3098	1915	750	2688	893	150
TOTAL	84060	64213	20963	49505	22714	10502	13134	15214	15079	17020
TONNES	16863	14354	5734	12831	7078	3332	2865	3952	3552	3648

* Birthday November 1

Table 6. 4Vn herring weights-at-age (gms).

Age	73-74	74-75	75-76	76-77	77-78	78-79	79-80	80-81	81-82	82-83
2	34	52	41	-	-	-	-	36	16	-
3	85	102	93	105	110	120	103	104	113	107
4	162	145	157	141	175	189	152	146	182	167
5	182	203	203	187	220	211	207	201	217	207
6	218	235	249	219	245	258	255	252	264	247
7	251	256	273	256	272	289	289	267	310	280
8	302	287	292	275	308	302	324	332	-	307
9	325	314	332	295	346	338	366	361	375	362
10	350	334	361	319	377	376	400	395	375	391
11+	367	362	382	333	383	397	417	431	453	405

Table 7. Quarterly Tag returns (to April 3, 1983) for 3063 fish tagged in 4Vn, November 26 - December 15, 1977

Recovery Location	1977	1978				1979				1980			
	4	1	2	3	4	1	2	3	4	1	2	3	4
4Vn	10	2	-	-	13	-	-	-	1	-	-	-	-
4Wa	1	75	-	-	2	2	-	-	-	-	-	-	-
<u>4X</u>													
South Shore	-	-	3	2	-	-	-	-	-	-	-	-	-
S.W. Nova Scotia	-	-	1	6	-	-	-	-	-	-	-	-	-
Bay of Fundy	-	-	-	2	-	-	-	-	-	-	-	-	-
<u>4T</u>													
Edge	-	-	-	-	-	-	1	-	-	-	1	-	-
Pictou Island	-	-	-	1	-	-	-	-	-	-	-	-	-

Yearly Quarters used
 1 - Jan 1-Mar 31
 2 - Apr 1-June 30
 3 - July 1-Sept 30
 4 - Oct 1-Dec 31

Table 8. Quarterly tag returns (to Apr 3, 1983) for 3993 fish tagged in 4Vn, November 9-December 2 1978

Recovery Location	1978	1979				1980				1981
	4	1	2	3	4	1	2	3	4	1
4Vn	66	-	2	-	-	69	1	-	7	-
4Wa	4	5	4	-	-	4	-	-	-	2
<u>4X</u>										
South:Shore	-	-	-	-	-	-	-	3	-	-
S.W. Nova Scotia	-	-	-	1	-	-	-	2	-	-
Bay of Fundy	-	-	-	1	-	-	-	1	-	-
<u>4T</u>										
Edge	-	-	10	-	-	-	3	-	-	-
Northumberland St	-	-	-	1	-	-	-	-	-	-
Western Gulf	-	-	-	2	-	-	-	-	-	-
4R	-	-	1	-	-	-	-	-	-	-

Yearly Quarters used
 1 - Jan 1-Mar 31
 2 - Apr 1-June 30
 3 - July 1-Sept 30
 4 - Oct. 1-Dec 31

Table 9. Quarterly tag returns (Apr 3, 1983) for 11, 101 fish tagged in 4Vn, Dec 10/79-Jan 7/80

Recovery Location	1979				1980				1981				1982			
	4	1	2	3	4	1	2	3	4	1	2	3	4			
<u>4Vn</u>																
Sydney Bight	96	750	21	-	67	7	-	-	3	-	-	-	-			
Bras d'Or Lakes	-	-	-	-	-	-	3	-	-	-	-	-	-			
<u>4Wa</u>	-	8	3	-	4	7	-	-	-	-	-	-	-			
<u>4X</u>																
S.W. Nova Scotia	-	-	-	4	-	-	2	3	-	-	-	-	-			
<u>4T</u>																
Edge	-	-	24	-	-	-	-	-	-	-	-	-	-			
Magdalen Is	-	-	1	-	-	-	-	-	-	-	-	-	-			
Northumberland Str	-	-	3	8	-	-	1	3	1	-	-	1	-			
Northern PEI	-	-	-	-	1	-	1	1	-	-	-	-	-			
Western Gulf	-	-	-	1	5	-	2	2	1	-	-	-	-			
<u>4R</u>	-	-	2	-	-	-	-	-	-	-	-	-	-			

Yearly quarters used 1 Jan 1-Mar 31
 2 Apr 1-June 30
 3 July 1-Sept 30
 4 Oct 1-Dec 31

Table 10. Quarterly tag returns from 2975 fish tagged in St. Ann's Bay, 4Vn, Apr 14-May 1, 1981

Recovery Location	1981			1982		
	Apr 1-June 30	July 1-Sept 30	Oct 1-Dec 31	Jan 1-Mar 31	Apr 1-June 30	July 1-Sept 30
4Vn Sydney Bight	1	-	25	-	-	-
Bras d'Or Lakes	1	-	-	-	7	-
4Wa	-	-	-	-	-	1
4T						
Magdalen Is	-	-	-	-	1	-
Northumberland Str	1	1	-	-	1	-

