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MINISTRY OF AGRICULTURE, FISHERIES AND FOOD

FISHING FOR SANDEELS

LABORATORY LEAFLET (NEW SERIES) No. 21

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FISHERIES LABORATORY

LOWESTOFT

SUFFOLK

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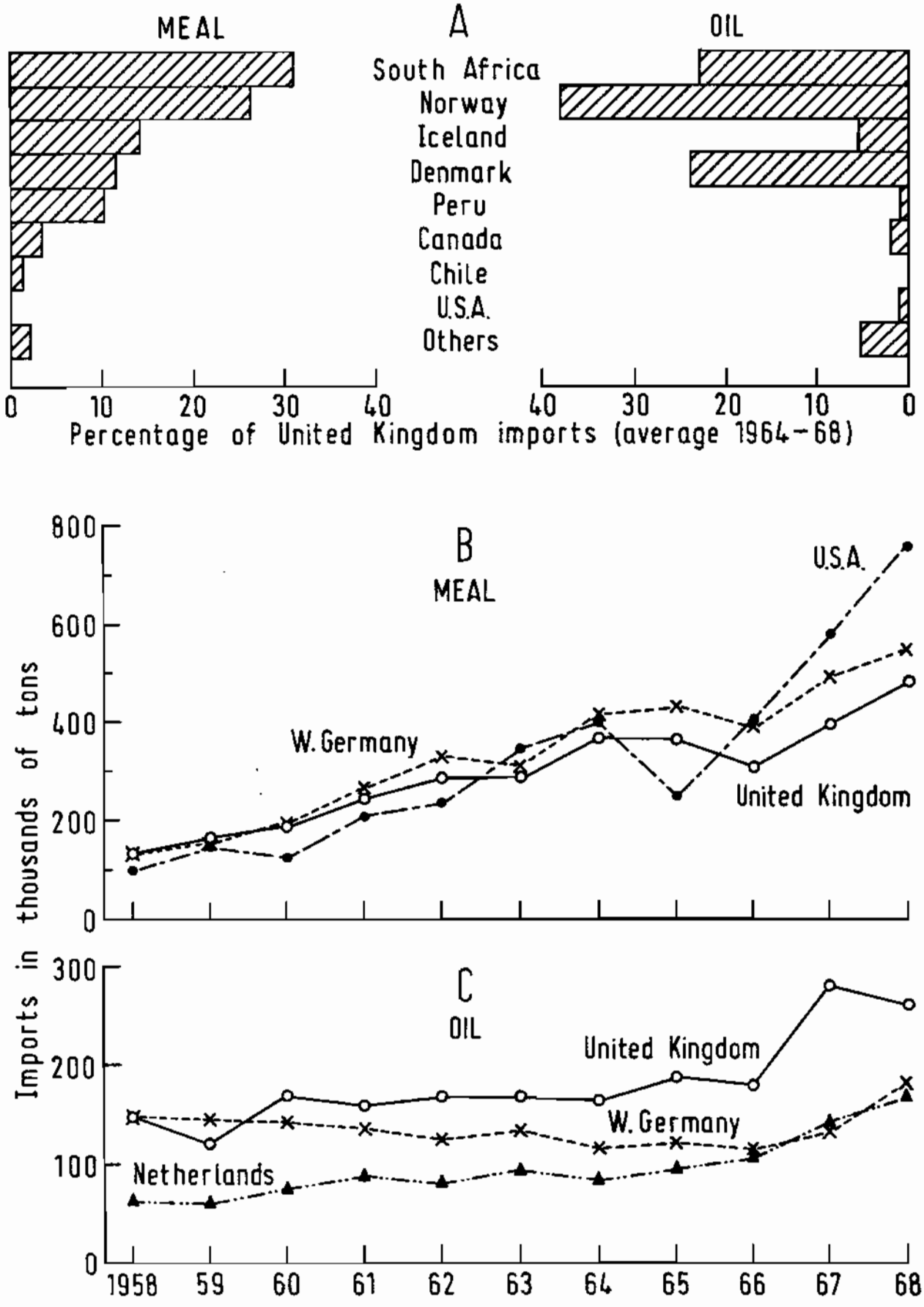

Figure 1 A: The proportions of UK imports of fish-meal and fish-oil supplied by various countries. B and C: Imports of fish-meal and fish-oil by the three top importing countries.

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FISHING FOR SANDEELS

INTRODUCTION

Britain is one of the world's major importers of fish-meal and fish-oil. In recent years, only the USA and Western Germany have imported more meal than the UK, and as far as oil is concerned we have imported more than any other country (Figure 1). The cost of these imports is considerable and in 1968 they reached a record of £41 million. The chief sources of our imports are South Africa, Norway, Iceland and Denmark (Figure 1). The meal is used as an animal foodstuff and the oil is used chiefly in the manufacture of margarine.

Industrial fisheries started to increase in importance after the last (1939-45) war, and whereas in 1948 only 7.7 per cent of the world catch of marine fish was used for reduction to meal and oil, the corresponding figure in 1968 was 35.6 per cent, so forming the largest single outlet for marine fishery products. The greatest development has taken place in South American Pacific waters, notably those off Peru and Chile, but in European waters, also, large industrial fisheries have been developed by Norway, Iceland and Denmark. The British fishing industry has taken no part in these fisheries and our own production of meal, currently around 80 000 tons per year, comes almost entirely from condemned and unsold white fish and offal.

Considering the size of our import bill for meal and oil, and the fact that some of the industrial fisheries take place close to our own coast, it makes sound sense to try to catch more of these fish ourselves, and two species, sprat and sandeel, are immediate possibilities. Perhaps 60 per cent of the Danish North Sea sandeel catch of 180 000 tons per year is taken from grounds within 6 hours' steam of the Humber. In addition, sprats are seasonally abundant in various areas off the English east coast.

