

This paper not to be cited without prior reference to the author.

International Council for the
Exploration of the Sea

CM 68/H:14
Pelagic Fish (Northern) Committee

Herring Investigations on the Southwest Coast of Ireland, 1967.

by

John P. Molloy.

INTRODUCTION: Landings of herrings along the southwest coast have been generally sporadic over the last few years and to date a proper herring fishery has not developed. Herrings have been landed at numerous ports along that portion of the coast extending from Schull to Brandon Bay and the annual landings since 1958 from that portion of the south-west coast have been as follows:-

1958	-	4,300 cwts.	1963	-	14,820 cwts.
1959	-	5,488 "	1964	-	3,567 "
1960	-	3,200 "	1965	-	7,727 "
1961	-	3,902 "	1966	-	8,704 "
1962	-	3,399 "	1967	-	23,972 "

The ports where the main landings occurred were:- Schull, Bantry, Kilocrohane, Castletownbere, Sneem and Dingle. Most herrings were landed during the months of September to January and were taken, prior to 1966, by small boats using drift nets. In the summer of 1966, however, extensive traces, thought to be of herrings, were reported by boats in Bantry Bay but for various reasons no herring fishing was undertaken. In December, 1966, again boats returning from Dunmore East to Castletownbere for Christmas located good markings in Bantry Bay. Subsequently, using mid-water gear, good catches of up to 200 crans of spent herrings were taken before the boats returned to Dunmore East. When the 1966/67 Dunmore East season ended, boats again caught quantities of herrings off Castletownbere before bad weather and lack of outlet markets prevented any further fishing and the boats reverted to trawling for white fish. However, the herring catches in the winter of 1966/67 encouraged fishermen to resume herring fishing in August, 1967. Four pairs of boats using paired mid-water gear commenced fishing in the middle of August and continued until late October. They met with a fair amount of success although landings were restricted due to lack of markets, bad weather, the presence, particularly in the earlier part of the fishing, of large amounts of small herrings, mackerel and pilchards and the fact that some landings contained herrings with "blackgut" which rendered them unsuitable both for freshing and for processing. "Blackgut" is caused by the presence in the gut

of tiny hard-shelled molluscs which the herrings take as part of their food.

The monthly landings during 1967 were as follows:-

January	-	109 crans	July	-	26 crans
February	-	-	August	-	677 "
March	-	474 "	September	-	1,743 "
April	-	50 "	October	-	1,338 "
May	-	52 "	November	-	607 "
June	-	85 "	December	-	-
Total = 5,161 crans					

From August to November, 1967, fishing took place over a wide area. Most fish were taken from north and south of the Dursey Sound and in the Sound itself. On days when boats were forced, due to weather conditions, to fish in Bantry Bay itself good quantities of small herrings were caught. During September boats from Dingle located and caught herrings from the New Grounds off Dingle Bay. These herrings and those caught by boats fishing north of the Dursey Sound were larger than the herrings caught south of the Sound and in Bantry Bay.

Scientific Investigations:

Castletownbere: A biological sampling programme was initiated in May, 1966, to investigate the stocks of herrings off the south-west coast and to determine whether any relationship existed between them and the main Dunmore East winter spawning stock. Samples were obtained and preliminary results from 1966 and from March to June, 1967, have already been published (Molloy, 1967). All samples were examined for length, sex, maturity, vertebral counts, age and racial type. It would appear that herrings which frequent the south-west coast are composed of a mixture of two races, i.e. a late autumn spawning component tending to remain north of the Dursey and a winter spawning component consisting of smaller individuals which are somewhat similar to the main winter spawning stock at Dunmore East. The small herrings that frequent Bantry Bay seem to form potential recruits to a winter spawning fishery. In view of the proposal to erect a fish meal factory at Castletownbere and the possibility that these young herrings may be fished for this purpose, it is important that the relationship between these young herrings and any adult stock be fully investigated. Sampling commenced in March, and continued until September, 1967.

