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The 1983-84, 4Vn Herring Biological Update

by

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Abstract

The purse seine catch during the 1983-84 winter fishery was 4,029 t, up slightly from the 1982-83 value of 3,648 t. The 1983-84 TAC of 5,000 t was not reached. Commercial catch rates were up from past years, but may reflect a shift in fleet composition rather than increased stock abundance; new regulations reduced the fleet size by 72% through allocation of the purse seine fishery to Gulf-based vessels. As in recent years, the fishery was centred in the northern half of 4Vn.

Previous tagging studies have suggested that several herring stocks overwinter in 4Vn, although the fishery mainly exploits fish of 4T origin. Until the stock mixture can be quantified, the 4Vn winter fishery should be eliminated. No loss of yield should result, since the same fish would be available to summer fisheries when stock mixing is less acute.

Résumé

Au cours de l'hiver 1983-1984, les captures au filet coulissant ont été de 4 029 t, soit une légère augmentation en regard des 3 648 t de 1982-1983. Le TPA de 5 000 t pour 1983-84 n'a pas été atteint. Par rapport aux années précédentes, le taux des prises commerciales a augmenté, mais cela reflète davantage les changements survenus dans la composition de la flotte de pêche qu'une abondance accrue des stocks; l'entrée en vigueur de nouvelles réglementations a réduit de 72 % la taille de la flotte, du fait de l'attribution de la pêche au filet coulissant à des bateaux du Golfe. Comme par les années passées, la pêche s'est surtout concentrée dans la partie nord de la subdivision 4Vn.

Il ressort d'études par étiquetage antérieures que des populations de hareng passeraient l'hiver dans la subdivision 4Vn, alors que l'industrie exploite principalement les stocks provenant de la division 4T. D'ici à ce qu'on ait pu quantifier ces données, il y aurait lieu de mettre fin à la pêche d'hiver dans la subdivision 4Vn. La rendement ne risque pas d'en souffrir, puisque le même poisson pourrait être pêché pendant l'été, au moment où les populations sont moins mélangées.

Introduction

The Sydney Bight (4Vn) herring fishery has historically exploited a small fixed gear (trap and gillnet) fishery during the spring and summer. Landings were less than 500 t and sometimes included catches from the Bras d'Or Lakes. A large mobile fishery developed in 1968, consisting primarily of foreign vessels. Since 1970-71, the purse seine fishery has been primarily Canadian, operating during the late autumn and early winter months. This winter fishery has been thought to prosecute fall spawning fish (Sinclair et al. 1979); the Bras d'Or Lakes supports a fishery on spring spawning fish during April and May. No other local fishery occurs in 4Vn on spawning fish. Tagging studies have been carried out on the spring and overwintering components of 4Vn to help in determining the relationship between 4Vn and other stock components (Simon and Stobo 1983).

Catch and CPUE Trends

Canadian landings declined from 1972-73 until 1979-80 and have since stabilized around 3800 t (Table 1). The 1983-84 landings of 4029 t were slightly higher than in the 1982-83 season but did not reach the quota of 5000 t. Purse seine landings began 16 November and ended 8 January (Table 2). As in past years, a number of catch-per-unit effort indices have been estimated from purse seine logs, hail information, and delivery slips. Log records were returned for 73% of the landings, though the comparability of the data to previous years is questionable. Whereas in the past the purse seine fleet consisted primarily of Scotia-Fundy based vessels, this year only Gulf based vessels were allowed to fish in 4Vn. As a consequence only 8 vessels were active (versus 22 the year before); the effect on the fleets' performance is unknown. The catch-per-set index reached a historical high but this is probably unreasonable as no unsuccessful sets were recorded. The catch-per-night values were the highest since 1972-73 but again no unsuccessful nights' fishing were recorded. The two catch-per-successful night indices are more comparable to previous years and both show substantial increases (Table 3, Figure 2).

Geographical Distribution of Catch

The fishery was again centred in the northern half of 4Vn with almost all of the fish caught in the region between the Bird Islands and Cape Smokey (Figure 1). This continues a trend noted in Stobo and Simon (1982) that the centre of fishing activity has shifted northward over the historical period of the fishery.

Previous tagging results have suggested that herring from 4T, 4VWX, and 4Vn overwinter in Sydney Bight (Simon and Stobo 1983). However, the majority of fish found north of a line between Pt. Aconi and the 3Ps-3Pn boundary were of 4T origin. In an attempt to reduce exploitation of mixed stocks, fishing was restricted to the area north of this line (Figure 1). It should be noted however, that much of the fishery had gravitated to this region prior to the introduction of the regulatory line.