Scientific investigations have been conducted for a number of years on both the sprat and sandeel populations. In the case of the sprat fisheries attempts have been made to assess the sizes of the stocks fished in the Wash and the Thames and off North Shields. The results of these investigations are being prepared for publication, but it can be pointed out here that at the present levels of fishing we have been unable to show any effect of fishing on the size of the stocks. The present catches are limited by the numbers of vessels employed; the stocks might well support an annual catch of up to 50 000 tons.

Sandeel investigations have been concerned mainly with their biology and distribution. Sandeel fishing is a very skilled operation, and to obtain commercial catches considerable knowledge is needed of the individual fishing grounds.

Populations of sandeels have been discovered in areas not fished commercially. However, in order to compare the relative sizes of these populations with those already fished, a good understanding of the changes in catch-rates of sandeels on the known fishing grounds is needed.

THE NORTH SEA SANDEEL FISHERY

The fishery started in 1953 and, despite fluctuations, total landings continue on an upward trend (Figure 2). The figure for 1969 is not yet available, but it is understood that it was a poor year. More than 90 per cent of the catch is taken by Denmark (which also has a small fishery in the Skagerrak), although Norway and Germany also participate, the latter country less so in recent years.

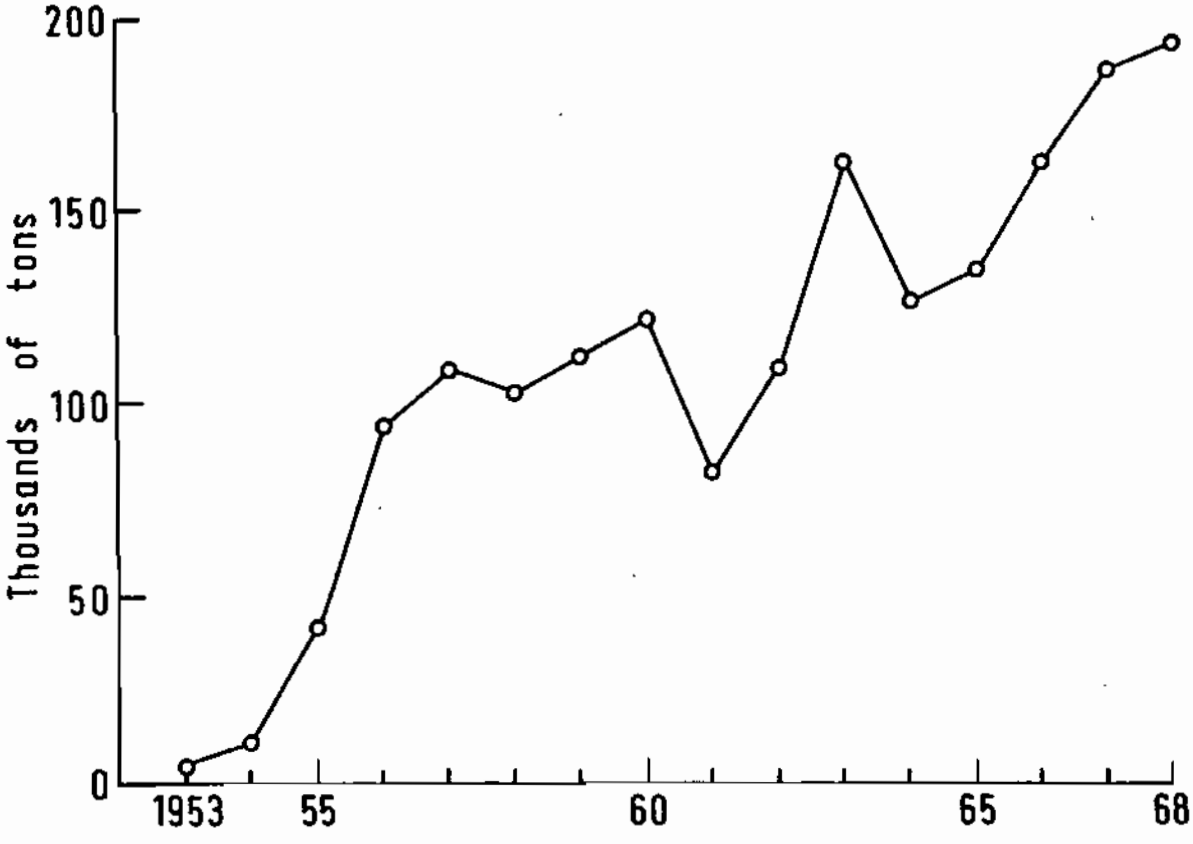


Figure 2 Landings of sandeels from the North Sea by all countries.

The North Sea fishery exploits two main stocks, one along the coasts of Denmark and Germany and the other off the English coast close to the Humber. It is believed that the English stock is the larger, and this is found on the tops of the Norfolk Banks and Dowsing grounds, and around the south-western edge of the Dogger Bank–Outer Wellbank, South-west Spit, Southernmost Rough, and the Hills (Figure 3).