Table 11a. Quarterly returns from 8000 fish tagged in Souris P.E.I. October, 1978

Recovery Location	1978	1979			1980
	Oct 1-Dec 31	Jan 1-Mar 31	Apr 1-June 30	July 1-Sept 30	Oct 1-Dec 31
4Vn Sydney Bight	1	-	-	-	1
4T					
Magdalen Is	-	-	1	-	-
Escuminac	-	-	1	-	-
Souris	85	-	-	-	-

Table 11b. Quarterly returns from 10,289 fish tagged in Souris PEI October, 1981

Recovery Location	1981	1982		
	Oct 1-Dec 31	Jan 1-Mar 31	Apr 1-June 30	July 1-Sept 30
4Vn Sydney Bight	8	1	-	-
4Wa	-	1	1	-
4T Magdalen Is	-	-	1	-
Northumberland Str.	10	-	1	1

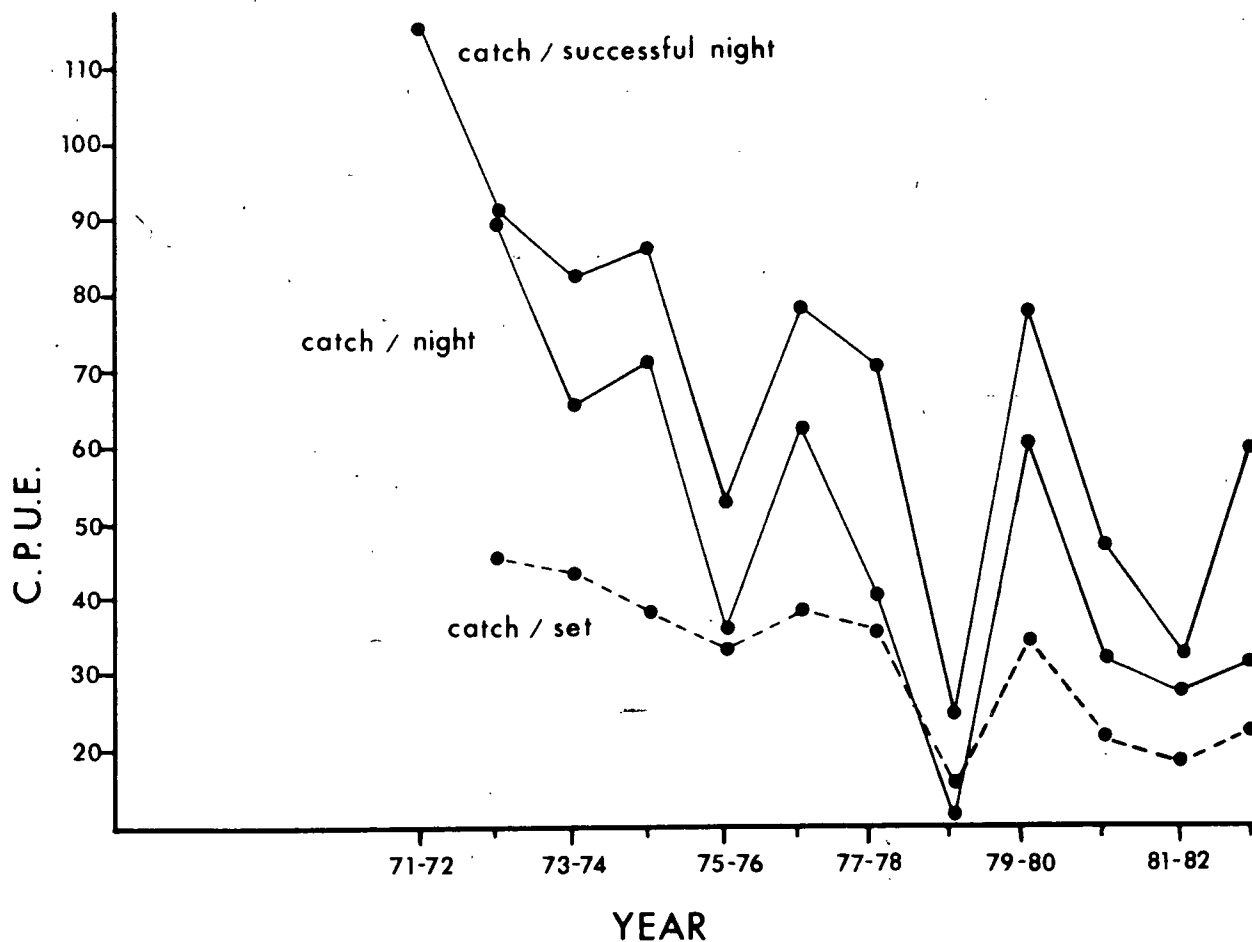
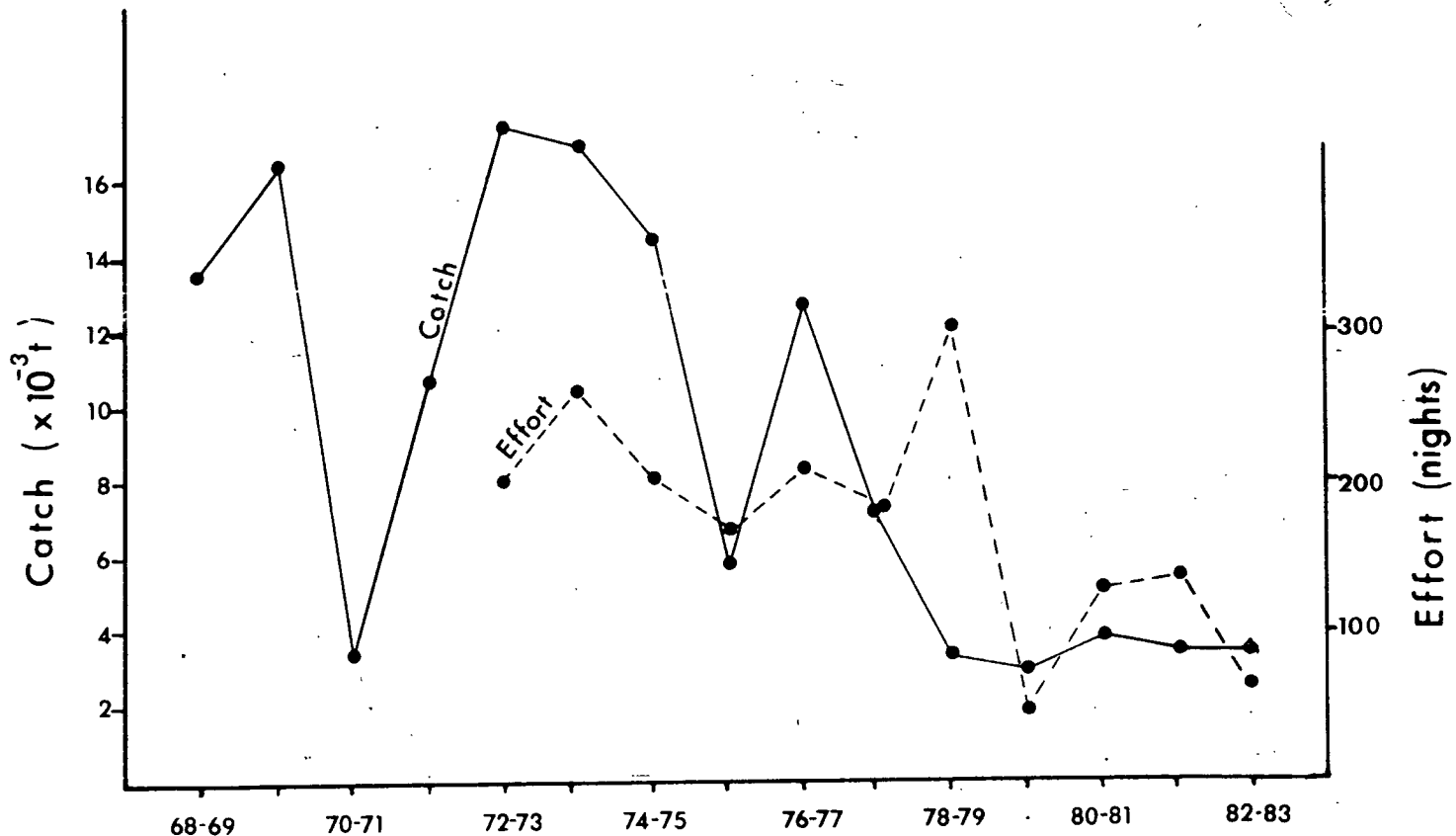
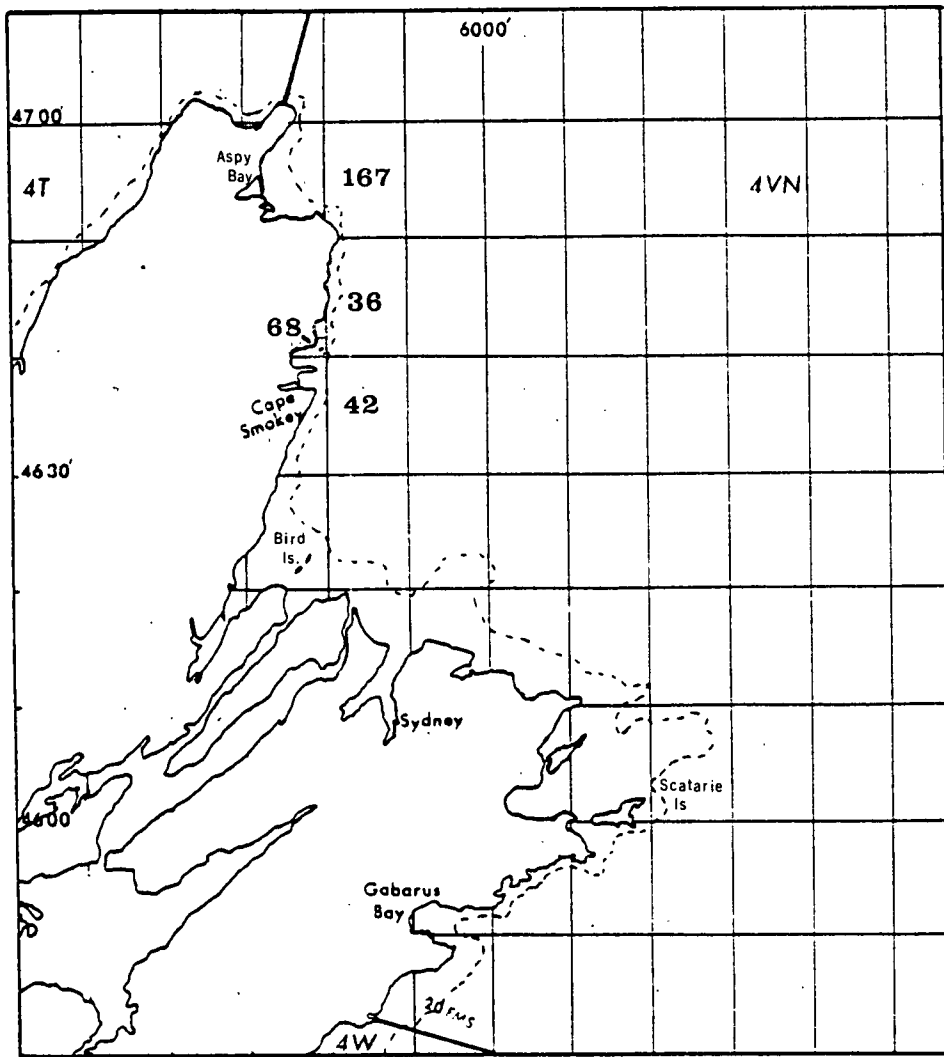
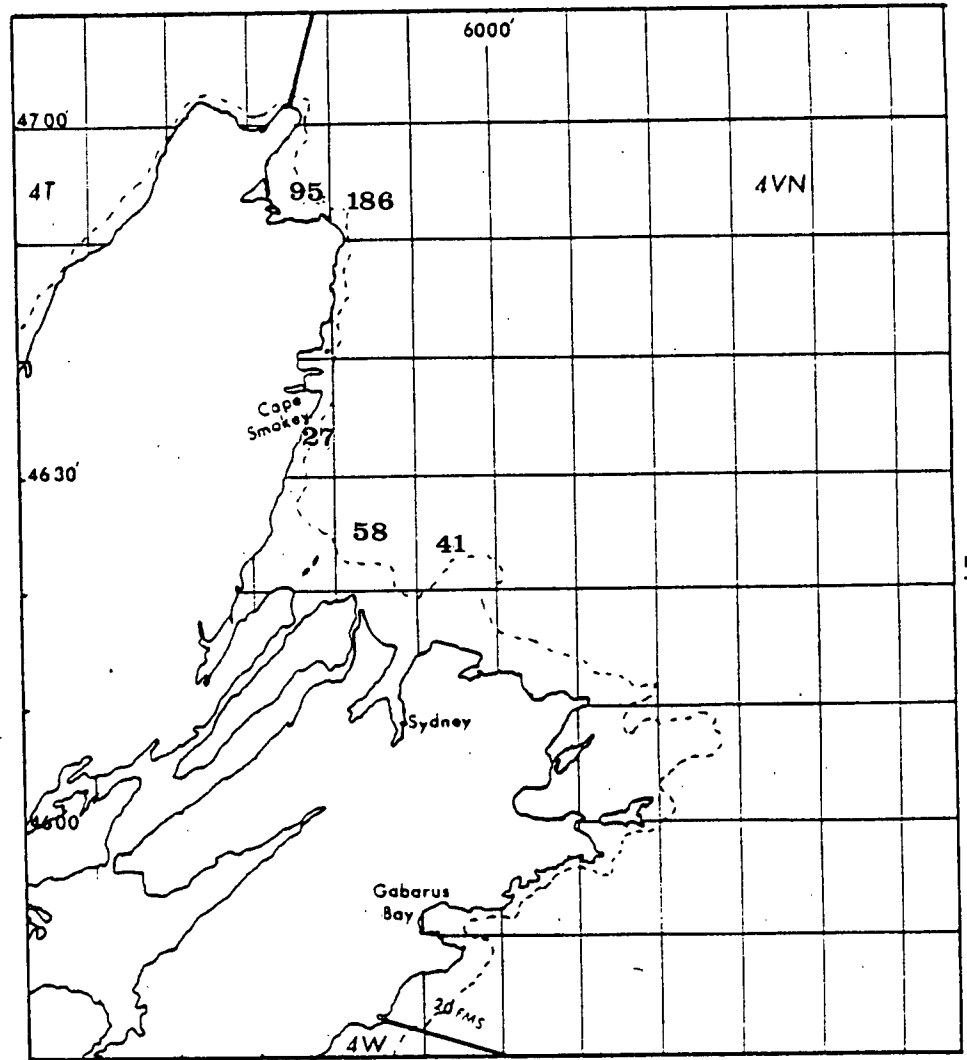