Age Composition

The number of samples taken (17) in 1983-84 was adequate to generate monthly age compositions for November, December, and January; unfortunately only 5 samples were aged. The monthly numbers and weights-at-age are given in Table 4, with the November and December figures adjusted to a November 1st birthday. Both months' numbers-at-age were very similar, with 4 and 5 year olds making up the majority of the catch while the January catch consisted of slightly younger fish (3 and 4 year olds). This pattern has been observed in previous years (Table 7).

When comparing the historical data with this year's weights-at-age some differences can be noted. The 1983-84 weights-at-age of age 2 and 3 year olds are comparable to age 3 and 4 year olds of previous years (Table 6). Upon enquiry we found that the age determination criteria were different this year (C. MacDougall per. comm.). In the past all herring in 4Vn were assumed to be fall spawners and were aged accordingly, with all fish being called age 1 after their first winter. This year up to 60% of age 2, 3, and 4 year olds were thought to have been spring spawners. The change in spawning date assignment resulted in age assignments that were 1 year less than would have been given previously, since the nucleus was no longer considered to form during the first winter. No independent evidence is available to suggest that the apparent increase in the proportion of spring spawners is real, as apposed to being an artifact of ageing differences.

Even with the ageing differences the 4+ numbers-at-age are thought to be comparable with past data (Table 5, Figure 3) since they are mostly fall spawners (C. MacDougall pers comm.). Over 70% of the catch-by-weight were 4, 5, and 6 year olds (year-classes 1978-80). The 1980 year-class is strongest while the 1976-77 year-classes are now much less dominant. Excluding the large year-classes, the long-term trend has been to catch a larger proportion of younger fish.

Discussion

The tagging studies have been reviewed in Simon and Stobo (1983). Briefly, in three winter taggings in 4Vn, the distribution of returns has varied according to tagging location. Fish tagged north of the Pt. Aconi line have tended to migrate into 4T while herring tagged east and south of the line were recovered in 4WX. Herring tagged during the winter in 4W do not move in any great numbers into 4Vn and herring tagged in 4T (Souris, PEI) during the fall were caught in 4Vn by purse seiners.

An April tagging of herring in St. Ann's Bay, just outside the Bras d'Or Lakes, resulted in fish moving into the lakes while others were caught in 4T that same spring. The majority were caught through the following winter in 4Vn. Messieh (1975) found that a May sample of St. Ann's Bay herring were evenly split between spring and fall spawners. The spring spawners were likely Bras d'Or Lake herring while the fall spawners may have been late migrating 4T fish.

Scott (1975) looked at the meristics of herring in the Maritimes and concluded that Sydney Bight fall spawners were not significantly different from eastern Gulf of St. Lawrence herring. He also stated that the Bras d'Or Lakes appeared to support a local population of spring spawning herring separate from those of all other areas.

The available information seems to confirm that "if fishing activity continues in the northern part of 4Vn it is almost certain that the 4T component will be exploited" (Simon and Stobo 1983). With the Pt. Aconi line restricting fishing to the northern half of 4Vn it is likely that the 4T component (probably herring from the eastern Gulf of St. Lawrence) is the only outside stock involved. The level of local stock exploitation is unknown at this time. Landings from the Bras d'Or Lakes have been decreasing over the last few years but whether this is due to the winter purse seine fishery or increased gillnet activity in the lakes is unknown.

On the basis of biological considerations, there should be no overwintering fishery in 4Vn, since this would result in no loss of yield to the overall herring fishery; the components which overwinter in 4Vn would be available at other times of the year (Sinclair et al. 1981). Should there continue to be a 4Vn fishery it is probable that the 4T component would be exploited. Since the stock mixture in 4Vn has not yet been quantified, effort should be expended towards this goal. At present, herring catches in 4Vn are not incorporated into any other stock assessment, and may therefore be underestimating removals of 4T herring.

References

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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	83-84
Can. Fixed Gear	492	407	252	91	296	235	225	74	142	162	116	212	226	74	120	310	327	261	328	248	342	-
Can. Mobile Gear	-	-	-	-	-	2	2044	5335	2917	10681	17537	16285	14297	5546	12831	7078	3332	2865	3952	3552	3648	4029
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	4029
TAC																11000	8000	3000	4500	3000	3000	5000

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

	1982		1 9 8 3										1984		
	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan
Purse Seine	267	3381											2013	1842	174
Inshore Gear															
Traps						20	229								
Drift Gillnets						7	9	8							
Set Gillnets						36	33								

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
83-84	73.1	85.7	73.1	46.3

¹ From log information only

² From hauls, delivery notes and log information

³ From previous assessment

Table 4. 4Vn herring numbers-at-age ($\times 10^{-3}$) and weight-at-age for the 1983-84 purse seine fishery*.