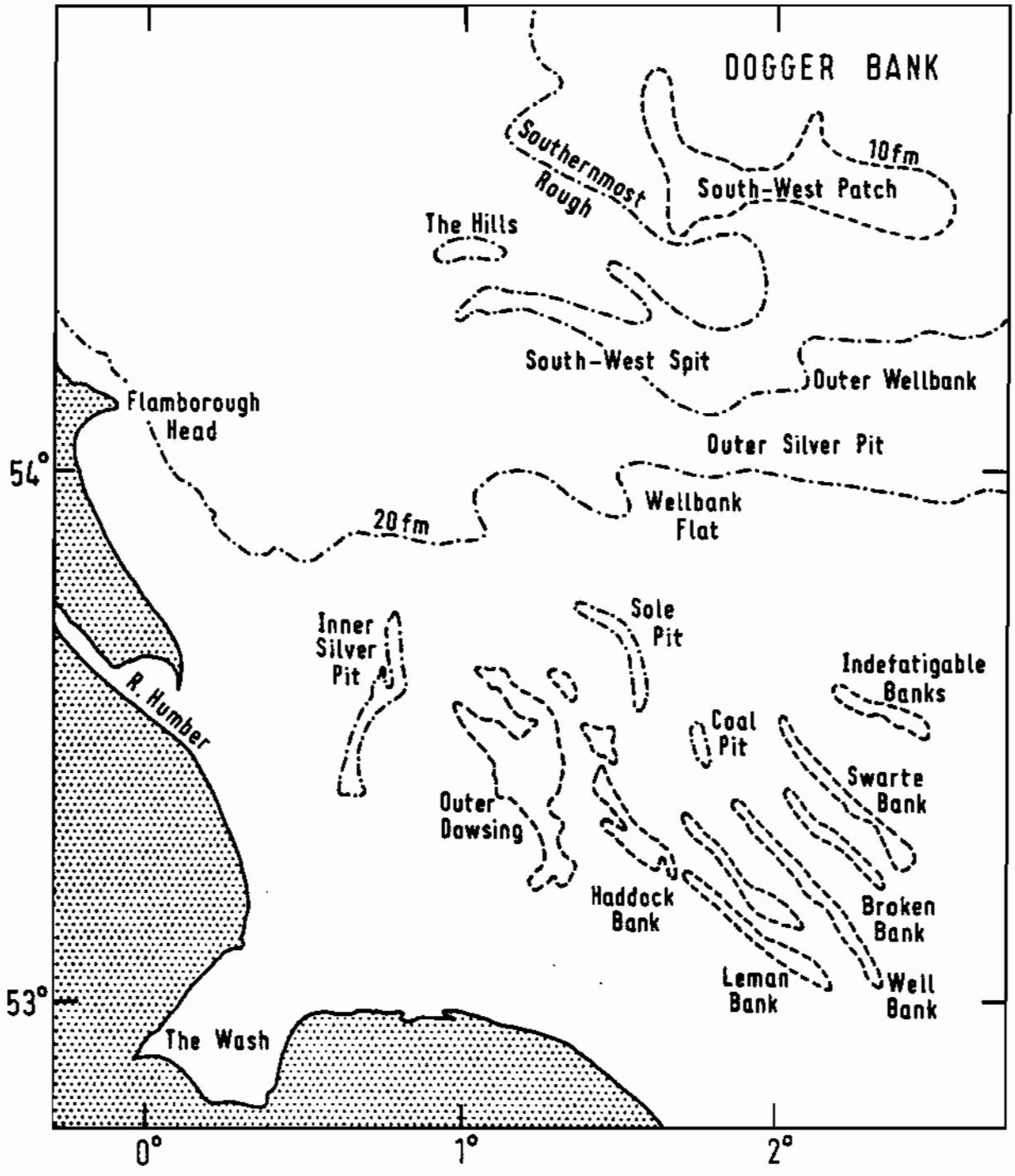


Figure 3 The sandeel fishing grounds off the Humber.

The gear used is a wing-type single-boat bottom trawl, with a high headline and light footrope. The footrope is lightly weighted with pieces of lead and in addition a small amount of light chain can be added to the bosom. The footrope merely trips lightly along the bottom and does not have to dig in. Bridles of 30-40 fathoms and legs of 15-20 fathoms are used, and a length (about 1 fathom) of heavy chain is usually attached to each lower leg just in front of the wing.

Mesh size is usually 100 mm (4 inches) in the wings and 80 mm (3 inches) in the square and belly, decreasing to 20 mm ($\frac{3}{4}$ inch) just in front of the cod-end; the mesh size of the latter is 15 mm ($\frac{1}{2}$ inch) stepping down to 5 mm (3/16 inch).

The fishery is seasonal and takes place from April until July or August, but peak catches occur in June. Sandeels bury themselves in the sand at night and hence can be trawled only during daylight. Considerable variation in catch-rate may take place during the day and a poor tow may be followed by a very good one.

THE EXPERIMENTAL SANDEEL FISHING IN MAY-JULY 1969

With the introduction of a new Immature Sea-Fish Order in October 1968, which permitted the landing of 10 per cent by weight of undersized protected species (e.g. cod, haddock, plaice, etc.) in the catches of industrial (non-protected) fish, the possibility arose for the commencement of an industrial fishery for sandeels based on the Humber. When Mr V. Nielsen, the owner of MV MATANUSKA, approached the Ministry for sponsorship in an assessment of the profitability of such a fishery, the opportunity also arose to obtain the detailed catch statistics and experience of sandeel fishing necessary to enable us to interpret our earlier findings in other non-exploited sandeel stocks.

A financial guarantee related to minimum grossing was agreed for a ten-week fishing period (May-July 1969). An expert Danish sandeel skipper acted as adviser for three of the nine trips made. Staff of the Fisheries Laboratory acted as observers during most of the trips, and it is the information thus obtained which forms the basis of this leaflet.

The vessel

The MATANUSKA is a wooden-built ship of 69 ft overall length and 74 gross tons; she is powered by a 240 hp Kelvin engine. Before the start of the experiment, the ship spent three weeks at Esbjerg in Denmark (the most important port in the sandeel fishery), where she collected four sandeel trawls and underwent some modifications. These were as follows: (a) the fitting of a new winch and net hauler, (b) the construction of a new fish-room hatch, and (c) the lengthening of the fish-room stanchions so that they reached the deck head.