Figure 1. Distribution of catch, effort and CPUE for the 4Vn purse seine fishery. Effort is the catch divided by catch/night.



November



December

Figure 2. Monthly purse seine catch (t) distribution from log books for 1982.

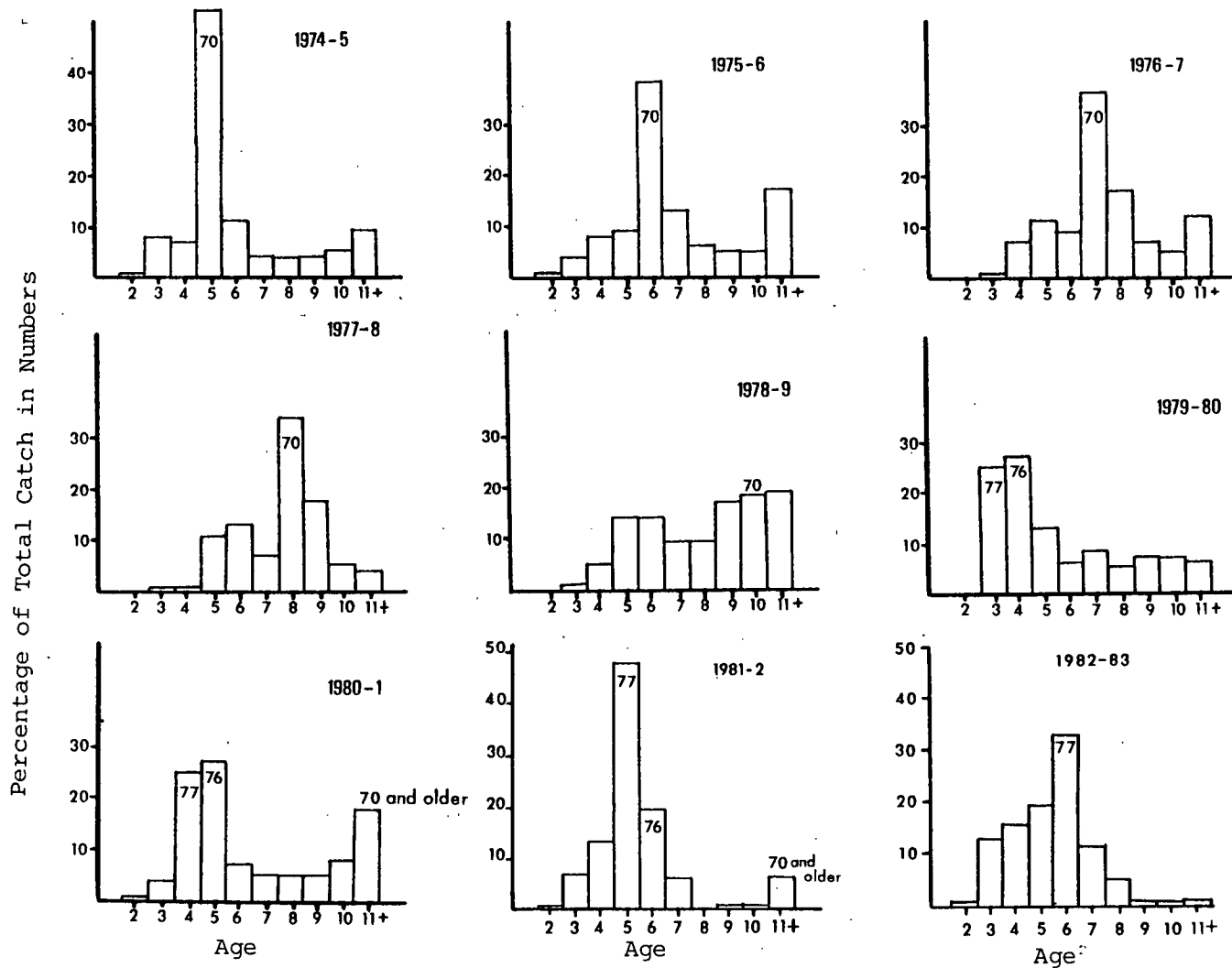


Figure 3. Historical age composition by percent for the 4VN herring fishery 1974-75 to 1982-83.

