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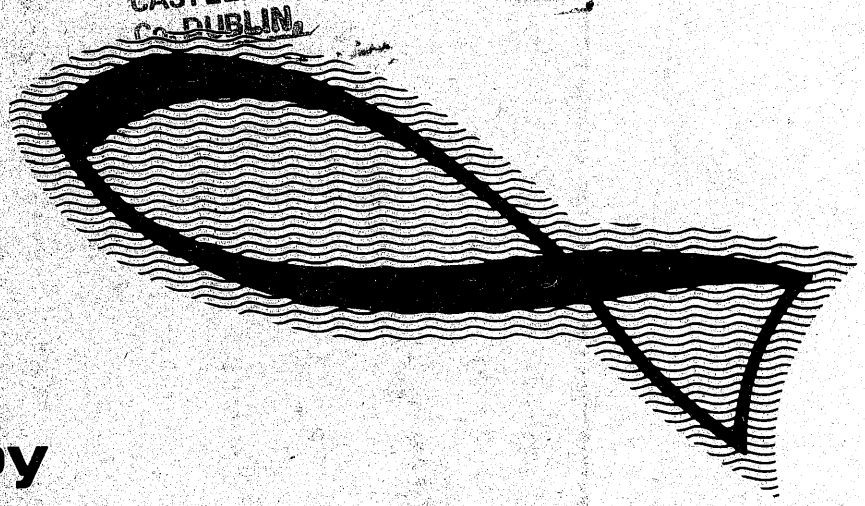
Preliminary Investigations of the Sprat stocks off the South coast of Ireland



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Abstract

The development of a new fishery for sprat off the south coast is reviewed. The fishery during 1976 and 1977 produced over 1,600 tons of sprat, valued at over £92,000. The quality of sprat landed was excellent throughout the fishing period. While it is difficult to estimate the size of the stock in the area, it would appear that landings could be substantially increased. This, together with the quality of the sprat, could make this fishery a valuable alternative to the Celtic Sea herring fishery.

Introduction. Although large stocks of sprats have been reported off the south coast of Ireland for quite some time, the landings have fluctuated very considerably over the years. The reasons for the fluctuations have been twofold - viz. - a lack of consistent supplies meant that there was never a stable market, and secondly the traditional method of fishing by small boats relied very much on the appearance of shoals of sprats in very shallow inshore water. If sprat failed to appear then no attempt was made to locate them in other areas. Fishing was mainly carried out in the estuary of the Blackwater at Youghal, in Cork Harbour and in Kinsale. The annual landings in Table 1 illustrate the fluctuations that have occurred since 1920.

Table 1. Annual landings of sprats along south coast (tonnes) 1921 - 1976.

Year	Tonnes	Year	Tonnes	Year	Tonnes	Year	Tonnes	Year	Tonnes	Year	Tonnes
1921	17	1931	34	1941	8	1951	0	1961	1	1971	0
1922	16	1932	8	1942	17	1952	0	1962	0	1972	119
1923	49	1933	4	1943	40	1953	0	1963	76	1973	640
1924	122	1934	+	1944	+	1954	0	1964	154	1974	192
1925	372	1935	0	1945	3	1955	0	1965	77	1975	20
1926	578	1936	42	1946	7	1956	0	1966	169	1976	38
1927	38	1937	8	1947	461	1957	0	1967	0		
1928	18	1938	1	1948	36	1958	0	1968	1266		
1929	10	1939	+	1943	105	1959	0	1969	0		
1930	138	1940	1	1950	0	1960	5	1970	0		

In the mid sixties attempts were made to establish a fish meal factory at Castletownbere and in connection with this BIM organised resource surveys off the south-west coast. In 1968, considerable quantities of sprat were located in Bantry Bay during the period February to August (Edwards, 1969). Industrial fish surveys were again carried out in 1971 and 1973 and these again indicated that quantities of sprats were available inshore during February - March in Bantry and Dunmanus Bays (Waind, 1974). However, as no reduction plant was established in the area no fishery developed on these sprat stocks. Shoals of sprat were often encountered by boats fishing herring off the coast from Dunmore East to Cork Harbour so that the presence of a sprat stock along the south coast was never in doubt.

Development of present fishery. The decreasing catches from the once lucrative Celtic Sea herring fishery and the possibility that the fishery might be completely closed to all fishing for a number of years has prompted fishermen to consider the sprat stock as an alternative source of income. In December 1976 therefore, as a result of co-operation between An Board Iascaigh Mhara, the Irish Fish Producers Organisation, and the South and East Coast Fishermen's Association an experimental fishery was started. A market for suitable sprat was guaranteed by the presence in Cobh of a Norwegian freezer trawler which could take supplies of approximately 150 tonnes per day. Irish buyers had also expressed interest in acquiring supplies for freezing on shore and also for spicing and curing. The ensuing fishery began in December 1976 and finished in March 1977.