	1	2	3	4	5	6	7	8	9	10	11+	Total
November												
Number	-	60	961	2574	2788	1650	787	341	167	17	31	9376
Average Weight	-	109	155	180	217	247	267	289	340	342	391	215
December												
Number	-	80	1101	2752	2118	1500	738	288	112	5	49	8743
Average Weight	-	111	154	180	217	248	268	285	332	342	373	211
January												
Number	-	49	201	358	172	88	34	20	8	-	6	936
Average Weight	-	102	146	178	213	231	268	297	316	-	382	187
Total												
Number	-	189	2263	5684	5078	3238	1559	649	287	22	86	19055
Avg. Weight	-	108	153	180	217	247	267	287	336	342	380	212
% Numbers	0	1	11.9	29.8	26.7	17.0	8.2	3.4	1.5	1	1	
% Weight	0	1	8.6	25.4	27.3	19.9	10.3	4.6	2.4	1	1	

* Fish aged as if birthday on November 1st.

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	83-84
1	0	0	0	0	0	0	0	0	0	0	0
2	43	116	1	0	0	0	0	43	104	82	189
3	3798	5116	671	16	7	26	3172	518	945	2308	2263
4	43737	4156	1544	2986	110	441	3427	3791	1965	2733	5684
5	14264	33189	1848	5103	2377	1413	1671	3946	7192	3359	5078
6	4435	6430	7846	4136	2800	1443	741	1060	2982	5722	3238
7	2955	2417	2571	17602	1442	878	1004	645	844	1798	1559
8	3176	2304	1123	8379	7622	847	607	614	-	816	649
9	2841	2242	892	3401	4056	1701	873	717	77	37	287
10	3842	2842	1006	2431	1202	1838	879	1192	77	15	22
11+	4969	5401	3461	5451	3098	1915	750	2688	893	150	86
TOTAL	84060	64213	20963	49505	22714	10502	13134	15214	15079	17020	19055
TONNES	16863	14354	5734	12831	7078	3332	2865	3952	3552	3648	4029

* 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	83-84
1	-	-	-	-	-	-	-	-	-	-	-
2	34	52	41	-	-	-	-	36	16	-	108
3	85	102	93	105	110	120	103	104	113	107	153
4	162	145	157	141	175	189	152	146	182	167	180
5	182	203	203	187	220	211	207	201	217	207	217
6	218	235	249	219	245	258	255	252	264	247	247
7	251	256	273	256	272	289	289	267	310	280	267
8	302	287	292	275	308	302	324	332	-	307	287
9	325	314	332	295	346	338	366	361	375	362	336
10	350	334	361	319	377	376	400	395	375	391	342

* Birthday November 1

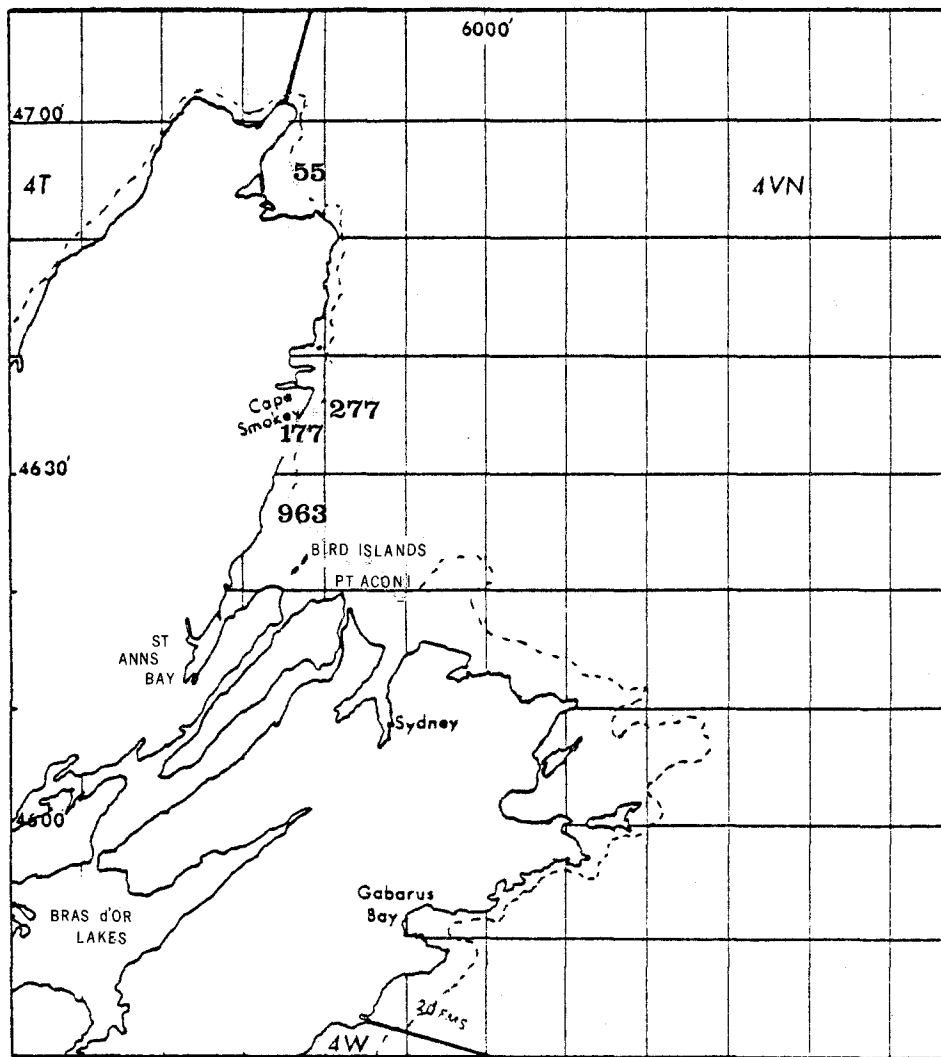
Table 7. Comparison of 4Vn herring monthly age composition and average weights-at-age for November 1980 - January 1984.

