



**AN ROINN TALMHAIOCHTA AGUS IASCAIGH**  
**(Department of Agriculture and Fisheries)**

**FISHERY LEAFLET No.20.**

**HERRING INVESTIGATIONS ON THE NORTH**

**- WEST COAST 1969 and 1970.**

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**by**

**T. D. KENNEDY.**

Herring Investigations on the North-West Coast, 1969 and 1970.

Although the main herring fishery off the North-West coast of Ireland now takes place from October to late January or early February, considerable quantities of herring are also landed throughout the remainder of the year. This report is thus divided into two sections, one dealing with the period March to September, 1969 (the off season) and the other dealing with the period October, 1969 to February, 1970 (the main season).

March to September, 1969.

LANDINGS. From March to September, 1969 approximately 7,600 crans of herrings were landed at Killybegs by boats using bottom trawls. The main areas fished were from 15 to 20 miles off the Stags of Broadhaven and in Donegal Bay between Carrigan Head and Dawros Head.

SCIENTIFIC INVESTIGATIONS. The results of the 1968/69 herring investigation programme (Molloy and Kennedy, 1969) indicated that the main fishery in the area is based on an autumn spawning component, although smaller numbers of winter spawning herrings were present in the catches. It was accordingly decided to continue sampling, although on a less extensive basis, throughout the year for the following purposes:-

- (1) To determine the relationship of spring and summer herrings to those located during the main winter season;
- (2) To study growth and development during the spring and summer period;
- (3) To study the age composition and the abundance of potential recruits to the adult fishery and
- (4) To collect information on the quality of these spring and summer herrings.

The herrings landed were, generally, the by-catch from the white fish fishery and, while the results obtained from examination of such samples may not give a complete picture of the main herring stock, they do provide sufficiently accurate data to enable certain conclusions to be reached. During the period March to September, 1969 a total of 1,992 fish from this area were investigated in samples of approximately 100 each.

Each fish was examined in the usual way for length, sex, maturity, vertebral counts and age. In addition each sample was weighed to ascertain the number of fish per kilogram. The percentage fat content was also estimated from fillets.

During the 1968/69 winter herring season the age distribution, as determined by otolith readings, was dominated by five-year-old fish. While this pattern was continued during the spring and summer of 1969, the overall percentage of five-year-olds dropped somewhat - from 72% to 63%. By the end of May, 1969, the summer's growth on the edge of the otoliths was sufficient to enable the winter zone to be clearly seen, indicating that each fish had, by that time, moved to the next age group. The percentage monthly age distributions, shown in Table 1, were very similar throughout the whole period. Observation also showed little evidence of young potential recruits entering the fishery in any appreciable quantity. This would suggest that recruitment to the main adult fishery had not been good. It should be noted that recruitment has been very poor since the 1966/67 season. It is, of course, possible that young herrings were not taken because of the particular areas in which the boats fished, but the fact that they were not present in the samples as late as September would indicate that they were poorly represented.

The small number of fish in the age groups other than the six-year-olds made it difficult to determine with any degree of accuracy the rate of growth during the period. In the case of the six-year-old fish, however, an increase of 0.73 cm in length was observed.

Maturity stages. Spent (stage VII) and recovering spent (stage VIII) fish were the most prominent in the 1968/69 winter herring catch (Molloy and Kennedy, 1969). Stage VIII fish remained dominant from March to May, but in June and July the gonads changed fairly rapidly through stages III and IV (filling) and by August and September the majority of fish had reached stages IV and V (full). The percentage maturity distribution is shown in Table 2.

Vertebral counts. The two characteristics used in defining the stock were the maturity stages and vertebral counts. The maturity stages indicated a stock which would spawn sometime in October and would, therefore, below

to an autumn spawning component. The low vertebral count per age class per maturity stage also indicated an autumn spawning component. There was no evidence to suggest the intermingling of any other component with the adult stocks during this period, although one sample of small fish examined during July had a vertebral count of 56.74, which could be considered to be an intermediate count, i.e. containing both autumn and winter spawning fish. Apart from this the average vertebral counts were exactly the same as those during the main winter season.