Landings and value. The fishery produced a total catch of 1,640 tonnes or approximately 10,250 cran. (The conversion factor for crans to tonnes for sprat is 6.25 - which is considerably different than the factor of 5.8 for herring). The total represented a landed value of nearly £92,000 for fishermen. 1,015 tonnes were landed at Dunmore East while the remainder were landed at Cobh. The average price paid throughout the fishery was £56.25 per tonne .

Boats and gear

Nine boats took part in the fishery. Eight boats engaged in paired midwater fishing, while one boat tried single mid-water trawling.

Location of the fishery. Generally speaking sprats were located in fairly shallow water i.e. within 20 fms. of shore in the area from Ballycotton Bay to Tramore Bay.

Effort and catch per effort. The number of landings made by pairs of midwater trawlers the total landings and the average catch per landing are shown in Table 2. (The catches by single mid-water trawlers have been excluded). The number of landings is not equivalent to the number of nights fishing because in many instances boats left harbour in the mornings and conducted fishing both that day and the following night. The average catch per landing would , however, indicate that the heaviest concentrations of sprats were present during February.

Table 2. Catches, effort and catch/landing by midwater trawlers

	Cobh			Dunmore East			Total		
	Tonnes	Landings	C/I	Tonnes	Landings	C/I	Tonnes	Landings	C/I
December	35.0	2	17.5	2.4	1	2.4	37.4	3	12.5
January	281.3	13	21.6	-	-	-	281.3	13	21.6
February	310.1	9	34.5	793.3	24	33.05	1103.4	33	33.4
March	-	-	-	219.3	8	27.4	219.3	8	27.4
Total	626.4	24	26.1	1015.0	33	30.8	1641.4	57	28.8

A comparison of these figures and those obtained in future years will give an indication of how the stock is reacting to fishing.

Biological Investigations

Samples were obtained for biological analyses throughout the duration of the fishing. The immediate aim of this sampling was to provide information to processors about fat content, length and weight of the sprats and the presence of food in the stomachs. However, the long term aim will be to estimate the size of the stock that inhabits this section of the Celtic Sea and to determine how it reacts to different levels of fishing.

Age distribution. The age of sprats, as in herring, is determined from their earstones (otoliths). Sprats are usually born in the late winter or spring and for convenience sake their birthday is estimated as 1st January. This in fact means that sprats off the south coast would have changed age during 1976/77 but as few sprat were landed during December, these December fish have been, for convenience sake, considered to be the same age as the fish landed in January. The percentage monthly age distribution is shown below.

Table 3. Monthly age distribution (Percentages)

Age (Years)	1	2	3	4	5	6	7	8
Year Class	1976	1975	1974	1973	1972	1971	1970	1969
December	-	-	-	58.4	37.2	4.1	-	0.3
January	-	3.7	11.1	59.3	23.0	2.6	-	-
February	-	1.5	17.2	48.9	29.0	3.4	-	-
March	-	-	13.9	75.0	11.1	-	-	-
Total	-	1.6	15.5	54.6	25.5	2.8	-	+

As can be seen sprat that were born in 1973 dominated the samples. Sprat spawned in 1975 were very scarce and those spawned in 1976 were completely absent. The absence of young sprats may be because the mesh of the nets in use is of the right size to allow them to escape or more likely because they were not in the area. Some skippers consider that the smaller and younger sprats remain closer to the shore. The age distribution seems to be typical of a very slightly fished stock with older fish abundant. It would also appear that older fish become less abundant during February and March - possibly because of an off shore migration after spawning. Molloy (1966) examined sprat in the summer obtained from sprat weirs in Youghal Harbour and found that 95% of all fish examined were 0-group (i.e. spawned earlier that year). These fish were approximately 3 cm long when first taken in the catches. Gibson (unpublished data) examined considerable quantities of sprat during the late summer and autumn of 1948 and 1949 from the estuarine fisheries of the Blackwater and from the fisheries in Cork and Kinsale Harbours. These fish were also predominantly 0 and 1 group fish and much younger than those obtained in the winter catches.

Length and weight Throughout the fishing the sprats landed were very large in comparison with those landed on the east coast. The lengths ranged from 8.5 cm to 17.5 cm. The samples containing the smallest fish were those landed at Dunmore East during February. The average number of sprats per kilogram ranged from 32 to 59. Table 4, shows the length range, the average length and the average number of sprats per kilogram for all samples examined.