	A G E*											Total
	1	2	3	4	5	6	7	8	9	10	11+	
<u>November 1980</u>												
Age Composition	0	0	76	784	429	132	122	242	328	604	959	3676
Average Weight	-	-	111.46	141.16	219.00	292.01	299.58	350.79	381.76	403.48	428.87	313.51
Average Length	-	-	24.59	26.47	30.49	33.50	33.77	35.53	36.51	37.12	37.89	33.61
<u>December 1980</u>												
Age Composition	0	0	126	2172	2655	755	479	372	384	502	1725	9170
Average Weight	-	-	112.40	153.69	205.04	244.85	286.65	319.58	343.55	391.68	432.58	262.69
Average Length	-	-	24.46	27.03	29.64	31.40	33.04	34.23	35.00	36.53	37.73	31.58
<u>January 1981</u>												
Age Composition	0	43	260	788	862	173	44	0	5	86	0	2261
Average Weight	-	35.77	98.89	131.75	180.52	250.79	0.00	0.00	381.70	351.29	-	164.45
Average Length	-	17.03	23.73	26.01	28.91	32.23	0.00	0.00	37.00	36.00	-	27.59
<u>November 1981</u>												
Age Composition	0	77	698	1451	5311	2202	623	0	57	57	660	11136
Average Weight	-	16.46	112.76	182.28	217.16	264.21	310.20	0.00	374.50	374.50	453.34	235.58
Average Length	-	13.00	24.18	28.23	29.87	31.82	33.51	0.00	35.61	35.61	37.87	30.31
<u>November 1982</u>												
Age Composition	0	0	49	188	244	439	209	40	11	8	21	1209
Average Weight	-	-	100.65	149.20	191.65	232.78	266.44	316.70	405.95	376.86	428.69	220.88
Average Length	Unavailable											
<u>December 1982</u>												
Age Composition	0	82	2269	2545	3115	5283	1589	776	26	7	129	15821
Average Weight	-	-	106.76	168.55	207.94	248.29	281.74	306.60	343.12	407.04	391.30	213.84
Average Length	Unavailable											