Fat content and number per kilo. As expected, the fat content which had remained low during the winter months, showed little increase until after March. From April onwards, however, it rose rapidly and reached a peak during June and July. From August to September the fat content fell considerably as the fish approached spawning. The number of fish per kilogram showed the expected decrease throughout the period as the individual fish increased both in size and maturity. The fat content and number per kilogram are shown in Table 3.

October, 1969, - February, 1970.

LANDINGS. The main herring season began off the Donegal, Sligo and North Mayo coasts in October, 1969 and continued until early February, 1970. A total of 50,003 crans was landed during the season compared with 63,821 crans during the 1968/69 season. Most of the landings were made at Killybegs, but substantial quantities were also landed at Sligo and Burtonport. Monthly landings in crans for each port were as follows:-

	Month	Killybegs	Sligo.	Burtonport	Others	Total.
	October	1,665	-	-	-	
	November	9,171	16,000	2,022	-	
	December	7,178	Combined figure for November-January period.	4,347	-	
	January	6,478		2,002	-	
	February	1,001		139	-	
1969/70	TOTAL	25,493	16,000	8,510	-	50,003
1968/69	TOTAL	33,503	20,079	9,341	898	63,821

Landings at all ports were lower than those of the 1968/69 season. This was due mainly to unsuitable weather in the Stags of Broadhaven area where herrings are usually caught in large quantities. In addition, several of the larger boats went herring fishing off the south coast in mid-November; thus the fleet was considerably smaller than in the previous season. During December and January small landings of herrings were made at Galway by one boat using a single mid-water trawl. The skipper of the boat reported that good markings had been recorded during the period.

Gear and catch effort: Five pairs of boats using Larsen mid-water trawls and six boats using single bottom trawls took part in the fishery. Small landings were also made by boats using ring nets. Most of the Sligo landings were made by boats using bottom trawls. Paired mid-water gear was responsible for 96% of the landings at Burtonport and 72% at Killybegs. The catch in crans for each type of gear was as follows:-

	Killybegs	Burtonport	Sligo.
Bottom trawl	4,923	1,301	16,000
Ring net	1,359	-	-
Paired mid-water trawl	18,348	7,209	-

The average catch per landing, also in crans, was:-

	Killybegs	Burtonport	Killybegs 1968/69
Bottom Trawl	40	-	50
Ring net	194	-	102
Paired mid-water trawl	89	139	161

A considerable drop in catch per effort was noticed. It was felt that this was caused, not by a lesser abundance of herrings, but by bad weather which prevented boats from fishing the Stags of Broadhaven area.

Location and extent of fishery. In general the fishing was confined to St. John's Point - Carrigan Head areas. There were, however, landings from the Stags of Broadhaven and Rossbeg grounds as weather permitted. From November to early January fishing also took place off Sligo Harbour.

Disposal of catch: During the season approximately 11,300 crans or 17.7% of

total catch were used for reduction to fishmeal and fish oil. A further 41.4% was exported as "rough packs" to the continent. The remaining quantities were consumed for the fresh market at home and in Britain and small quantities were used for kippering. The average price per cran for the three ports was:

Killybegs	=	83/6
Sligo	=	65/-
Burtonport	=	84/-

The value of all herrings landed during this period was £194,175 with an average price per cran of 78/-. This compared with a total value of £197,486 and an average price of 62/- for the 1968/69 season. These prices do not include herrings sold for fishmeal.

**SCIENTIFIC INVESTIGATIONS:** Scientific investigations began in October and continued throughout the season. Most of the herrings were examined at Killybegs, but samples were also examined at Galway, Sligo and Burtonport.

The aims of these investigations are:

- (1) To distinguish the various races of herring that frequent the areas;
- (2) To observe the effects of fishing on these races, and
- (3) To estimate an economic yield for the fishery.

During the season 3,542 fish were examined in a similar manner to those during the March to September period. The presence of a parasitic nematode worm anasakis sp. was noted. The numbers of herrings per kilogram and the fat content are shown in Table 3.