A description of the winch and net hauler, which can be seen in Plate 1, is given in Fishing News No. 2946 (21 November 1969). The new fish-room hatch was the standard type fitted to Danish industrial vessels, constructed of metal and with a hinged metal lid. The fish-room modifications were made because the compartments should be fairly small (e.g. 4 ft square). With soft-bodied fish such as sandeels and Norway pout it is essential to minimize the weight of fish pressing down on to the lower layers and to prevent the fish sliding about; otherwise they quickly decay. This did, in fact, start to happen on MATANUSKA's first trip and she had to return to Grimsby early, so that the fish room could be further modified.

For preserving the catch, 5 tons of ice were evenly spread on the floor of the hold and 20 per cent formalin was sprayed, by means of a hand pump, on to the fish as they were shovelled through the fish ports.

The vessel, which worked out of Grimsby, was equipped with VHF radio, Decca Navigator and track plotter, and Kelvin Hughes MS 29 echo sounder. The normal crewing arrangement was skipper, mate and two crew.

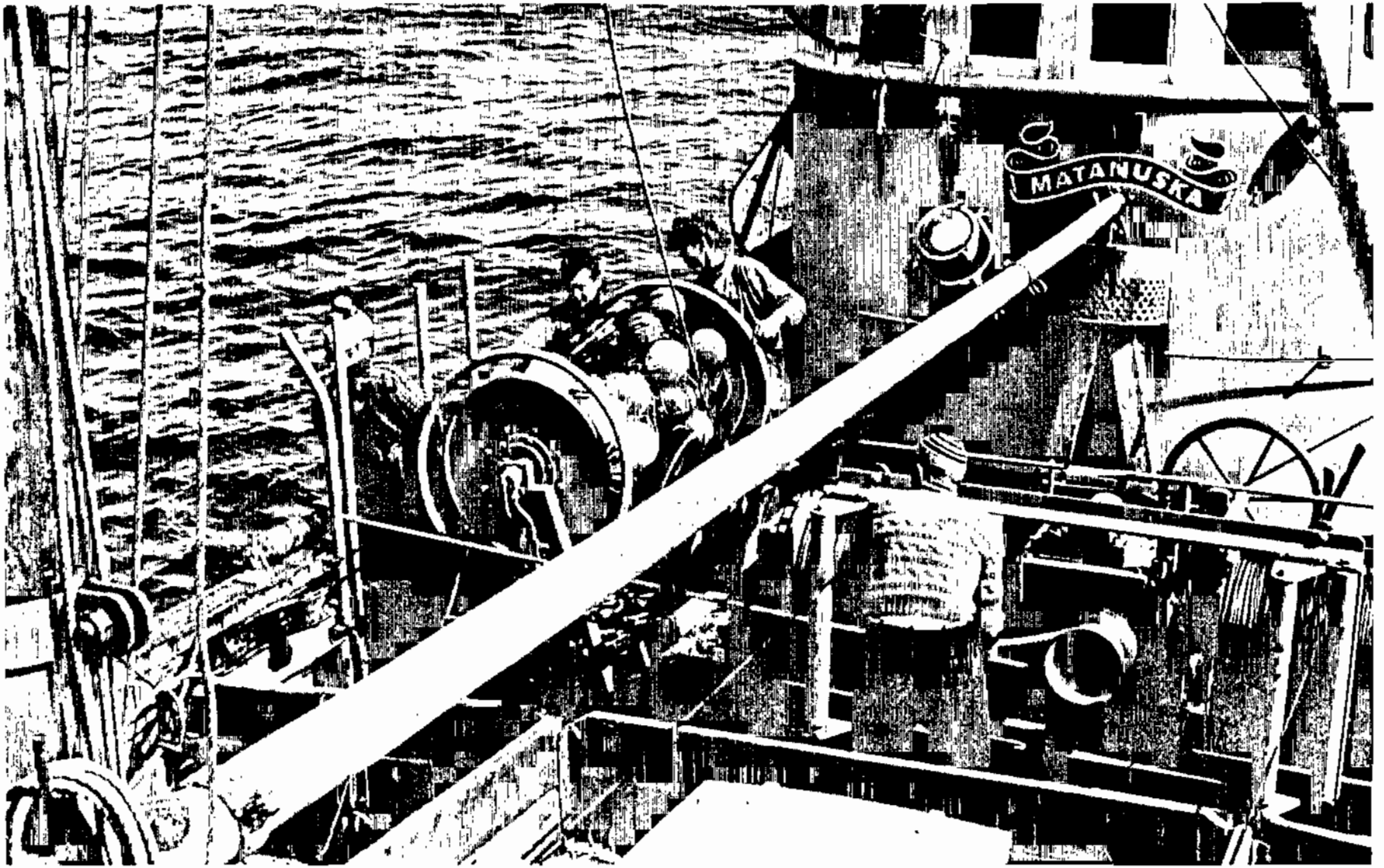


Plate 1 Fore-deck of the MATANUSKA during hauling, viewed from the fore-peak.