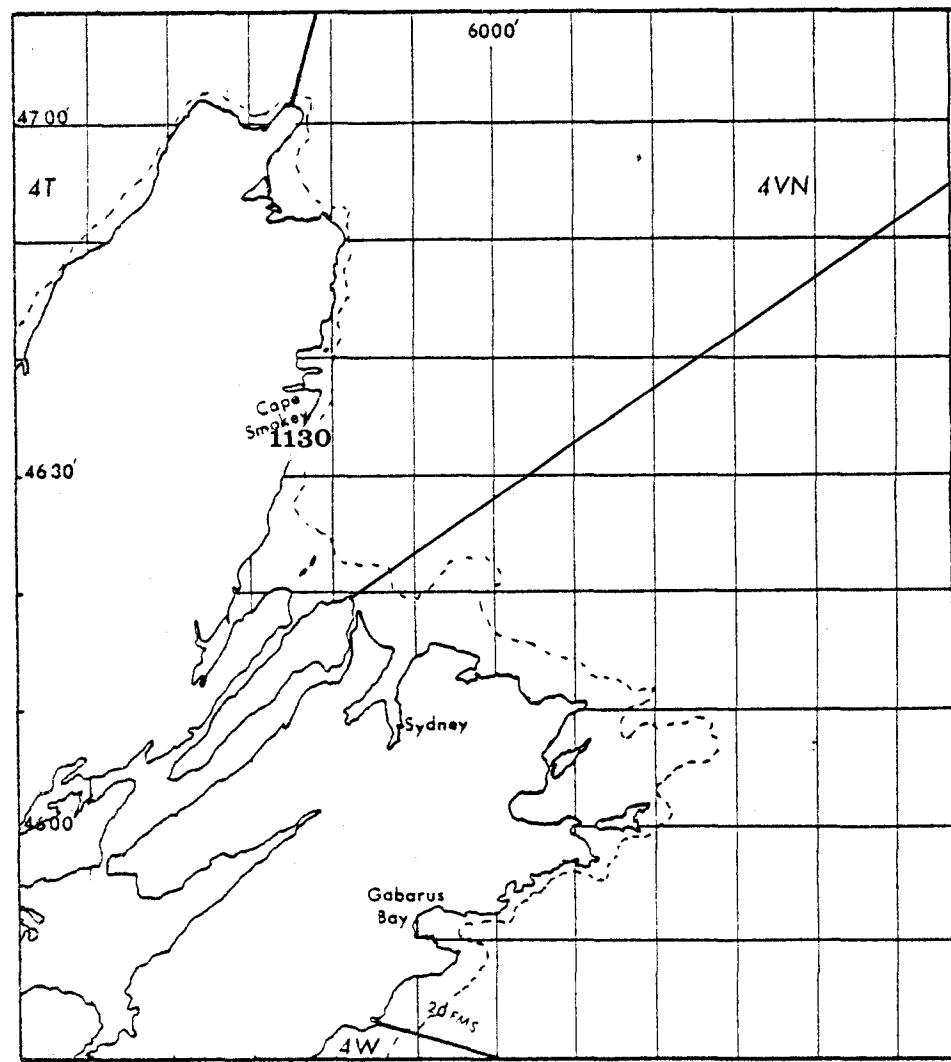
Table 7. (Continued)

	A G E*											Total
	1	2	3	4	5	6	7	8	9	10	11+	
<u>November 1983</u>												
Age Composition	0	60	961	2574	2788	1650	787	341	167	17	31	9376
Average Weight	-	108.53	155.22	179.74	216.78	247.23	267.24	288.91	340.41	342.39	391.41	214.72
Average Length	-	23.85	27.19	28.74	30.80	32.29	33.28	34.25	36.38	36.50	38.34	30.54
<u>December 1983</u>												
Age Composition	0	80	1101	2752	2118	1500	738	288	112	5	49	8743
Average Weight	-	110.92	153.97	179.77	217.08	247.76	267.62	285.48	331.85	342.39	373.49	210.70
Average Length	-	24.04	27.10	28.74	30.82	32.31	33.30	34.10	36.04	36.50	37.69	30.31
<u>January 1984</u>												
Age Composition	0	49	201	358	172	88	34	20	8	0	6	936
Average Weight	-	102.32	146.20	177.68	213.27	231.31	268.22	296.93	315.82	0.00	381.77	186.23
Average Length	-	23.32	26.56	28.62	30.62	31.32	33.32	34.60	35.42	0.00	38.00	28.86