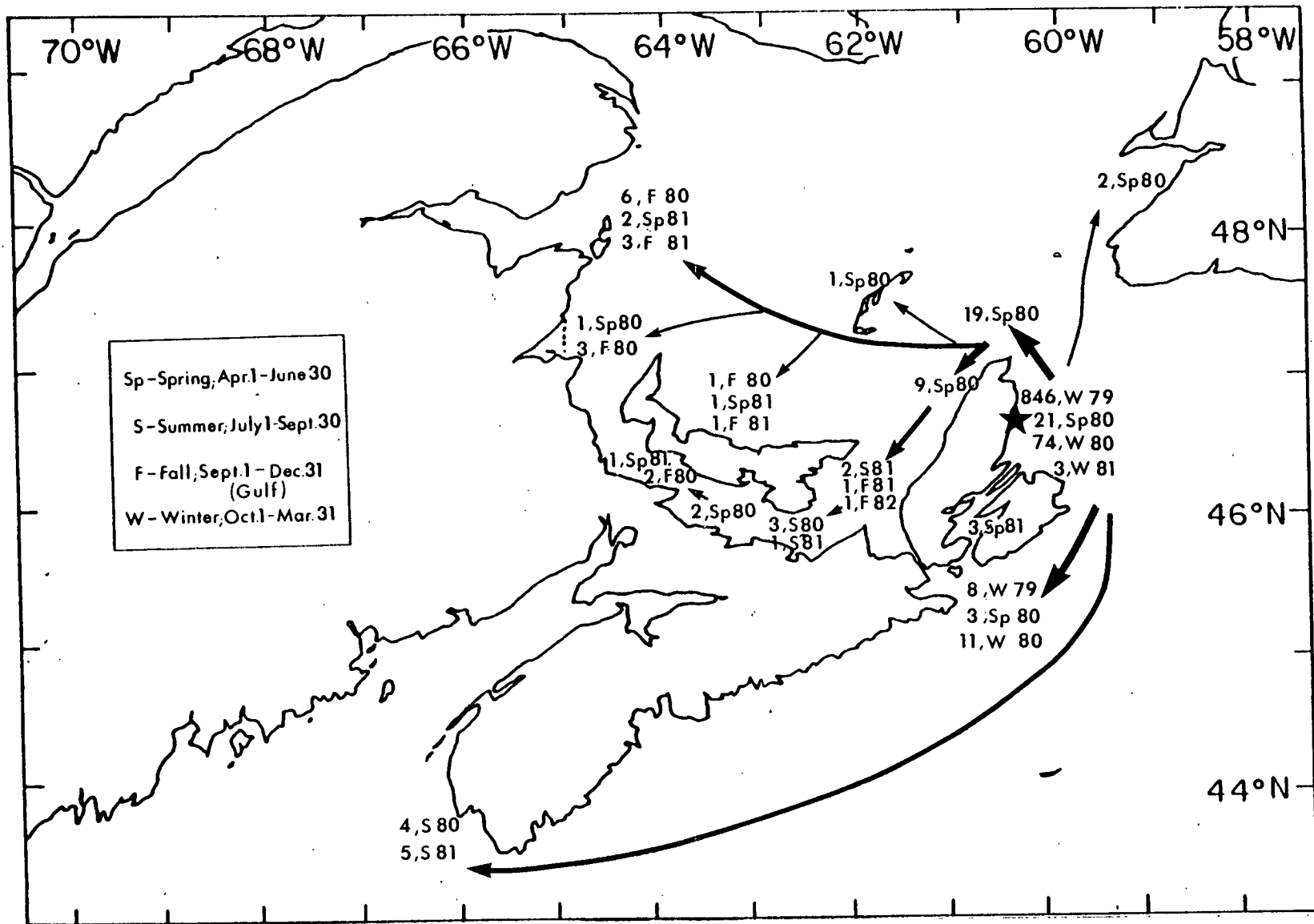


Figure 6. Recoveries from 11,101 herring tagged in 4Vn, December 10, 1979-January 7, 1980 (tagging area Ingonish-Bird Island). The total number of recoveries in various geographical areas are broken down by season by year.