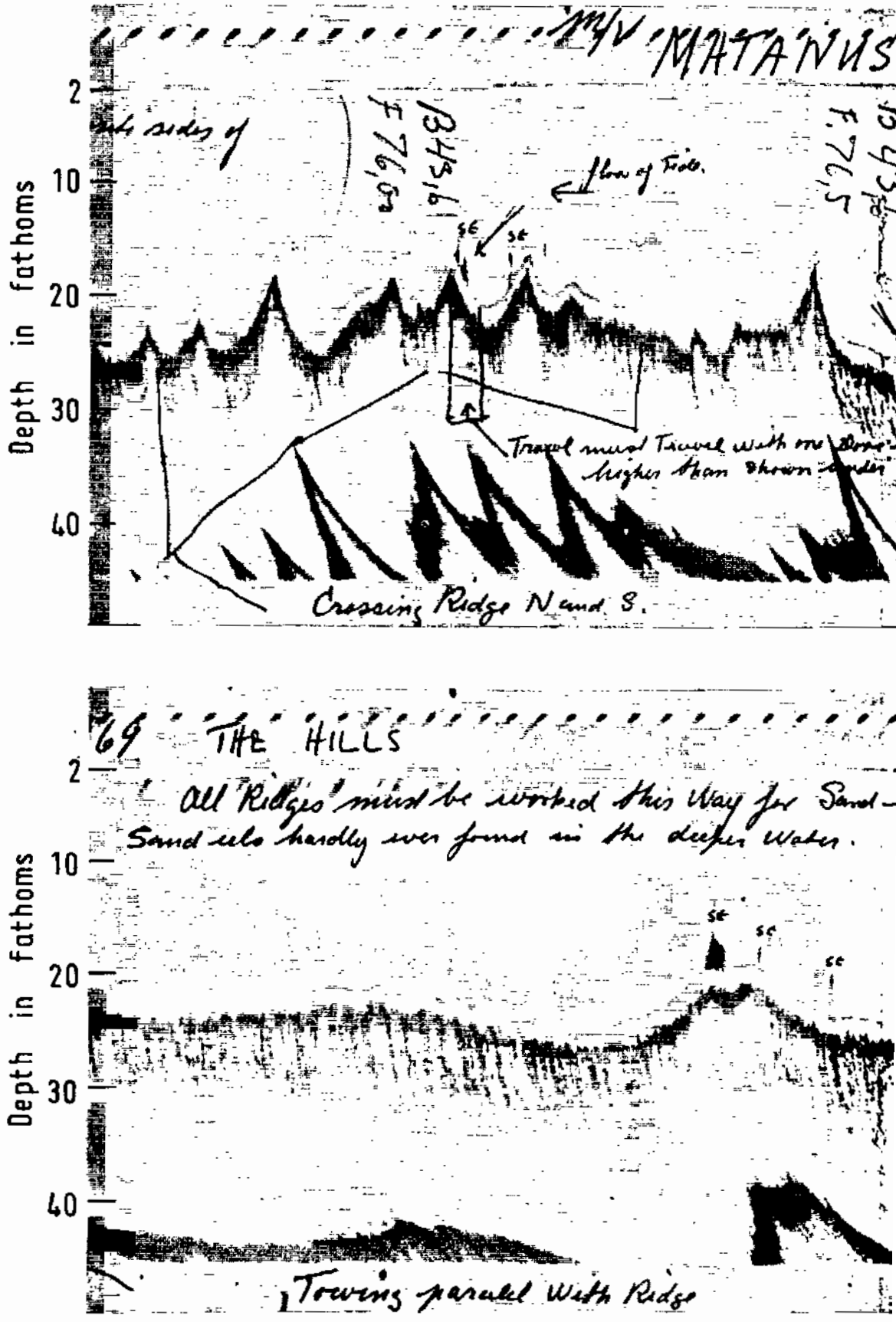
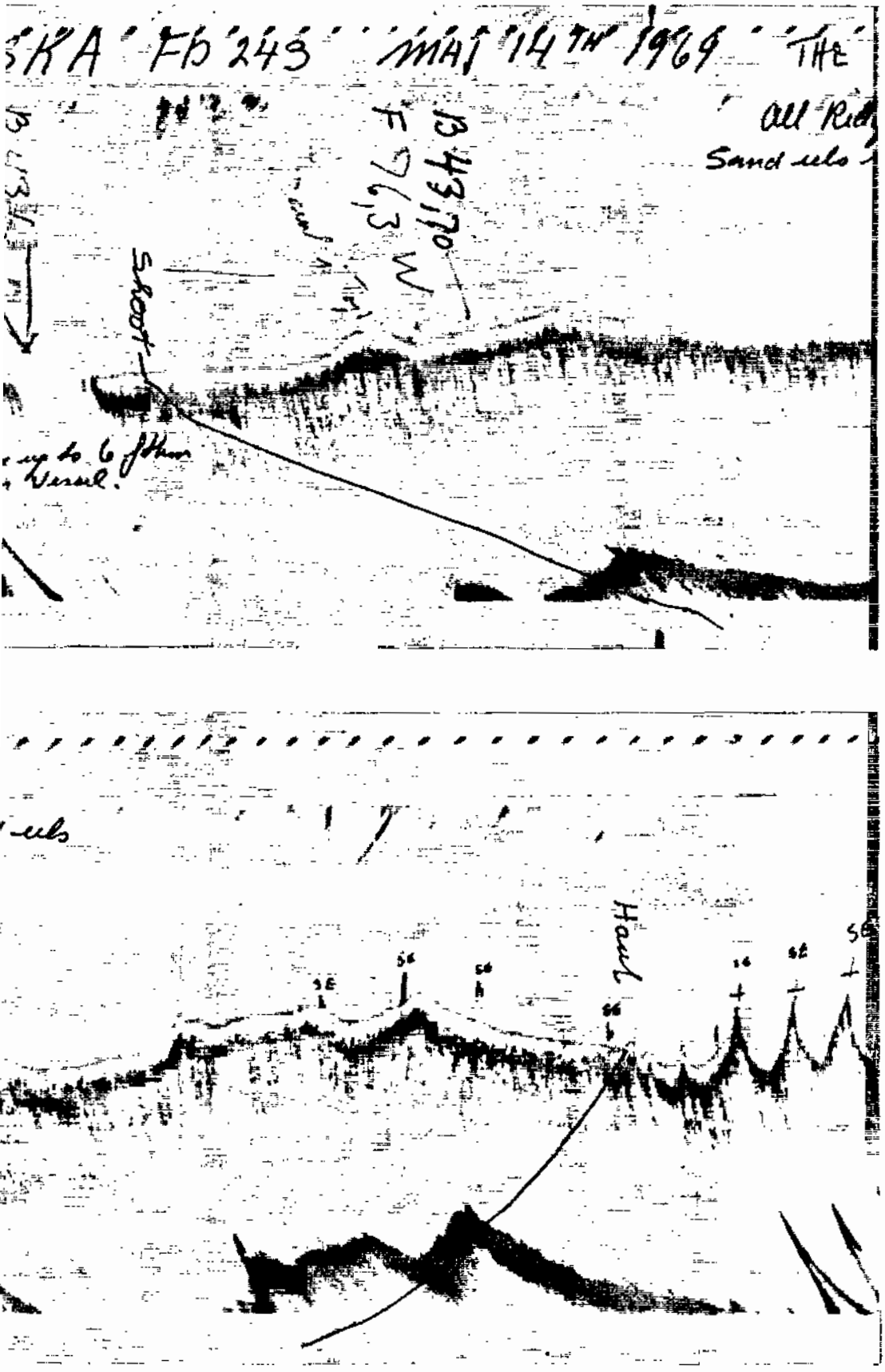