*Birthday November 1

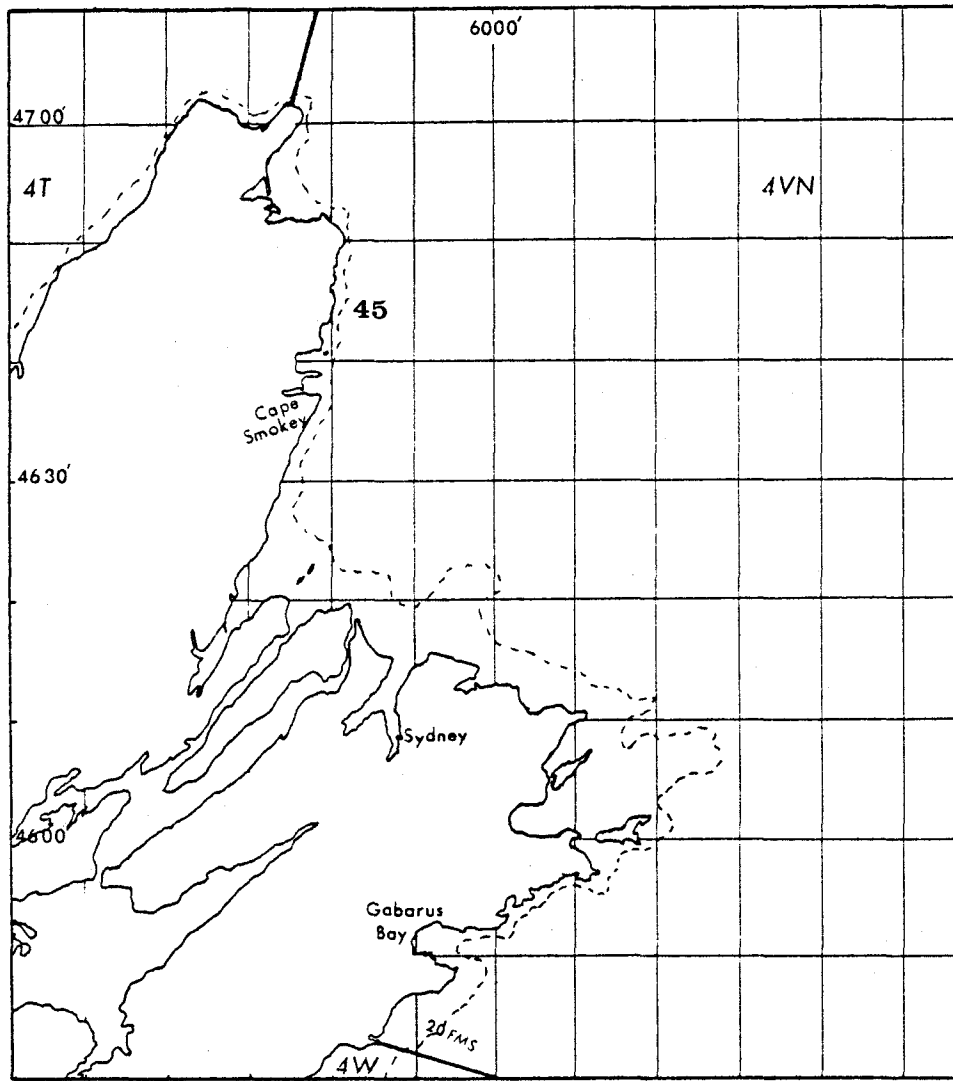


NOVEMBER



DECEMBER

Figure 1. Monthly purse seine catch (t) distribution from log books for 1983.



JANUARY

Figure 1. (Continued)