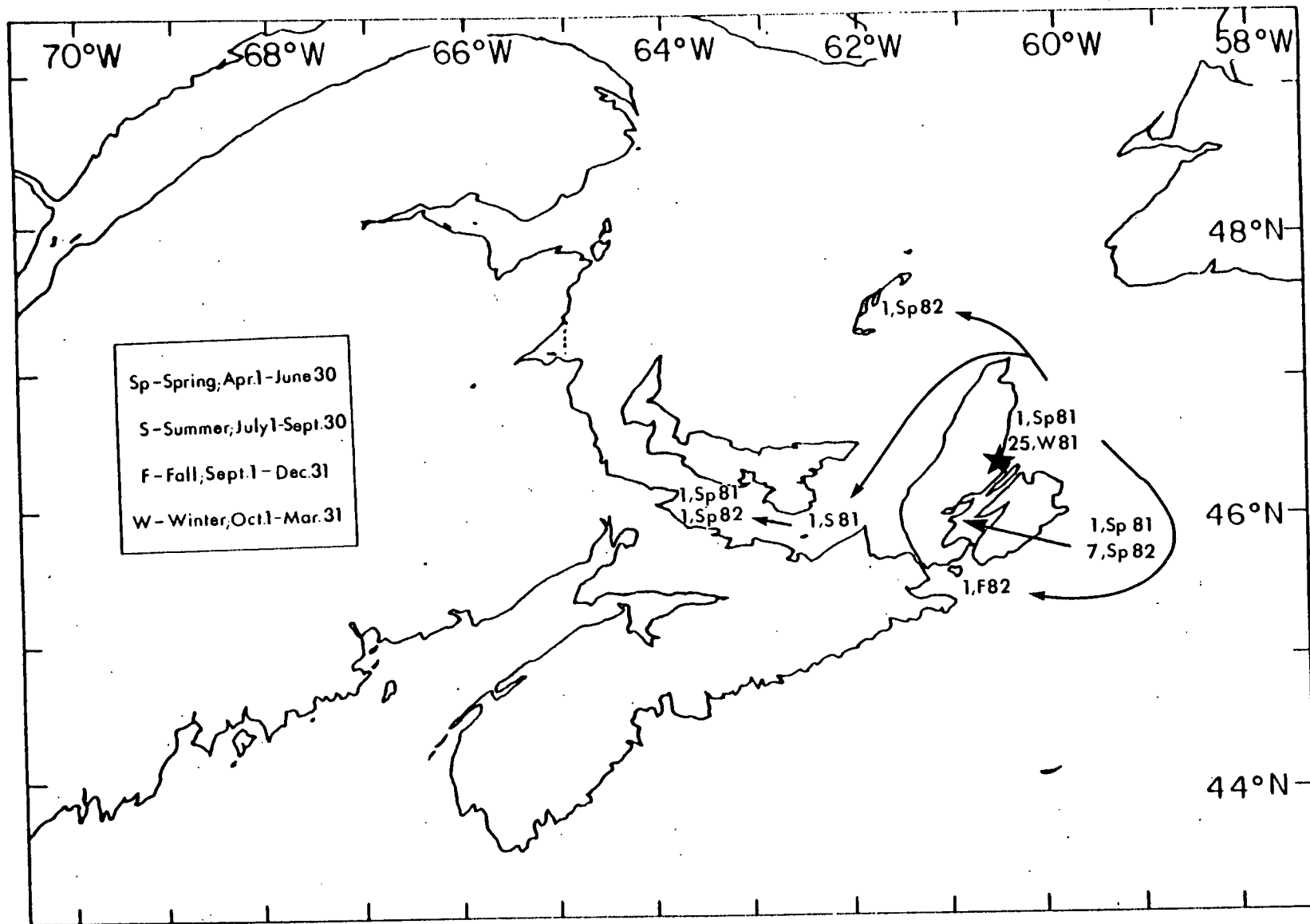


Figure 7. Recoveries from 2975 herring in 4Vn, April 14, -May 1, 1981 (tagging area St. Ann's Bay). The total number of recoveries in various geographical areas are broken down by season by year.