Plate 2 Photographs of an echo-record from a tow by MATANUSKA on the H
sandeels are indicated by "SE". The tow yielded a catch of 1 ton.



Hills. The record has been annotated by the skipper. Traces caused by
(Note that the lower picture is a continuation of the upper one.)

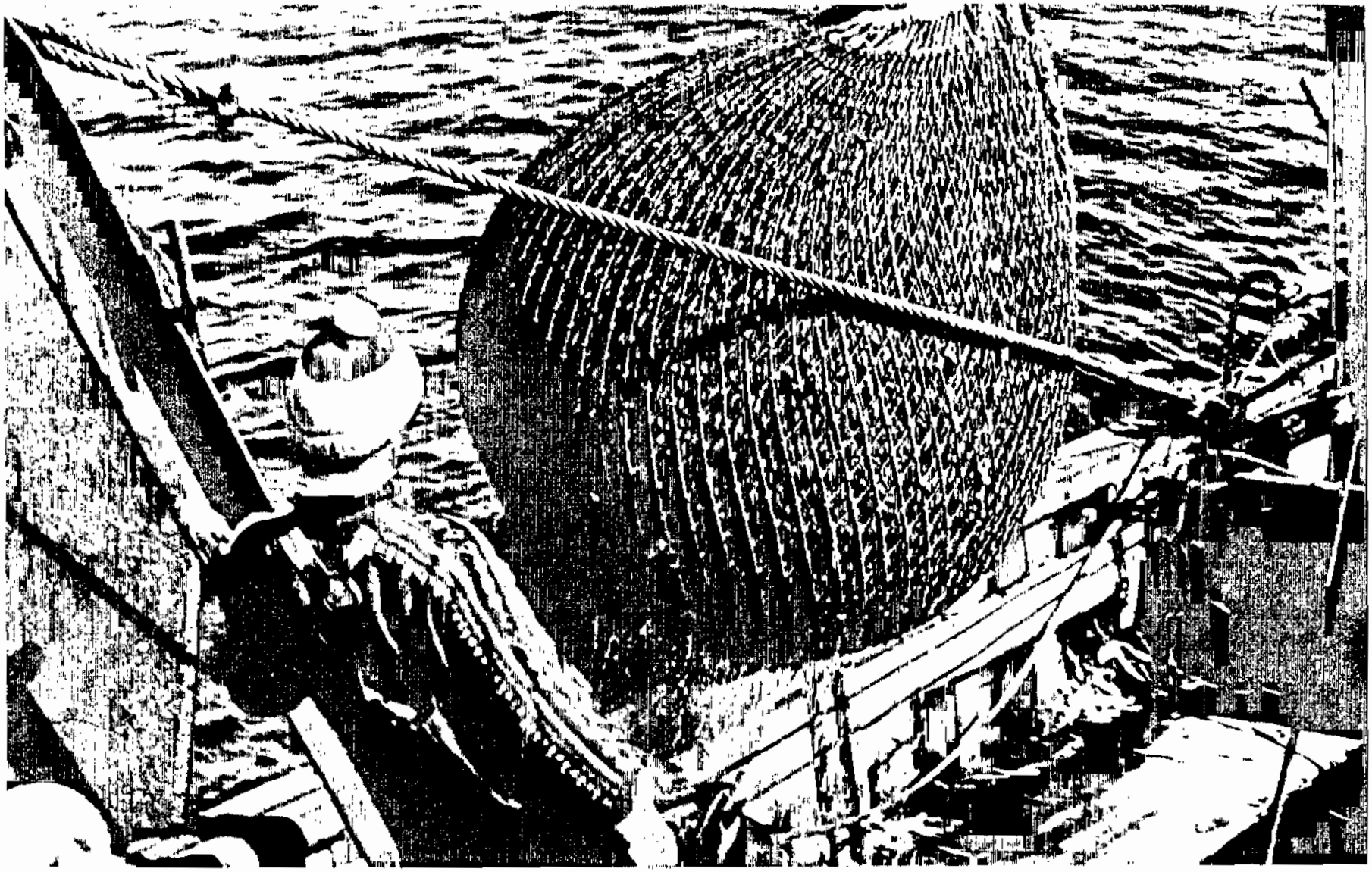


Plate 3 A good bag of sandeels being hauled aboard MATANUSKA.