Maturities and vertebral counts:

The samples examined in March consisted almost entirely of spent and immature fish. The immature fish (stage II) had a high vertebral count of 56.98, indicative of a winter spawning stock, while the spents had a count of 56.64 - indicative of a mixture of winter and autumn spawning components. The immature fish which were present throughout the sampling months maintained their high vertebral counts. During April most fish were again either immature, spawning or spent. The spawning fish (stage VI) which only appeared for a very short time and might belong to a spring spawning component, not commercially fished, had a vertebral count of 56.87. It is interesting to note that in January and February, 1952, shoals of herrings appeared in Kenmare Bay and good catches were taken and landed at Sneem. These fish were reported to be large full fat fish and presumably would have been "maizy" around April. Spent fish (stage VII) again had an intermediate count. In May, fish were composed of immatures, spents and recovering spents (stage VIII). In June, developing herrings (stage III) appeared in quantity for the first time and had a vertebral count of 56.64, suggesting a mixture of components. In July, filling fish (stage IV) appeared and had a definite autumn spawning vertebral count of 56.33. In August, the maturity stages had progressed further and stages IV and V (full) had an intermediate count, 56.68 and 56.62 respectively while stages II and III had winter spawning counts of 56.83 and 56.97. During September stages I - V were all represented and all except stage V (56.60) had high counts. The percentage maturity distribution per month and the respective vertebral counts per stage are shown below (Table I):-

.../Table

Table 1. Percentage maturity distribution per month and vertebral counts per maturity stage.

		I	II	III	IV	V	VI	VII	VIII
March	% Vertebral Counts		17.5 56.98					81.9 56.64	0.7 55.50
April	% Vertebral Counts		34.4 56.91				37.9 56.87	23.1 56.77	4.6 56.61
May	% Vertebral Counts	1.6 57.00	40.3 59.95	0.8 57.00			2.5 57.00	38.7 56.82	16.3 56.93
June	% Vertebral Counts	4.1 56.91	58.5 56.91	10.8 56.64			0.1 57.00	0.1 57.00	26.4 56.83
July	% Vertebral Counts	3.8 56.74	49.5 56.96	24.9 56.62	16.2 56.33	0.1 57.25	-	-	5.4 56.73
August	% Vertebral Counts	-	5.7 56.83	45.3 56.97	22.4 56.68	26.5 56.62	-	-	0.1 56.00
September	% Vertebral Counts	0.1 56.00	10.5 56.91	8.2 56.97	43.4 56.99	37.8 56.60	-	-	-

Unfortunately it was not possible to sample during October and November to see whether the stage V fish in September eventually became spent but the continued presence of herrings with low vertebral counts and the fact that in 1966 boats caught spent herrings before Christmas would seem to indicate the presence of a definite autumn spawning component in this area.

Age and growth.

The number of fish in each group per month was as follows:-

...../Table 2.

Month	2	3	4	5	6	7	8	9	10	10 ^x	Total
March	-	75	33	137	33	13	2	1	3	2	299
April	-	194	22	155	15	4	2	2	1	3	398
May	25	726	89	266	25	9	9	4	2	4	1159
June	62	615	58	63	6	3	2	1	2	2	814
July	42	294	25	96	19	14	4	-	2	1	497
August	20	332	29	91	21	4	1	4	1	1	504
September	89	327	60	132	28	5	5	3	1	-	710
TOTAL	238	2623	316	940	147	52	25	15	12	13	4381

The dominant age groups over the sampling period were three and five year old fish. Fish over five years of age were scarce throughout the period and did not amount to more than 6% of the total examined. The percentage age distribution remained fairly constant throughout the sampling period but it was noticeable that smaller fish, i.e. two and three year old fish, were more numerous during the summer months. It must be remembered that from April to July boats were white fishing and herrings were thus a by-catch. Therefore, the age distribution during this period may not be truly indicative of the stocks present during this time. Mean lengths per age class per month are given in Table 3.