Table 4. Mean lengths, size range and number of sprats per kilogram

Date	Area	Length cm	Range cm	No./Kg
10 Dec.	Dunmore	14.8	12.5 - 16.5	36.4
15 Dec.	Dunmore	14.7	12.5 - 16.5	37.8
16 Dec.	Cobh	14.9	12.5 - 16.5	36.5
7 Jan.	Dunmore	15.5	12.0 - 16.0	32.8
14 Jan.	Dunmore	13.2	9.5 - 15.5	59.0
21 Jan.	Cobh	13.5	9.0 - 16.5	53.0
2 Feb.	Cobh	14.3	9.5 - 17.0	45.1
10 Feb.	Cobh	14.2	10.0 - 17.0	45.6
10 Feb.	Dunmore	13.9	9.5 - 17.0	50.3
16 Feb.	Dunmore	13.7	8.5 - 16.0	50.0
18 Feb.	Dunmore	13.8	8.5 - 17.5	56.4
24 Feb.	Dunmore	14.5	10.5 - 17.5	45.1
26 Feb.	Dunmore	14.0	9.0 - 17.0	53.4
2 Mar.	Dunmore	13.9	9.5 - 17.0	54.8
4 Mar.	Dunmore	14.8	12.5 - 16.5	44.9

Fat content. The average fat content estimated from all samples is also shown in Table 5. As can be seen the fat content decreased considerably from December, when it was 22%, to March when it was 10% . The amount of fat present is a very important factor as far as buyers are concerned because it is this that determines how the sprat will be utilized. In comparison with samples from other areas the fat content appears to have been very high. This may be because of the size of the fish since it is known that there is a progressive increase in fat content with size of fish. Small immature fish possess a relatively low amount while the larger fish have the highest concentrations.

Table 5. Average fat contents per month

Month	South Coast ('76,'77)	South Coast+	East Coast+
	%	%	%
Jan.	15.3	9.0	5.4
Feb.	11.6		2.8
Mar.	10.0		3.9
Apr.		4.5	
May.		6.2	
June			9.9
July			10.1
Aug.		21.7	12.8
Sept.		17.5	
Oct.		17.3	
Nov			
Dec.	18.7	13.6	7.4

+ Based on estimates done in a number of years

Fat con ent was estimated on both whole fish and fillets but no consistent differences were detected, although it might be thought as spawning time approached that fat reserves in the flesh would be used up in the formation of reproductive material. However this did not appear to be reflected in the results and in future only whole fish will be used. Also the fat content was estimated by direct chemical methods, using Chloroform-Methanol extraction, and by indirect methods based on the estimation of the moisture content. Again the results were sufficiently close to enable the faster indirect method to be used. Some analysis of fat content from sprats examined in recent years are also shown in table 5 for comparative purposes.

Maturities and spawning. Sprats in general are known to have a very long spawning period - the females releasing batches of ripe eggs at regular intervals with a recovery phase between each spawning. This fact makes it difficult to determine the time at which the main spawning occurs. An examination of the maturity stages showed that most of the fish were either developing or full. No spents were recorded throughout the fishing period

which would suggest that fish leave the area immediately after spawning. No immature fish or juvenile fish were present in the catches. Bracken and Kennedy (1967) mention that monthly larval surveys carried out by Cu Feasa from December 1960 to April 1961 and January to March (1962) revealed large quantities of sprat eggs and yolk sac larvae indicating that a substantial winter spawning had taken place. However, Kennedy and Fitzmaurice (1969) during the course of investigations on bass eggs along the south coast found a considerable number of sprat eggs off Baltimore on June 7, indicating that a summer spawning had taken place. Kennedy, Fitzmaurice and Champ (1973) during the April to June period from 1967 to 1971 found the densest concentrations of sprat eggs around the Blasket Islands, but also found substantial quantities off the mouth of the Shannon and again off Baltimore.

It would appear, therefore, that spawning takes place over an extensive length of the coast-line and for a considerable length of time. There is, therefore, good reason to believe that fishing could be extended well into the Spring and early Summer.

Food content of the stomachs. It is well known that sprat and herrings are at particular times of the year liable to suffer from a condition known as 'black gut'. This condition is caused by the presence of chemical substances in the gut of the fish (trimethylamines) which are produced when food is broken down. Certain types of food e.g. tiny molluscs, produce large amounts of trimethylamines, which cause the body wall to break down. A similar condition known as "red gut" was present in some of the catches during the February to March period of the fishing and on one occasion some catches had to be dumped because too many of the sprat had broken body walls. This type of sprat is not suitable for canning or freezing. Some stomachs of sprat exhibiting this condition were retained to find out on what these fish had been feeding. The contents were comprised mainly of fish eggs, some copepods, decapods, phytoplankton and some plant material and some roundworms.

International Catches of Sprat. Up to recently the total catches of sprat taken off the south coast have been negligible. However, in 1976 the Dutch fleet took over 760 tonnes during the summer. These fish, according to Dutch scientists were very large in comparison to their catches in other areas. The existence of a considerable sprat stock off the south coast is well known to continental fishermen.

Estimation of mortality and calculation of stock size. It is exceedingly difficult when

only one years data is available confined to a fishing period of approximately three months, to make estimates of mortality rates and stock size. This is particularly so in the case of a short lived species such as sprats, where the stock size, even in the absence of any fishing, is heavily dependent on the size of the incoming year class. With the available data for one season it was not possible therefore to estimate how big a stock inhabits the Celtic Sea and it will require at least another years data before any claculations may be made. However, the size and age structure of the samples, together with the widespread distribution of eggs and larvae, and the indications recorded by fishermen from detecting equipment suggests that this resource is probably quite substantial in size.

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