Table 1 Details of MATANUSKA cruises; May-July 1969

Cruise	Starting date	Duration (days)	Number of hauls	Average duration (min)	Catch-rate (tons per hour)		Total catch		Main grounds
					Average	Range	Weight (tons)	Value (£)	
1	2 May	7	16	105	1.0	0.0-2.3	28.5	277	The Hills
2	13 May	7	27	102	1.4	0.0-4.0	63.4	602	The Hills
3	24 May	7	24	144	0.7	0.0-2.0	42.0	398	The Hills, Southernmost Rough
4	2 June	6	14	140	2.1	1.1-3.7	69.4	659	Broken Bank
5	9 June	7	24	141	1.3	0.5-2.2	73.1	694	Outer Dowsing
6	18 June	4	9	130*	1.9*	ND	37.6	356	Outer Dowsing
7	23 June	7	19	134	1.7	0.0-4.3	71.6	680	Outer Dowsing
8	1 July	4	9	130*	0.5*	ND	9.9	171	The Hills
9	10 July	7	22	130	0.9	0.0-1.7	44.7	469	Outer Dowsing
Total or Grand Mean		56	164	130	1.3	0.0-4.3	440.2	4 306	
Total including subsidy								4 628	

* estimated - exact figures not available
ND no data available.

The voyages

Table 1 gives details of each trip; the first started from Esbjerg on 2 May, but after that all operations were carried out from Grimsby. The Danish fishery also started during the first week in May which was, according to Danish sources, later than usual. The Danes fish the Dogger grounds first and then work their way south, since this is, apparently, the sequence of availability of the fish.

MATANUSKA usually left Grimsby on the evening tide and started fishing the next morning; at the end of the trip she usually docked on the morning tide, so that, on each voyage, the number of days' fishing was normally two less than that given under "duration" in Table 1. The number of hauls shown excludes shots with foul and badly damaged gear. The average catch-rate was 1.3 tons per hour, which was said to be well below the level in an average season. The maximum catch-rate was 4.3 tons per hour, but in a good season it has apparently risen as high as 15 tons per hour. The total grossing was £4 628 (including subsidy) for a total weight of 440.2 tons delivered to the meal factory. The price paid was £9 10s. 0d. per ton, except for the last two landings when £10 10s. 0d. per ton was paid.

The quantities of species other than sandeels in the catches were usually very small, though on the last two trips sprat and herring formed an appreciable part of the landings. Of the small amount of protected species caught, cod was the most common and 26 cwt (value £97) were landed separately during the nine trips.

The grounds

During the season MATANUSKA fished the following grounds: Outer Wellbank, Southernmost Rough, the Hills, Outer Dowsing, Haddock Bank and Broken Bank; copies of her Decca track plotter records for all grounds except the Outer Wellbank are available from the Fisheries Laboratory on request. During a research cruise on RV CLIONE Danish vessels were also seen on the Leman Bank, Well Bank and Indefatigable Bank. The most concentrated fishery took place on the Outer Dowsing in the middle of June, when 50-75 Danish vessels could be seen. Most of these boats stopped fishing for sandeels during the first week in July.

Each ground is located by Decca Navigator, but the ship's course during the tow is then altered according to depth, as indicated on the sounder, or by Decca track plotter records. The towing course is particularly critical on the Hills and Outer Dowsing, where the crests of the banks are rather sharply ridged. The trawl is towed parallel to the ridges on one side of the crest or the other, and if one of the doors is allowed to drop over the crest, the belly of the trawl is liable to be damaged. This is illustrated in Plate 2, which shows a series of photographs taken from an echo-record during a tow on the Hills. The ship has crossed the banks on a southerly course, before shooting the gear and towing parallel to the ridges. As noted by the skipper, one door travels at a different depth to the other, though the same length of warp is let out for both. The typical echo-traces which sandeels give - usually faint "spike" markings - can be seen and Danish skippers can, apparently, judge how long to tow by the amount of trace.