Three separate races of herrings were distinguished in the course of the main season. In addition to the autumn and winter spawning races already mentioned, a spring spawning race appeared in the catches during January and February. This race had not been evident in samples in recent seasons but had been detected by Bracken (1963). As in the previous period of the investigations, the autumn spawning stock dominated the main catches from October to February. This race, which spawned sometime in late September or early October, remained in the area as spents and recovering spents. In November a winter spawning race appeared in the catches. Most of these were taken from the Rossbeg area, but smaller amounts were taken mixed with the autumn spawning stock from areas as far south as the Stags of Broadhaven.

These fish were present as full fish during November and December, spawned during January and continued to be taken as spents during late January and February. The spring spawning race appeared for the first time in February as full fish and had not completed spawning by the time the season closed. The presence of these three separate races makes an appraisal of this fishery very difficult. The three races have different characteristics such as growth rates, vertebral counts, maturity stages, which make their identification possible.

Age and length: In the autumn spawning component the six-year-old fish (1964 year class) were again dominant, but the percentage had dropped from 73.8% to 57.4%. The four-year old fish (1966 year class) again constituted 12% of the total catch, but the three-year old fish (1967 year class) rose from 1% to 12% of the catch. The 1964 year class should still continue to be the largest single group as the numbers of young or recruit fish entering the adult shoals remain low. The winter spawning component was more evenly distributed throughout the age groups, although the six-year old fish were again the largest group present. Similarly, the spring spawning component was distributed over a wide range of age groups, with the eight-year fish the largest group. Both the winter and spring components are faster growing than the autumn component. The percentage age composition for each race was as follows:-

Race	Age in years									
	2	3	4	5	6	7	8	9	10.	10+
% Distribution of each race										
Autumn	0.9	11.8	11.6	3.4	57.4	6.5	3.2	1.8	0.6	2.8
Winter	0.7	14.0	14.9	10.5	24.3	6.9	12.4	4.3	1.6	10.3
Spring	-	7.3	10.6	10.9	14.6	9.4	24.6	9.4	0.9	12.4

Maturity Stages: The bulk of the autumn component was in stages VII (spent) and VIII (recovering spent). Full fish (Stages IV - VI) constituted less than 4% of the autumn component. Most (70%) of the winter component were in Stages VII and VIII, while the remaining 30% were in Stages IV - VI. In the spring

component all fish were in the maturity range IV - VI. The fact that very few Stage VI (running) fish of any race are taken indicates that boats do not fish the actual spawning concentrations. Location of those spawning grounds could lead to a more intense fishery in this area. The percentage maturity distribution per month for each race is shown in Table 2.

Vertebral counts: As already indicated vertebral counts are used as a method of separating races. Spring spawning fish have a higher vertebral count than winter spawning fish which, in turn, have a higher vertebral count than the autumn component. This can be seen by comparing the average vertebral counts as follows:-

Autumn component	=	56.56
Winter component	=	56.85
Spring component	=	57.01

To demonstrate further the difference in growth and vertebral counts the results for the six-year fish from each component were estimated as follows:-

	<u>Length</u>	<u>Vertebral Count</u>
Autumn component	28.40 cm	56.51
Winter component	29.55 cm	56.70
Spring component	30.36 cm	56.88

Fat Content: Regular samples were sent for analysis during the season. These samples included herrings caught at Rossbeg which were treated independently of herring caught elsewhere. For comparison purposes all fat results from March, 1969 to February, 1970 have been placed in Table 3.

Based on the samples examined at Galway the herrings landed there appear to be similar to the autumn spawning component fished on the north-west coast.

Conclusion: The following facts emerged from the two sampling programmes.

- (1) Herrings landed from March to September belong to the same autumn spawning race caught during the October - February period
- (2) The quantity and quality of herrings available during the summer months would merit a more intensive effort;
- (3) Three races of herrings were identified during the October - February



investigations, viz.

- (i) An autumn spawning component;
- (ii) A winter spawning component and
- (iii) A spring spawning component.