Table 3. Mean lengths (in cm) per age class per month.

Years	March	April	May	June	July	Aug.	Sept.	Mean
2	-	-	18.62	21.27	23.79	23.64	24.03	22.42
3	23.83	23.80	24.17	24.37	24.93	25.84	25.93	24.73
4	26.55	25.88	26.62	27.00	27.61	27.70	28.06	27.08
5	28.22	28.13	28.05	28.21	28.42	29.06	29.01	28.40
6	29.96	30.22	29.38	29.87	30.08	30.43	30.25	30.00
7	29.92	29.78	29.84	30.27	30.90	30.63	31.02	30.20
8	30.70	29.80	30.78	30.70	30.57	32.10	30.85	30.71
9	32.60	30.80	30.50	31.10	-	31.53	31.17	31.03
10	30.40	29.60	30.90	30.85	30.60	31.70	31.30	30.73
10 ^x	30.85	31.00	31.18	32.05	31.20	31.40	-	31.24

Due to scarcity of number in fish older than five years the mean lengths of age groups 6 to 10^x show some inconsistencies. Over the period May to September two-year old fish showed an increase in length of 5.41 cms. Increases in length of three, four and five-year old fish from March to September were 2.10 cm, 1.51 cm and 0.79 cm, respectively.

Individual fish were measured to the nearest mm and placed in half cm groups. A comparison was made between the length distributions of those herrings presumed to belong to the autumn spawning component and the winter spawning component. These length distributions were based on samples obtained during August to October and contain herrings from both Castletownbere and Dingle. The results shown in Fig. I clearly indicate that the autumn component are a much larger run of herrings, dominated by herrings in the 26.0 - 26.4, 28.0 - 28.4, and 30.0 - 30.4 cm group. The winter component had a much more normal type of distribution dominated by herrings in the 25.5 - 25.9 cm group.

All fish had their otoliths examined for racial type by means of their first winter ring. The first winter ring was divided into three categories, a) narrow (n), b) wide (w) and unclassifiable (u). According to Parrish and Sharman (1956) fish spawned in winter/spring contain a higher proportion of "n" type first winter rings and are a faster growing fish than those spawned in autumn. An examination of the dominant maturity stages per month in relation to the distribution of the type of first winter and the vertebral counts is shown in Table 4.

Table 4. Mean Vertebral Counts and percentage 1st Winter Ring type per stage per month.

	II	III	IV	V	VI	VII	VIII
March	56.98 94.4.2					56.64 70.26.4	
April	56.91 92.6.1				56.87 75.21.4	56.77 81.17.2	
May	56.95 91.6.3					56.82 76.20.4	56.93 86.10.4
June	56.96 83.15.2	56.64 76.22					56.83 77.20.3
July	56.96 84.14.2	56.62 71.27.2	56.33 65.33.2				
August	56.83 72.10.18	56.97 83.15.2	56.68 69.22.9	56.62 65.25.10			
September	56.91 87.5.8	56.97 92.6.2	56.99 76.19.6	56.60 70.21.9			

While there are no vast differences in the proportion of types of first winter ring, it is evident that those fish having a lower vertebral count have more "wide" first winter rings, indicating that they are an earlier spawned herring than those with high counts and more narrow first winter rings. Thus it can be seen that the stage V fish in September, stages IV and V in August, stages III and IV in July, stage III and VIII in June and stages VII in March belong to a different race of herrings.