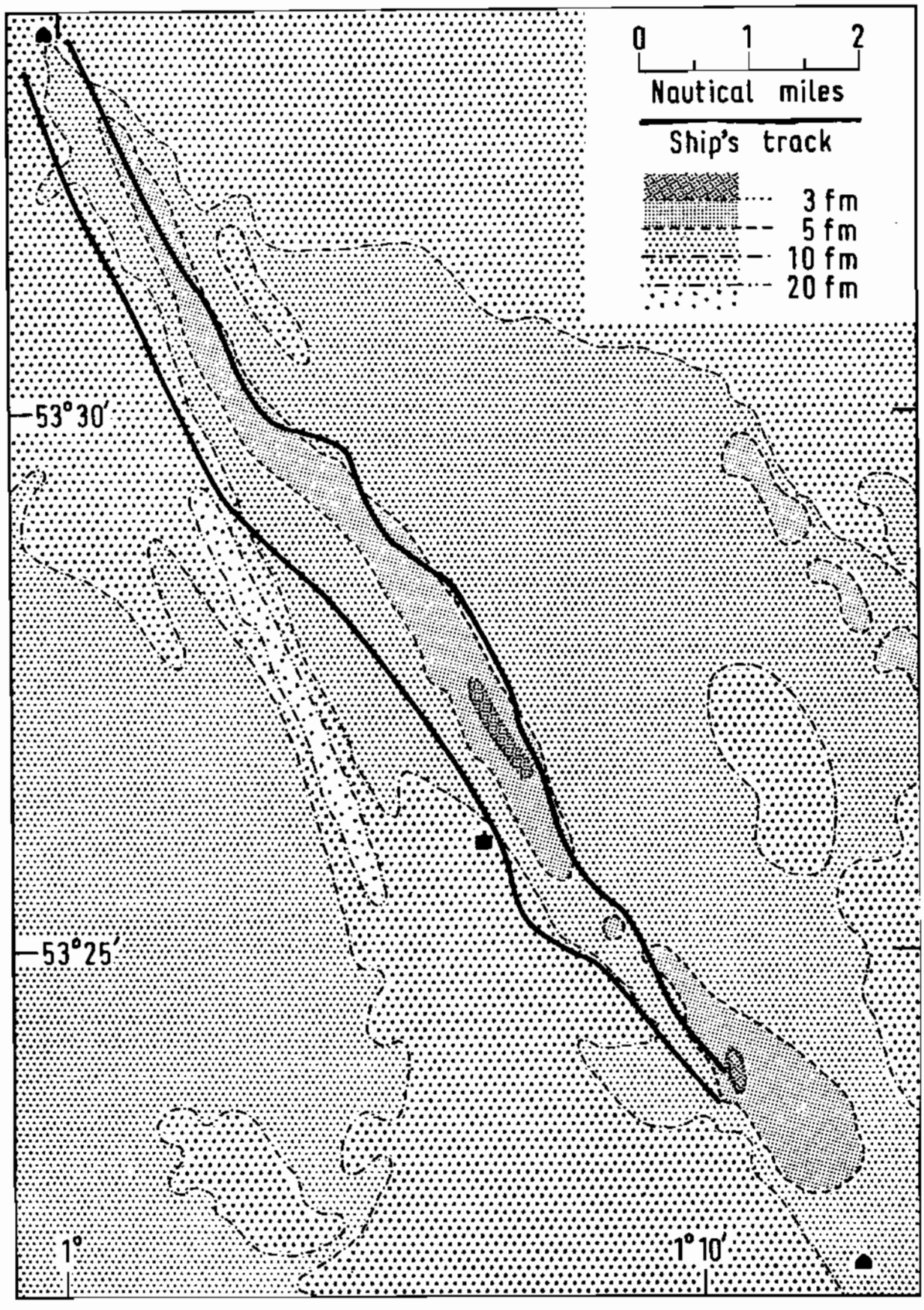


Figure 4 The Outer Dowsing Shoal (from Admiralty Chart L(D5)107) and MATANUSKA's fishing area as shown by the outer limits of her track plotter records. The three Outer Dowsing buoys are shown.

The Hills area is probably the most difficult of the sandeel grounds to work and it consists of numerous long sand ridges which run roughly in a north-west/south-east direction. Their difficulty is perhaps reflected in the names which the Danes have given them - such as "The Ruins", "Little Bankruptcy" and "The Last Chance" - though Danish humour has obviously played a part! The Outer Dowsing is not so difficult to work as the Hills, but again the trawl must be towed on one side of the crest or the other, but not across it. On the Norfolk Banks, however, the trawl is towed along the tops of the banks, which are rather more flattened than on the Dowsing or Hills areas.

As an example of the restricted nature of the fishing grounds, Figure 4 is a diagram of the Outer Dowsing Shoal on which the outer limits of MATANUSKA's tows, as shown by the track plotter records, have been superimposed. It can be seen that the width of the fishing area is mostly less than 1 nautical mile. It may also be noted that there is a tendency to keep to the western side of the shoal.

The profitability of the voyages

Obviously, fishermen will not turn over to industrial fishing unless it is at least as profitable as fishing for consumer fish. It is of considerable interest, therefore, to compare MATANUSKA's fishing operations with those of other vessels of comparable size which were fishing for consumer fish during the same period. Such a comparison is shown in Table 2, in which the figures for "other vessels" have been obtained by averaging the results of all landings at Grimsby by UK registered vessels of gross registered tonnage of between 20 and 100 (excluding MATANUSKA) during the period of MATANUSKA's fishing operations (4 May-16 July). This is, in effect, a comparison between MATANUSKA and the Grimsby seiner fleet. Most of the figures in Table 2 have been derived from the Ministry's fish landing forms, and the details for MATANUSKA may differ slightly from those given in Table 1, which are mostly taken from the fishing logbooks.

To summarize the table, MATANUSKA's catch-rate was much higher than the other vessels' and therefore her fishing time per trip was much less and the weight landed much greater. Despite the low value of industrial fish, her grossing per day at sea (day's absence) exceeded the average for the other vessels. When her net was in the water, MATANUSKA was earning nearly twice as much as the other average vessel, but this was to some extent offset by the fact that sandeels cannot be caught at night.

The profitability of the voyages was marred, compared with that of the consumer vessels, when certain service and levy charges were taken into consideration. In particular, these were the levies paid to the White Fish Authority and the British Transport Docks Board on the basis of the tonnages landed. Thus MATANUSKA paid an average of £34.3 and £26.4 per trip in charges to the WFA and the BTDB respectively, compared with £8.1 and £9.2 respectively for an average seiner voyage. The present system whereby the levies are based on tonnage and not, for example, on value, places an industrial fishery at a considerable disadvantage. A change in the system is indicated and at the time of writing there are some encouraging signs. Thus, for example, the industrial fish quay at Grimsby has recently been leased to a firm of fish sales agents and this should result in lower charges to the vessel owners.

Table 2 Comparison between an average trip by MATANUSKA fishing for sandeels and an average trip by a Grimsby near-water vessel (mostly seiners) fishing for white fish during the same period

	MATANUSKA	Other vessels
Gross tonnage of vessel	74.0	36.8
Hours' fishing	38.4	131.2
Days' absent	4.9	11.4
Weight landed (tons)	51.5	12.2
Value (excluding subsidy)	£503.6	£980.5
Grossing per day's absence	£102.8	£86.0
Grossing per 1 hour's fishing	£13.1	£7.5
Price received per ton	£9.6	£80.4
Number of trips	8*	487

*MATANUSKA's first trip has been omitted because it was a shakedown trip and entailed a long steam from Esbjerg.

In conclusion, the sandeel fishery could provide a profitable fishery for $2\frac{1}{2}$–3 months for small vessels based on the Humber, especially if costs incurred by such factors as WFA levy, dock charges and Board of Trade manning requirements (at present, two certificated men are required) can be reduced.*

*Since the completion of this leaflet, an Order has been laid before Parliament which, amongst other things, reduces the WFA levy on fish sold for reduction to meal to 0.12d. per stone. The new regulation operates from 15 February 1970.

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