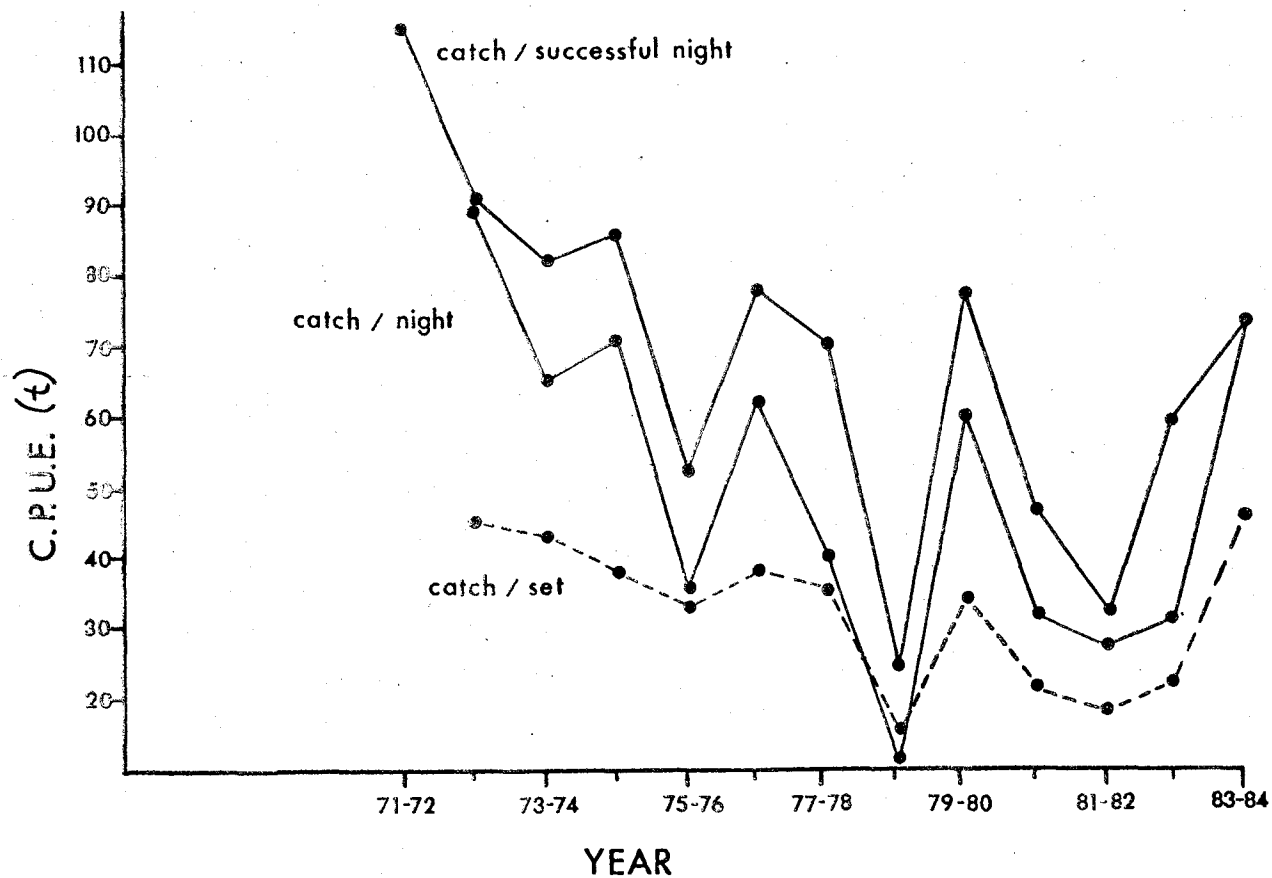
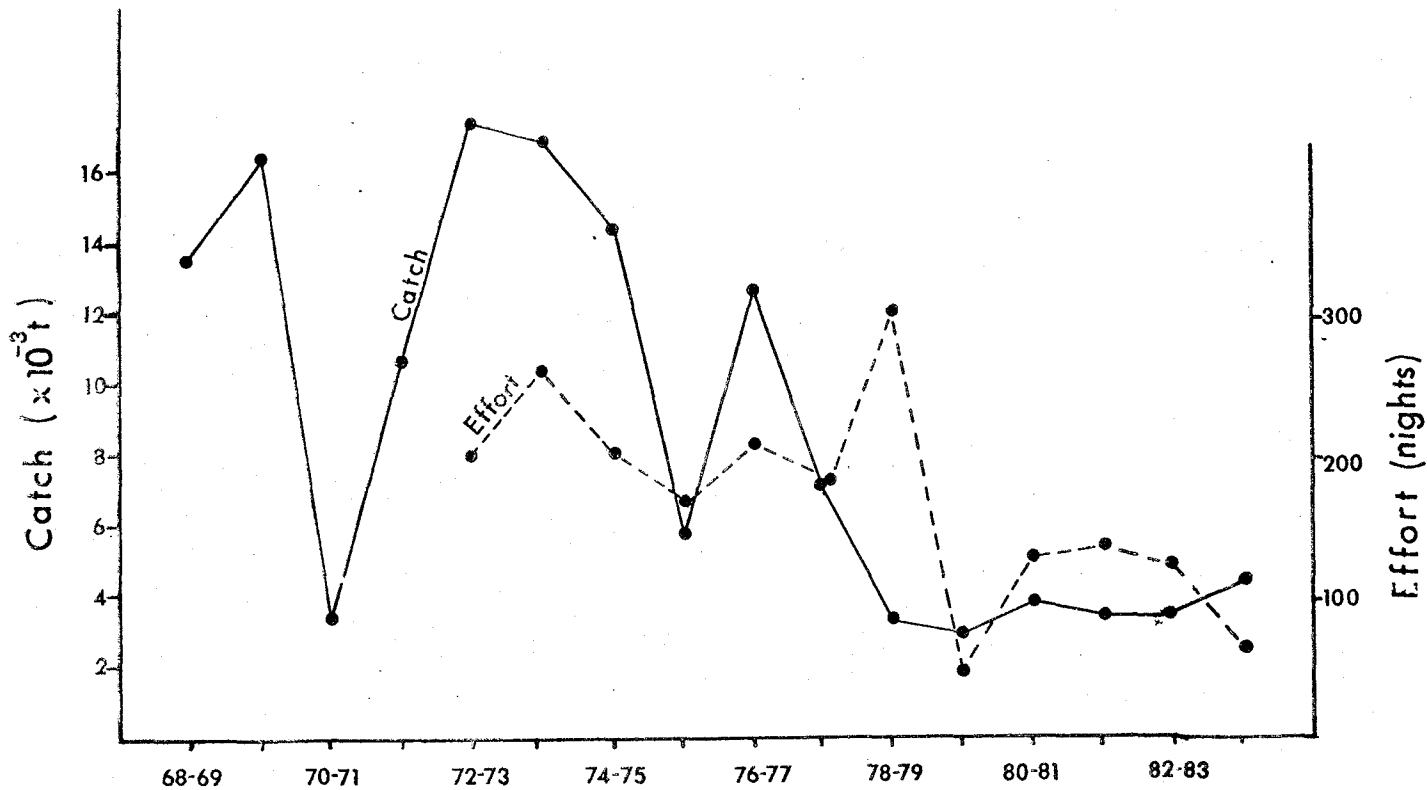


Figure 2. Distribution of catch, effort, and CPUE for the 4Vn purse seine fishery. Effort is the catch divided by catch/night.