An examination of vertebral counts per age class showed that two and three year old fish had a consistently high vertebral count but older fish had a lower count. It would appear that all the young fish are potential recruits to a winter spawning fishery while the older fish contain a mixture of both winter and autumn spawning stocks. The vertebral counts and winter ring distribution over the sampling period per age class were as follows:-

	Age Class									
	2	3	4	5	6	7	8	9	10	10 ⁺
Average Vertebral Counts	56.86	56.82	56.5	56.76	56.53	55.60	55.80	56.60	56.33	56.54
% Winter Ring Distribution	75.5.21	87.10.3	64.32.4	65.29.6	65.27.8	65.29.6	88.8.4	47.33.20	58.42	34.8.8

The winter ring distribution again shows a higher proportion of "w" type in fish over 3 years old with a similar lower vertebral count.

Bracken and Burd (1963) showed that recruitment to the Dunmore fishery takes place with two, three and four-year old. A comparison of these three age groups was made between the September samples from Castletownbere and the November samples from Dunmore East. These periods should show the least differences because growth at this time would be coming to a close. Comparisons were made under three headings viz. mean lengths, mean vertebral counts and 1st winter ring type distribution. The following are the comparative results:-

Age class	Mean lengths		
	2	3	4
Castletownbere	24.0	25.9	28.1
Dunmore East	23.9	26.8	28.1
	Mean Vertebral counts		
Castletownbere	56.91	56.91	56.65
Dunmore East	56.79	56.96	56.79

1st Winter Ring distribution			
Castletownbere	88.6.5	84.10.6	63.30.7
Dunmore East	81.7.12	80.17.3	64.33.3

The difference between the two areas in regard to these three points are very slight and suggest a very close connection between the young fish from the Castletownbere area, especially Bantry Bay, and the recruit stock entering the Dunmore East fishery.

DINGLE: As in Castletownbere, most herrings taken were the result of by-catch in white fisheries. Only three samples were obtained, two in June and one in October. The two samples obtained in June were similar to the herrings taken in Castletownbere during the same period, and were mostly immature and recovering spents with small amount of developing herrings. The vertebral counts per maturity stage, compared with Castletownbere, were as follows:-

	II	III	VIII
Castletownbere	56.96	56.64	56.83
Dingle	57.12	56.68	56.75

The dominant age groups were three and four-year old fish. The sample obtained in October taken off the New Grounds by paired mid-water boats contained much larger herring, mostly full (late stage V) with an overall vertebral count of 56.58. The dominant age groups were three, four, five and six-year olds and the overall 1st winter ring type distribution was (n) 69%, (w) 22% and (u) 9%. These herrings would also seem to belong to a late autumn spawning component which is not at present fully exploited. The fact that the maturity stages were most late stage V (i.e. very close to spawning) would indicate that these herrings would spawn in the vicinity and were presumably within reach of local boats long before they were first caught.

Fat content. The fat contents of samples of herrings examined during the summer months were as follows:

<u>Date</u>	<u>Area</u>	<u>Fat Content</u>
27/6/67	Castletownbere	17.7 %
21/6/67	Dingle	17.15%
29/6/67	Castletownbere	22.00%
5/7/67	Castletownbere	19.30%

Summary

- 1) Herrings from the south-west coast were examined from March to September, 1967.
- 2) Results indicate the presence of two components, viz., a winter spawning component and a late autumn spawning component.
- 3) The autumn spawning component which seems to be north of the Dursey Sound is not as yet exploited by Commercial boats.
- 4) The immature herrings of the winter spawning component, which tend to remain south of the Dursey Island, have characteristics very similar to the Dunmore East stock of herrings and appear to be potential recruits to this fishery.

REFERENCES

- Bracken, J., and Burd, A.C. 1965. "Studies on the Dunmore Herring Stock"
J. Cons. int. Explor. Mer. Vol. XXIX. No.3.
- Molloy, J. P. 1967. "Herring Investigations on the South Coast of Ireland",
 1966/67. ICES, C.M. 1967/H:7.
- Parrish, B.P. and Sharman, D.P. "Some research on objects and methods used
 in Herring "racial Investigations". ICES. CM. 1958. No. 18.