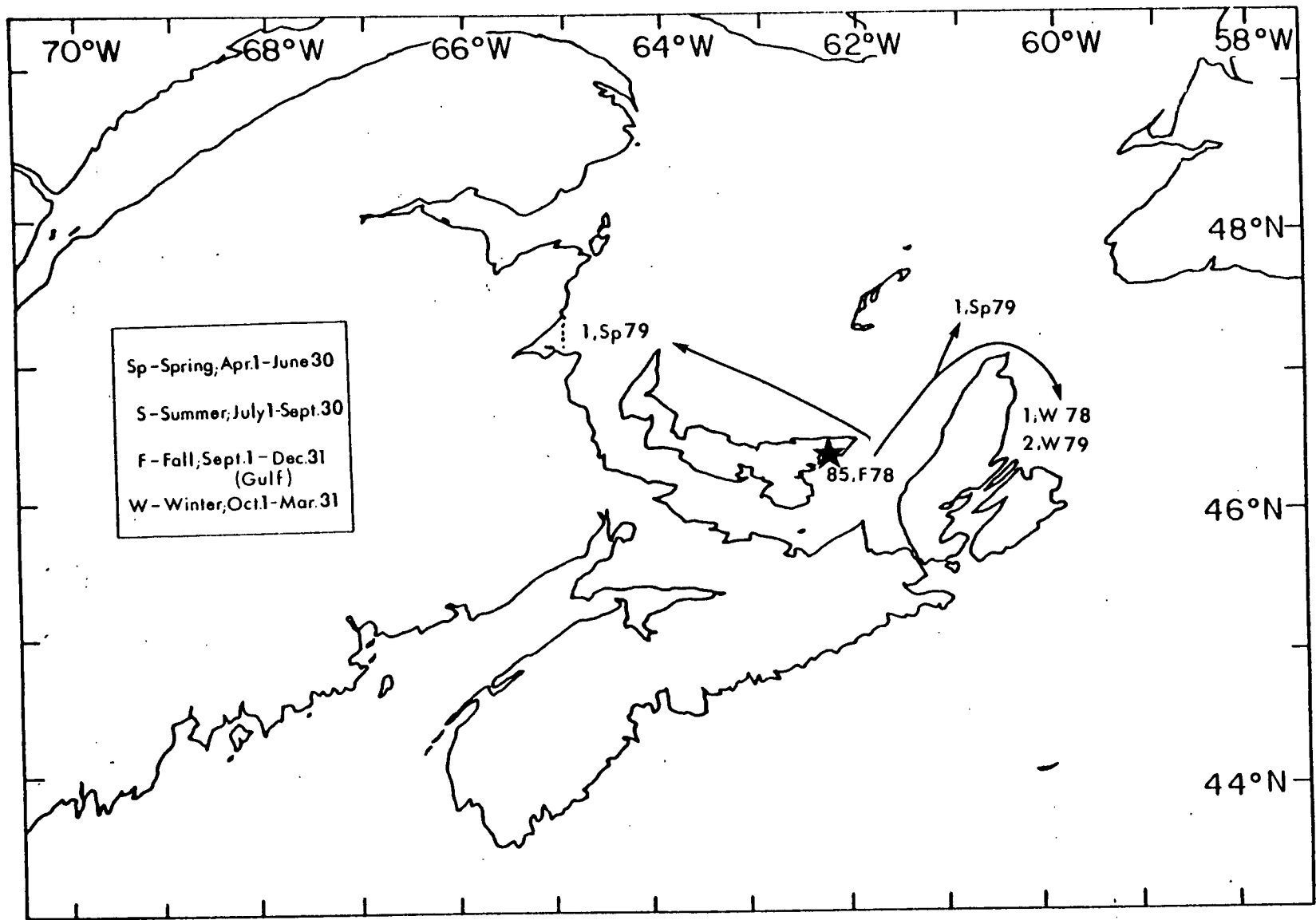


Figure 8. Recoveries from 8,000 herring tagged in Souris, P.E.I. October 1978

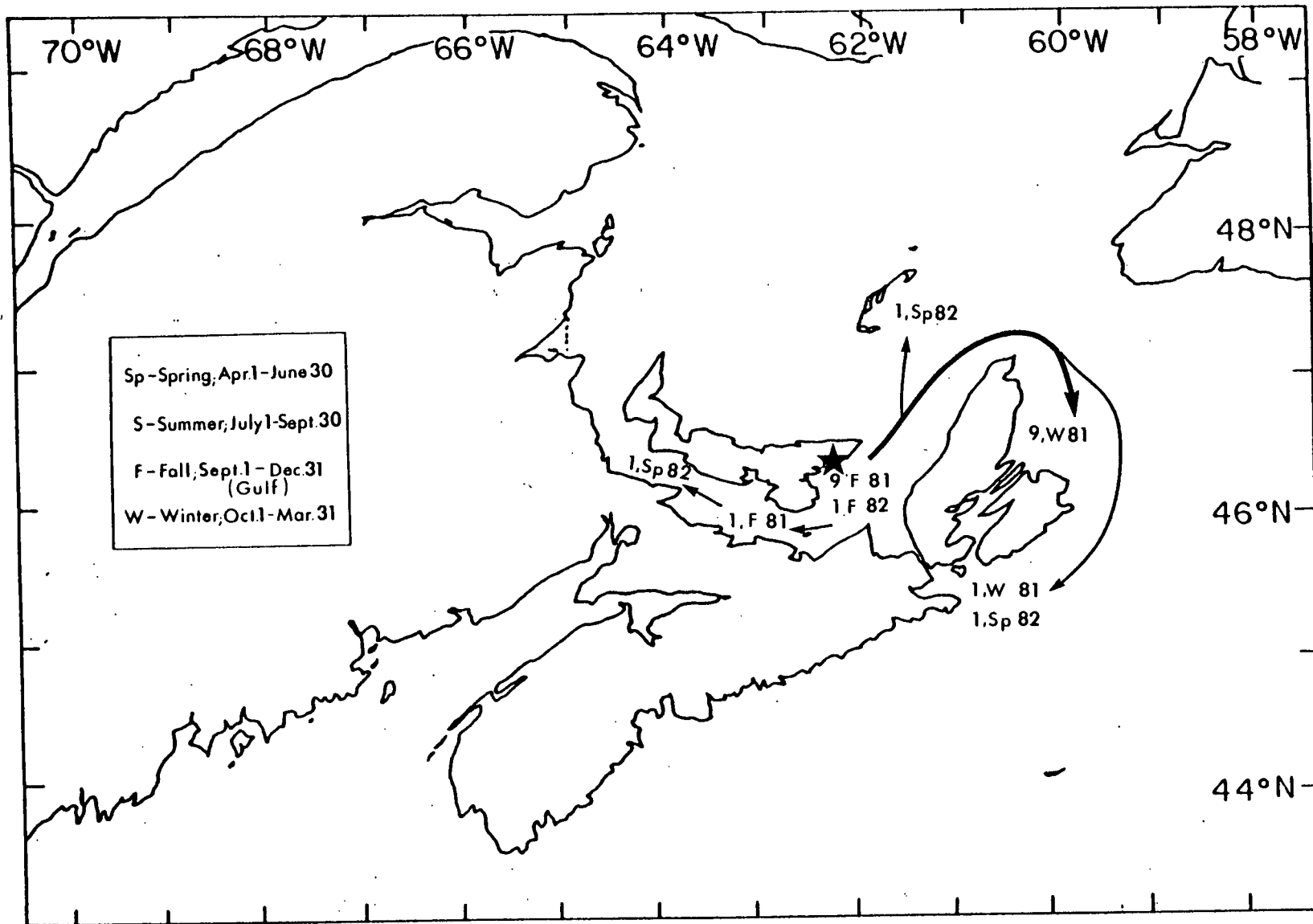


Figure 9. Recoveries from 10,298 herring tagged in Souris P.E.I. October 1981