The autumn spawning component is the most important. It is composed mainly of six-year old fish. Recruitment during the last three years has been very poor;

- (4) Neither the winter spawning nor spring spawning races are intensively fished at present.

Acknowledgement: The author gratefully acknowledges the assistance of skippers and others who supplied data for this paper. He also wishes to thank Messrs. Killybegs Sea Foods, Ltd.; Messrs. Marinpro, Ltd., Burtonport; Messrs. Sligo Sea Food Marketing Company and Messrs. Galway Bay Sea Foods, Ltd. for the facilities kindly afforded him at their respective premises.

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Table 1. Percentage age distribution per month.

Month	Age in years										
	1	2	3	4	5	6	7	8	9	10	10+
March	-	2.00	18.00	5.00	43.00	9.00	7.00	4.00	3.00	5.00	4.00
April	-	0.75	16.88	2.52	68.03	4.79	4.28	1.00	1.00	-	0.75
May	0.20	11.24	14.46	1.81	64.86	3.21	0.80	1.21	0.40	0.60	1.21
June	-	-	6.53	24.12	2.51	65.33	1.01	0.50	-	-	-
July	-	18.05	16.54	14.29	3.26	45.86	1.75	-	-	-	0.25
August	-	0.67	15.72	20.74	2.68	57.86	1.00	0.33	0.67	0.33	-
September	-	-	5.00	16.00	2.00	74.00	1.00	1.00	-	-	1.00
October	-	-	17.10	18.60	3.50	56.80	3.00	1.00	-	-	-
November	-	1.20	10.70	8.90	4.40	60.80	7.40	2.80	2.10	0.50	1.20
December	-	0.40	9.70	11.20	2.90	61.70	6.70	2.60	1.60	0.40	2.80
January	-	-	14.19	11.40	1.94	58.49	8.60	1.72	1.94	0.86	0.86
February	-	3.01	12.04	15.72	4.35	36.79	2.34	9.70	2.34	1.67	12.04

Table 2. Percentage maturity stages per month.

Maturity stage	March	April	May	June	July	August	September
(Immature) II	2.00	0.50	1.21	0.50	21.80	1.00	-
Filling { III	-	-	7.43	44.72	31.83	4.01	1.00
IV	-	-	-	1.00	33.33	74.92	38.00
Full V	-	-	0.20	-	8.02	19.73	61.00
Mazy VI	-	0.50	-	-	-	-	-
Spent VII	3.00	-	-	-	-	-	-
Recovering Spent VIII	95.00	99.00	91.16	53.78	5.02	0.33	-

Table 3. Mean percentage fat content and numbers per kilo.

Month	Area.	Condition.	Range of fat content	Average fat content	No. per kilo
March	Killybegs	Recovering Spent	2.48- 2.52	2.50	7.1
April	"	"	3.96- 7.80	4.80	6.9
May	"	"	7.34-17.56	10.80	6.5
June	"	Filling	19.70-24.66	22.20	5.9
July	"	"	19.17-23.44	20.70	5.9
August	"	Full	14.64-19.81	17.40	4.8
September	"	"	11.90-13.52	12.70	4.6
October	Rossbeg	"	-	11.53	5.4
October	Killybegs	Spent	7.44- 8.06	7.75	5.8
November	Rossbeg	Full	-	16.10	4.9
November	"	Spent	-	8.90	7.1
November	Killybegs	"	6.06-10.00	7.69	6.3
December	Killybegs	Spent	2.77- 6.08	4.82	6.6
December	Rossbeg	Full	-	12.04	5.3
December	"	Spent	-	7.87	7.4
January	Killybegs	Spent	2.50- 5.26	4.24	7.2
January	Rossbeg	Full	8.60-10.70	9.65	4.4
January	"	Spent	5.70- 5.90	5.80	5.4
February	Killybegs	Spent	-	2.70	6.5
February	Rossbeg	Full	8.10- 8.30	8.20	4.2
February	"	Spent	6.20- 8.10	6.83	6.2