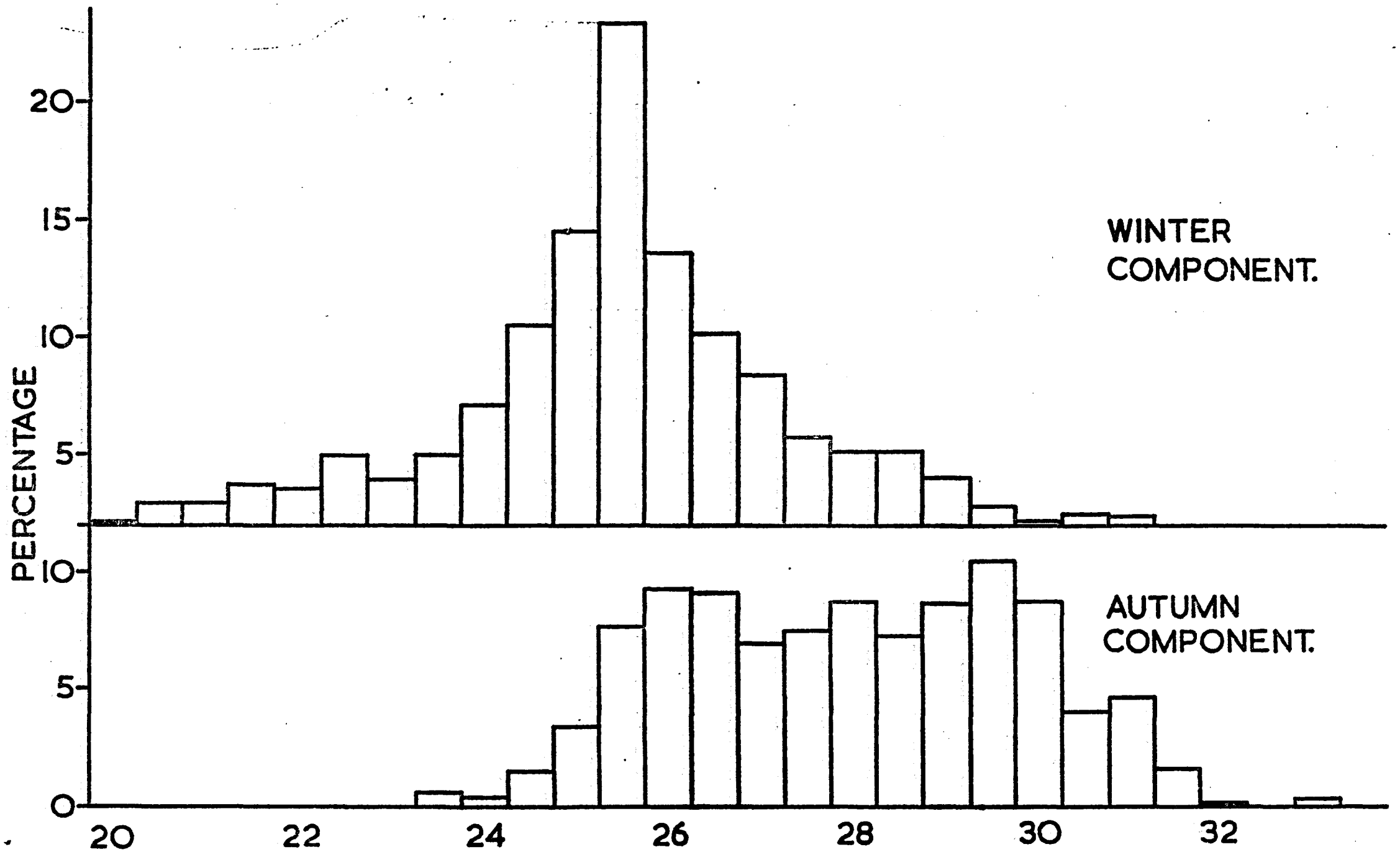


FIG. 1. LENGTH DISTRIBUTION 1/2 CM GROUPS (%).