Percentage of Total Catch in Numbers

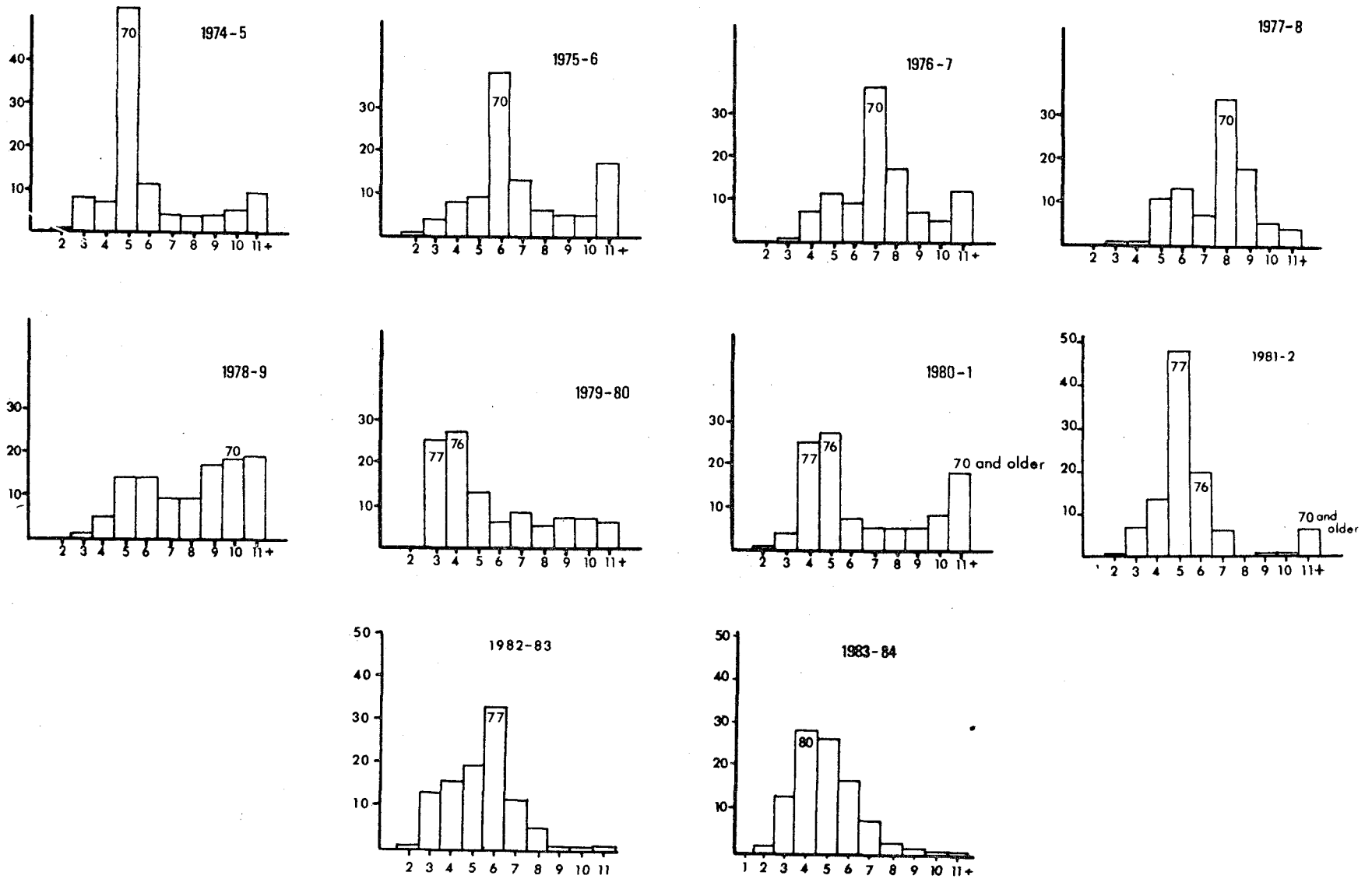


Figure 3. Historical age composition by percent for the 4Vn herring fishery, 1974-75 to 1983-84.